



NEW RECORD AND EGG PREDATION OF *Crypturellus notivagus* (AVES, TINAMIDAE) IN THE STATE OF RIO GRANDE DO SUL, BRAZIL

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Abstract: The Yellow-legged Tinamou (*Crypturellus noctivagus*) is an endemic and threatened Brazilian forest bird. In the Rio Grande do Sul state, the species was reduced to only one relictual population estimated in 18 adult individuals. Here, we unveil a second population of *C. noctivagus* for this state and a record of eggs predation by a Black-and-white Tegu (*Salvator merianae*). The population was discovered in an enclave of Atlantic Forest domain fragment into the Pampa biome in the municipality of Passo do Sobrado, based on the observation of an adult and a nest containing 10 eggs - an unusual number of eggs for this species. Through this new population of *C. noctivagus* in the state, further ecological studies are needed aiming at its local conservation.

Keywords: conservation; geographic distribution; threatened species; Tinamiformes; Yellow-legged Tinamou.

The Yellow-legged Tinamou, *Crypturellus noctivagus* (Wied, 1820; Tinamidae, Tinamiformes), is a forest bird endemic to Brazil (Sick 1997, Pacheco *et al.* 2021). It occurs in forest fragments in the Atlantic Forest domain (mainly in lowland forest areas), following the coastal slope from the states of Bahia to Rio Grande do Sul (Sick 1997). Populations of *C. noctivagus* are suspected to be declining as a consequence of the fragmentation of its natural habitat and hunting (Bencke *et al.* 2003, Cabot 2020, Phalan *et al.* 2020, BirdLife International 2022), especially in those inhabiting areas outside of protected areas (Corrêa *et al.* 2019).

The *C. notivagus* is classified as not threatened in the Brazilian Red List (MMA 2022), but there are regional distinctions in its conservation status (Phalan *et al.* 2020). For example, in the state of Rio Grande do Sul (RS), *C. noctivagus* is Critically Endangered (Rio Grande do Sul 2014). For decades, the last known record of *C. noctivagus* was in the municipality of Soledade in November 1974 (Belton 1994), in which led to its classification as Probably Extinct in RS by Bencke *et al.* (2003). More than three decades later, a relictual population was rediscovered for the RS in an isolated forest fragment within the Pampa

biome in the municipality of São Sepé (Corrêa *et al.* 2010). This population was estimated at about 18 adult individuals (Corrêa *et al.* 2020a), which were believed to be the only living individual in RS (Corrêa *et al.* 2010, 2020a). Due to the fragmentation of its natural habitats (Bencke *et al.* 2003) and the existence of isolated populations of *C. noctivagus* (Corrêa *et al.* 2019), monitoring the breeding biology and success of this species is important for conservation purposes (Corrêa *et al.* 2010, 2020a).

Despite general aspects of the breeding biology of *C. noctivagus* are known, the only information on its reproductive biology in RS comes from Berlepsch & Ihering (1885). The breeding period of *C. noctivagus* is during spring and summer, when three or four eggs are laid per nest (Berlepsch & Ihering 1885, Cabot 2020). The nest is found on the ground. The female can perform one and/or more postures during the reproductive period (Cabot 2020). On the ground, nests are susceptible to opportunistic predators potentially reducing breeding success (Sick 1997, Cabot 2020). Freshly laid eggs vary in color from turquoise to shiny blue but after a few days fade to light gray. The incubation period is on average of 17 days. In the family, males incubate the eggs (Sick 1997, Bencke *et al.* 2003, Cabot 2020). In order to contribute additional information to *C. noctivagus*, we here report the presence of a new population in Rio Grande do Sul and provide information on the predation of eggs in a nest.

The study area is within an Atlantic Forest fragment in the municipality of Passo do Sobrado, Rio Pardo Valley, RS, Brazil. The fragment is near the Jacuí River and over 300 ha, in the domain of Deciduous Seasonal Forest (29°47'21.7" S 52°12'55.9" W). The transition from Atlantic Forest to the Pampa biome is nearby, and region suffers from anthropogenic impacts from agricultural activities such as raising livestock and monocultures (IBGE 2004). The area is not under any legal protection. The climate in the region is temperate, with an average annual temperature between 18 and 19° C. The average annual precipitation varies between 1600 and 1900 mm. The elevation ranges from 60 to 200 m (Alvares *et al.* 2013).

