

# Reappearance of the mangrove rail *Rallus longirostris* following reinvasion of southern Brazilian salt marshes by the exotic tanner grass *Urochloa arrecta*

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## Research Article

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# Abstract

The mangrove rail *Rallus longirostris*, a bird species typically associated with mangroves, was recorded from the 2000s to the early 2020s occupying patches of the invasive African grass *Urochloa arrecta* in subtropical salt marshes of southern Brazil. Following eradication of this alien plant species through management actions in 2020, *R. longirostris* disappeared locally. Although the initial study was concluded in 2020, fieldwork continued, allowing assessment of subsequent dynamics. Here, we document post-eradication development and evaluate previous hypotheses regarding the association between *R. longirostris* and *U. arrecta*. Monthly surveys were conducted in salt marshes of Guaratuba Bay, Paraná, from September 2022 to March 2026. Patches of *U. arrecta* reappeared as early as 2021, but *R. longirostris* was only recorded again from mid-2023 onwards, when larger patches had developed. By July 2024, patches occupied by the bird measured 0.02 ha, 0.02 ha, and 0.12 ha. A patch measuring 0.006 ha is still not occupied. Our results reinforce a strong association between *R. longirostris* and areas dominated by *U. arrecta*, suggesting that this invasive grass provides structurally distinct habitat and/or reduces competitor presence. The absence of *R. longirostris* in smaller patches of *U. arrecta* further indicates a minimum patch size threshold for occupancy. These findings also highlight a complex conservation trade-off, as management of *U. arrecta* benefits native biota, including threatened birds, while simultaneously reducing habitat availability for *R. longirostris*. Continued long-term monitoring remains essential to assess whether this association is stable or represents an ecological trap.

## Introduction

A population of the mangrove rail *Rallus longirostris* Boddaert, 1783, a bird species typically associated with mangroves (Vieira 2015), was recorded occupying patches where the African tanner grass *Urochloa arrecta* (Hack. ex T. Durand and Schinz) Morrone and Zuloaga invaded salt marshes in southern Brazil from the 2000s to the early 2020s (Bornschein et al. 2022, 2023). *Rallus longirostris* was also observed away from *U. arrecta* patches, occasionally alongside the similarly sized blackish rail *Pardirallus nigricans* (Vieillot, 1819), the most abundant bird species in the studied salt marshes, without evidence of territorial interactions (Bornschein et al. 2022). However, only *R. longirostris* was recorded within *U. arrecta* patches, where it nested in exposed basket-like structures supported by this plant, whereas *P. nigricans* nested in concealed basket-like structures within native herbaceous vegetation (Bornschein et al. 2022). After the management and eradication of the *U. arrecta* in the patches used by *R. longirostris* in 2020, the species was no longer recorded locally from 2021 onward (Bornschein et al. 2022).

The vegetation in the patches invaded by *U. arrecta* is structured into only two layers rather than three, as in native salt marshes (Bornschein et al. 2022). Based on this structure, an ecological relationship between *R. longirostris*, *P. nigricans*, and habitats invaded by *U. arrecta* has been proposed (Bornschein et al. 2022). The lower vegetation layer in these patches is extremely dense, restricting the movement of larger birds such as rails through the vegetation mass. Consequently, its upper surface effectively functions as a “ground” for rail locomotion, providing a relatively open habitat and a reproductive niche above tidal inundation (Bornschein et al. 2022). This configuration appears to favor *R. longirostris*,

offering habitat and, particularly, a reproductive niche free from competition with *P. nigricans*, which occupies and nests in areas with denser vegetation (Bornschein et al. 2022).

The study by Bornschein et al. (2022), which represents an additional example of situations in which invasive species may benefit native species (Overton et al. 2014; Casazza et al. 2014; Wang et al. 2025), has been continued. The objective of the present study is to document the re-establishment of areas invaded by *U. arrecta* and their subsequent occupation by *R. longirostris*.

## Methods

Following Bornschein et al. (2022), fieldwork was conducted monthly from September 2022 to March 2026 in the Guaratuba Bay estuary, a Ramsar Site on the coast of Paraná State, southern Brazil. The study area included four sites: 1) Jundiaquara Island (c. 25°52'25"S, 48°45'32"W; 11.2 ha); 2) confluence of the Claro and São João Rivers ("Continente"; c. 25°52'28"S, 48°45'44"W; 8.3 ha); 3) Riozinho River mouth ("Riozinho"; c. 25°52'00"S, 48°45'05"W; 1.3 ha); and 4) part of the Folharada Island (c. 25°51'58"S, 48°43'23"W; 16.6 ha). Surveys followed the same procedures as described by Bornschein et al. (2022): diurnal observations (from dawn to ~ 13:00 h, plus additional 2–3.5 h in the afternoon) conducted by three to four observers over three to four days per month. Although field effort primarily focused on the marsh antwren *Formicivora acutirostris* (Bornschein, Reinert & Teixeira, 1995) (e.g., Sandretti-Silva et al. 2024a,b), surveys involved visual and auditory monitoring of birds across the entire study area.

The study sites comprise estuarine marshes (Doody 2001), classified as subtropical salt marshes (Bornschein et al. 2017), that are flooded twice daily by mixed semidiurnal tides (Lee and Chang 2019). Vegetation is dominated by native herbaceous species, including crinum lily *Crinum. americanum* L., California bulrush *Schoenoplectus californicus* (C. A. Mey.), *Fuirena robusta* Kunth, *Cladium mariscus* (L.) Pohl, *Acrostichum danaeifolium* Langsd. and Fisch., *Stephostachys mertensii* (Roth) Zuloaga and Morrone, and southern cattail *Typha domingensis* Pers. Trees are also present, particularly *Calophyllum brasiliense* Cambess., *Laguncularia racemosa* (L.) C.F. Gaertn., and *Annona glabra* L. (Reinert et al. 2007; Favretto et al. 2022). In invaded patches, *U. arrecta* is the dominant species and it is usually associated with *S. californicus*. Measurements of patches dominated by *U. arrecta* were obtained using Google Earth Pro (version 7.3.7.1155), based on satellite imagery from February 2022 and July 2024.

## Results

In 2021, we observed that some individuals of *U. arrecta* had persisted despite management efforts at Continente. Although we implemented a limited control by manually removing the invasive plants, this measure was ineffective. By July 2024, *U. arrecta* had become the dominant species in a patch measuring 0.006 ha (62.2 m<sup>2</sup>) at Continente, where *R. longirostris* was not recorded as of March 2026 (Fig. 1).

In late 2022, two small patches dominated by *U. arrecta* appeared on Jundiaquara Island and one at Riozinho (Fig. 1). By July 2024, they measured 0.02 ha (187 m<sup>2</sup>), 0.12 ha (1,232 m<sup>2</sup>), and 0.02 ha (198

m<sup>2</sup>), respectively. We recorded at least one pair of *R. longirostris* in each of these three patches from mid-2023 through March 2026. No individuals of *R. longirostris* were recorded outside patches dominated by *U. arrecta*, and no evidence of breeding activity was detected during this period.

## Discussion

The reappearance of *R. longirostris* following the reinvasion by *U. arrecta* reinforces the hypothesis of Bornschein et al. (2022) that this exotic grass, when dominant, constitutes a structurally suitable habitat that is either preferred or otherwise available for use in the study area. The observed cycle of the appearance of the bird following the establishment of the invasive grass, its disappearance after the eradication of the plant (Bornschein et al. 2022), and its return after reinvasion, provides strong evidence of an association between *R. longirostris* and the habitat provided by *U. arrecta*. Our results also indicate that there is a minimum patch size of areas dominated by *U. arrecta* required for use by *R. longirostris*. However, the minimum patch size used by *R. longirostris* in the study area could not be precisely determined due to the lack of satellite imagery for 2023 in Google Earth.

Bornschein et al. (2022) emphasized that *R. longirostris* was already considered threatened with extinction in the state of Paraná, where it was classified as Vulnerable (VU). Nevertheless, the authors advocated continued management of *U. arrecta* due to its detrimental impacts on native biota, particularly the salt marsh endemic *F. acutirostris* (Bornschein et al. 2024; see Reinert et al. 2007). A subsequent revision of the list of threatened birds in Paraná (Decree 6,040/2024 of the State of Paraná, June 5, 2024) retained *R. longirostris* as Vulnerable (VU). In contrast, the conservation status of *F. acutirostris* is markedly more critical: only 918 adult individuals are estimated to remain, and the species is undergoing a continued population decline, with extinction projected within the next 28 years (Sandretti-Silva et al. 2024b).

Studies investigating its behavior and reproductive success inside the patches, together with long-term monitoring are essential to determine whether the association between the bird and the exotic grass is stable or whether invasive patches function as ecological traps over time (*sensu* Nordby et al. 2009; Kloskowski 2012; Stinson and Pejchar 2018). However, long-term monitoring remains a challenging task in Brazil due to chronic funding limitations, often resulting in self-funded fieldwork and increasing the risk of sunk cost fallacy.

## Declarations

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Arthur Henrique Guarnieri. Preparing figures and/or tables: Marcos R. Bornschein, Giovanna Sandretti-Silva, Arthur Henrique Guarnieri.