On 9th November 2020, through the recognition of the vocalization, we recorded the

presence of a new population of *C. noctivagus* (Figure 1). While accessing the fragment, we observed an individual in a nest with eggs. Later, on 14th November 2020, a camera trap (Suntekcam Ht001b) was installed near the nest to record breeding success and potential predators. The camera was installed at a distance of about three meters from the nest. On the same date, we undertook a 4 hours sampling in the area by randomly walking on existing trails searching for the species both visually and acoustically. Sampling was performed in the morning by two researchers.

The observed individual of *C. noctivagus* was incubating eggs in its nest, which consisted of a hole in the ground. The nest was in a ravine near a Yellow Cinnamon (*Nectandra lanceolata* Nees & Mart. Ex Nees) trunk associated with bromeliads (*Ananas* sp.) and vines. The eggs were located about 4 m from the edge of the forest and about 8 m from a small semipermanent stream. In the nest were 10 bright blue eggs, some of them covered with dry leaves. A day after the nest discovery, on 15th November 2020, the camera trap recorded an individual of Black-and-white Tegu *Salvator merianae* (Duméril & Bibron 1839) foraging on the eggs at 4:50 pm, thus, preventing the breeding success of this nest (Figure 2).

In our brief random search within the fragment, we observed two individuals of *C. noctivagus* and six others acoustically. These were in different parts of the forest fragment and apparently were not the same individuals. Other forest tinamids was also acoustically recorded: the Brown Tinamou *Crypturellus obsoletus* (Temminck 1815) and the Tataupa Tinamou *Crypturellus tataupa* (Temminck 1815).

Although some information on *C. noctivagus* from RS has already been reported in the recent literature (Corrêa *et al.* 2010, Corrêa & Petry 2018, 2019, Corrêa *et al.* 2019, 2020a, 2020b), this work unveils a second population in the state and the record of a nest of *C. noctivagus* with 10 eggs which is considered unusual for this species, according to information available in Berlepsch and Ihering (1885), Sick (1997), Bencke *et al.* (2003) and Cabot (2020). This new population provides an opportunity for further research and conservation programs of this species in the state, with particular focus on the genetic diversity in

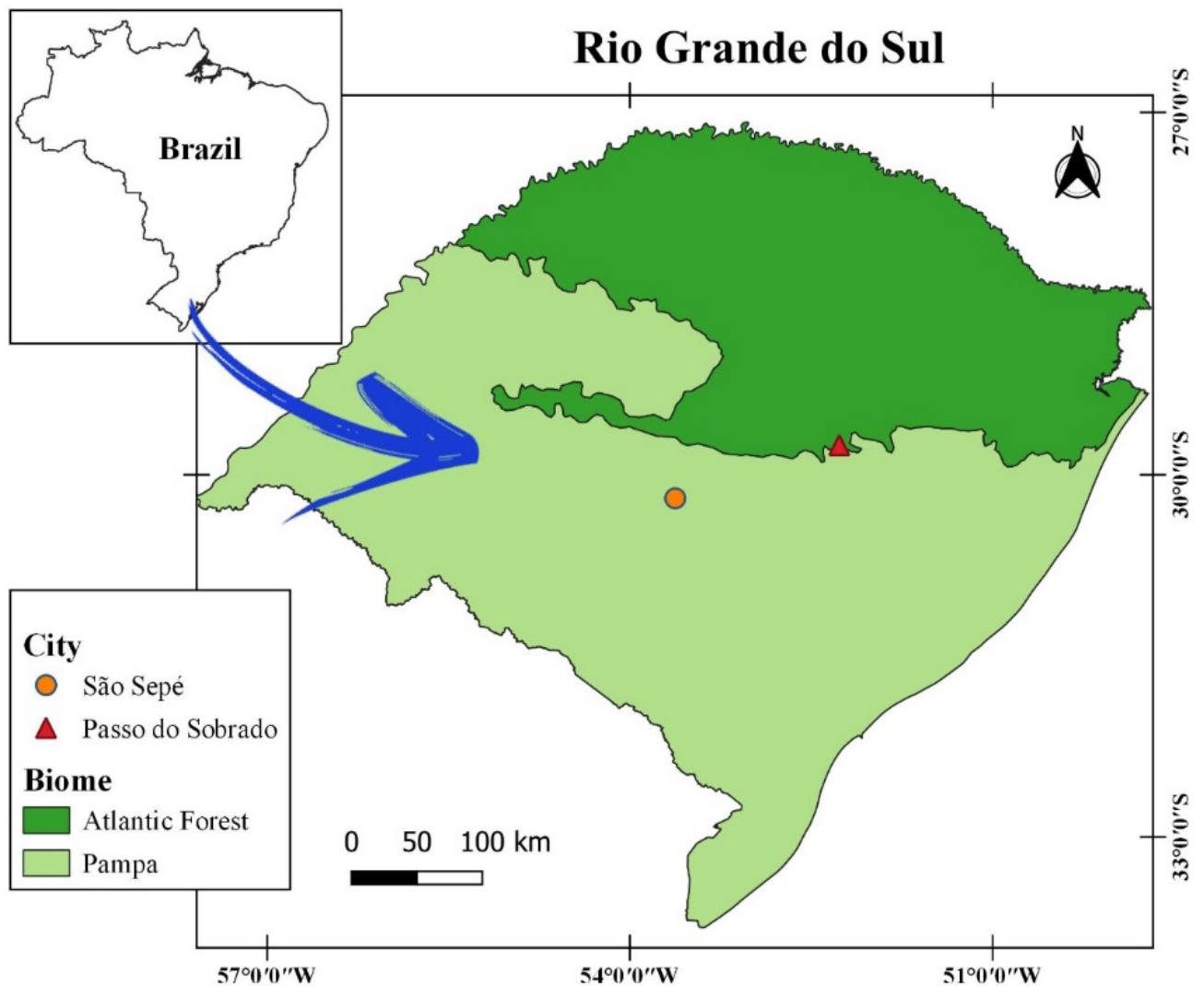


Figure 1. Location of the newly recorded *Crypturellus noctivagus* population in the municipality of Passo do Sobrado, Rio Grande do Sul, Brazil, and of the relictual population found in 2009 in the municipality of São Sepé, Rio Grande do Sul (Corrêa *et al.* 2010). The Passo do Sobrado population is within the Atlantic Forest biome, and the São Sepé population is in the Pampa biome.

this region. In addition, surveys in adjacent areas, mainly in forest fragments from the regions of Rio Pardo and Rio Taquari valleys, are fundamental in the search for other populations.

Bird nests on the ground are more exposed to predators (Sick 1997), and predation of tinamid nests occurs mostly during the night (Brennan 2010). Predators are adaptable in their searches for nests (Fiorillo & Batista 2019), and in the first days after laying, the brightly colored eggs starkly contrast with the brownish soil and dry leaves. Male tinamids incubating eggs often leave their nest to drink and forage, or in defense against a potential predator (Sick 1997, Cabot 2020). In this way, they leave olfactory cues in the environment

and unintentionally help predators find their nests (Brennan 2010, Fiorillo & Batista 2019). *Salvator merianae*, which commonly preys on eggs of *Gallus gallus domesticus* (Linnaeus 1758, Lema 2002), were recorded in the diurnal period preying on eggs of *C. noctivagus*, in this study. It is important to see how much this opportunistic predator can interfere with the reproductive success of *C. noctivagus*. A study would be important to verify the potential predators of *C. noctivagus* nests in RS and to determine which period (day or night) would have the highest incidence of predation. The test could be carried out with artificial egg models, for example.

Lastly, we report here the existence of a second



Figure 2. A) *Crypturellus noctivagus* nesting in Passo do Sobrado, Rio Grande do Sul, Brazil; B) Nest with 10 eggs, some of them covered with dry leaves; C) *Salvator merianae* preying on eggs of the *C. noctivagus*; D) Nest after predation.

population of *C. noctivagus* in RS. However, it is important to search for other populations, especially along their historical distribution in the state (Bencke *et al.* 2003).

Other isolated populations are expected, especially in forest fragments in transitional areas between Atlantic Forest and Pampa biomes.

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