**Data availability:** The raw data in this article are included in text and figures.

**Competing interests:** The authors have no relevant competing interests to disclose.

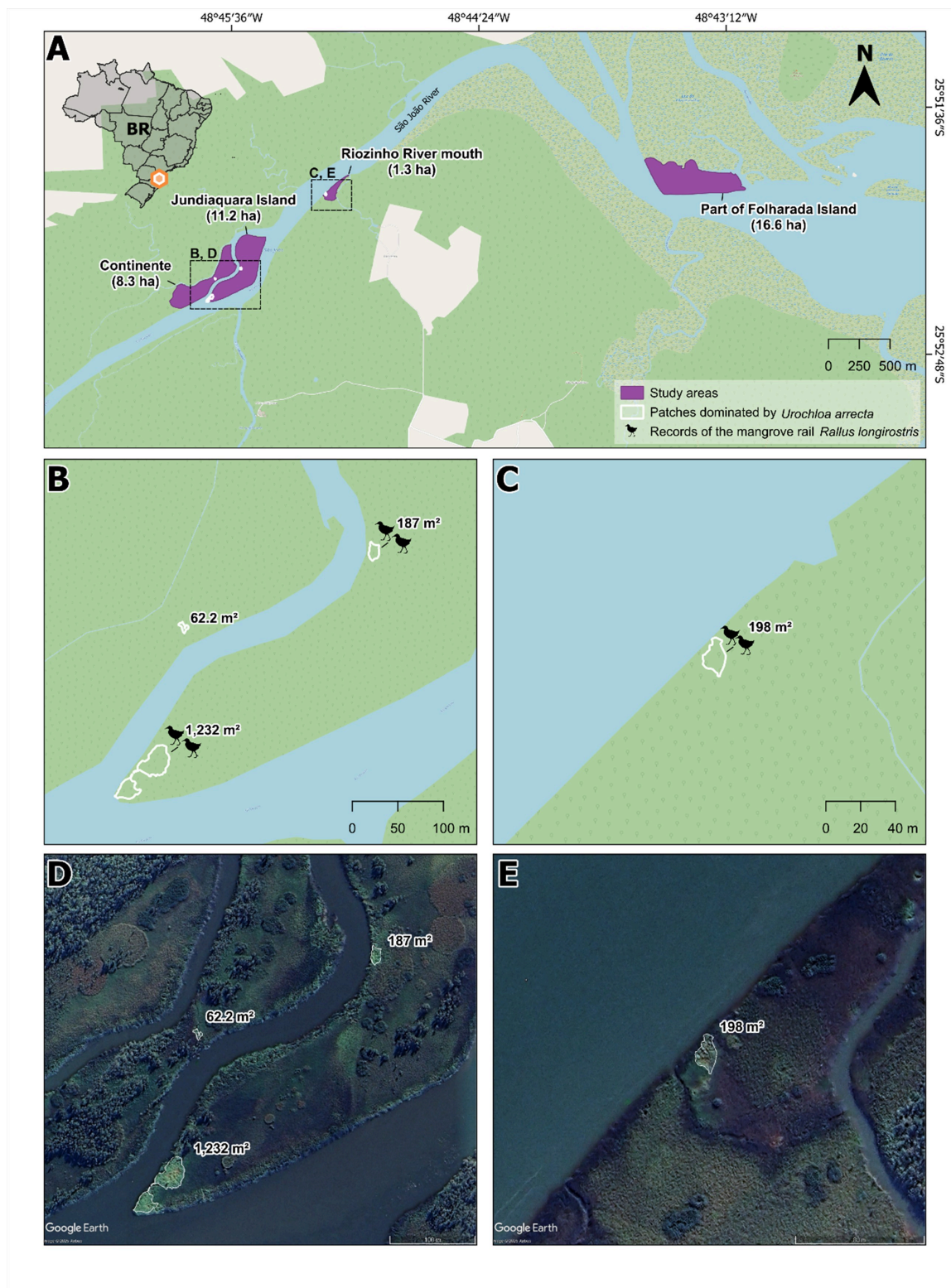
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## Figures



**Figure 1**

A) Study area in Guaratuba Bay, Guaratuba Municipality, Paraná, southern Brazil (purple polygons), during 2022–2026. B–E) Size of patches dominated by the alien tanner grass *Urochloa arrecta* (Hack. ex T. Durand and Schinz) Morrone Zuloaga. Imagery source: Google Earth Image © 2025 Airbus, Instituto Brasileiro de Geografia e Estatística (IBGE), and OpenStreetMap contributors.