



NESTING OF BLACK-WINGED SALTATOR *SALTATOR ATRIPENNIS* IN NORTHWESTERN ECUADOR

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Abstract · The Black-winged Saltator *Saltator atripennis* is common in the Andes of Colombia and Ecuador. However, there is only anecdotal information on its reproductive biology. In this study, I describe its nest shape, structure, material composition, and clutch size based on three nests found between May and June 2020 in northwestern Ecuador. For a single nest, I conducted daily measurements for 18 consecutive days on the weight of the eggs and nestlings and performed linear regressions to determine their change over time. All nests were cup-shaped and were built in dense shrubbery. The clutch size consisted of two sky-blue eggs with irregular concentric black stripes on the larger pole. Incubation lasted 14 days, during which eggs lost weight at an average daily rate of 0.4 g. The two fledglings disappeared after four days, during which they gained weight at a daily rate of 3.3 g, which is almost twice the rate of weight gain recorded for other *Saltator* species. The information presented in this study substantially increases our knowledge of the reproductive biology of *S. atripennis*, but further studies are needed for a more comprehensive understanding of the species' full breeding cycle.

Resumen · Anidación del saltador alinegro *Saltator atripennis* en el noroeste de Ecuador

El Saltador Alinegro *Saltator atripennis* es común en los Andes de Colombia y Ecuador. Sin embargo, sólo existe información anecdótica sobre su biología reproductiva. En este estudio, describo la forma, estructura y composición de los materiales del nido y el tamaño de la nidada a partir de tres nidos encontrados entre mayo y junio de 2020 en el noroccidente de Ecuador. Para un solo nido, realicé mediciones diarias durante 18 días consecutivos sobre el peso de los huevos y los polluelos, y realicé regresiones lineales para determinar su cambio a lo largo del tiempo. Todos los nidos tenían forma de copa y estaban contruidos en arbustos densos. El tamaño de puesta consistió en dos huevos de color azul celeste con rayas negras concéntricas irregulares en el polo mayor. La incubación duró 14 días, durante los cuales los huevos perdieron peso a una tasa media diaria de 0,4 g. Los dos volantones desaparecieron después del cuarto día, durante el cual los polluelos ganaron peso a una tasa diaria de 3,3 g, casi el doble del peso ganada que se ha registrado para otras especies de *Saltator*. La información presentada en este estudio aumenta sustancialmente nuestro conocimiento de la biología reproductiva de *S. atripennis*, pero se necesitan más estudios para comprender mejor el ciclo reproductor completo de la especie.

Key words: *Incubation period · nest characteristics · nesting materials · nestling development · reproductive biology*

INTRODUCTION

The genus *Saltator* (Passeriformes: Thraupidae) includes 16 species restricted to the Neotropics, ranging from Mexico to Argentina, and the Lesser Antilles (Winkler et al. 2020, Remsen et al. 2023). Saltators inhabit semi-open habitats to well-preserved montane forests from sea level to 3000 m a.s.l. (Ridgely & Tudor 2009, Winkler et al. 2020). While most species in the *Saltator* genus may be common, usually easy to see and with distinctive melodic songs, there is limited information on their reproductive biology across their distributions (Winkler et al. 2020). For seven *Saltator* species, nest, clutch size, nestlings, reproductive periods, and weight loss of eggs and nestlings have been described (Skutch 1954, Winkler et al. 2020, Arteaga-Chávez 2023). However, for other nine species information on nesting is either poorly detailed or unknown (Skutch 1954, Winkler et al. 2020, Arteaga-Chávez 2023).

The Black-winged Saltator *Saltator atripennis* occurs in the Andes of Colombia and western Ecuador (Freile & Restall 2018, McMullan et al. 2018). In Ecuador, the species is mainly distributed in lowland subtropical and foothill areas, although it is also found locally along the coast (Athanas & Greenfield 2016, Freile & Restall 2018). The species inhabits wooded clearings, forest edges, and montane forest canopies at 0–2000 m a.s.l. (Athanas & Greenfield 2016, Freile & Restall 2018).

Even though the species is relatively common throughout its distribution (Athanas & Greenfield 2016, McMullan et al. 2018), there is limited information available regarding its natural history and reproductive biology (Brewer 2020). Adults have been observed carrying nesting material in April in Colombia and in February in Ecuador, with nestlings observed in December (Hilty & Brown 1986, Brewer 2020). Clutch size of *S. atripennis* ranges from two to three eggs, and the nest is a deep cup (Hilty & Brown 1986, Brewer 2020). In this study, I provide detailed information on the nest, incubation time and weight change of eggs and nestlings of *S. atripennis* in northwestern Ecuador.

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METHODS

In May and June 2020, I found three *S. atripennis* nests while conducting a birdwatching activity in the community of Gualchán, northwestern Carchi province (0°47'7.07"N, 78°12'40.37"W, 1100 m a.s.l.). The nests were in a brush of secondary vegetation in a landscape matrix dominated by tropical plant crops and cattle pastures. The study area has two climatic seasons. The period of higher precipitation occurs October–May, while the drier season extends July–September (Instituto Nacional de Meteorología e Hidrología INAMHI 2024).

I conducted observations using Brunton 8x42 binoculars to record the location, shape, composition, and clutch size of the nests. For a single nest, I measured the nest and eggs and weighed the eggs and nestlings daily for 18 consecutive days to determine changes during incubation and fledging. Following the recommendations of Martin & Geupel (1993) and Fierro-Calderón et al. (2021) to avoid disturbances and nests abandonment by adults, I visited nests between 15:00 h and 17:00 h when the adults left the nest in search of food. I then measured the eggs and chicks after moving them approximately 10 m from the nesting area, after which they were returned to the nest. For measurements of the nest and the eggs, I used a manual caliper (precision 0.1 mm) and a pocket digital scale MH (precision 0.01 g) to weigh eggs and nestlings. I performed linear regressions of daily weight of eggs and nestlings to determine the rate of change over time (Rahn & Ar 1974).

RESULTS

On 12 May 2020, I found the first active nest with one egg. This nest was placed 5 m from a Buff-throated Saltator *S. maximus* nest. I discovered the second and third nests on 10 and 15 June 2020, each containing two eggs. The three nests were located approximately 10–15 m apart on a strip of brush along a dirt road. The nesting area consisted of secondary vegetation with dense shrubs up to 2.5 m high, including *Piper* sp. (Piperaceae), *Baccharis* sp., (Asteraceae) and exotic pastures (Poaceae). All three nests were located within dense vegetation on forked branches of *Piper* sp., at heights ranging from 1 to 1.8 m above

the ground (Figure 1A).

The three nests were cup-shaped, and their structures consisted of three layers (Figure 1B). The inner layer had rootlets, tendrils and thin, dark brown vegetative fibers; the middle layer had thin, long, yellowish-brown fibers from plantain leaves; and the outer layer contained thin twigs and dry stems with a grayish color. Measurements for the first nest taken after fledging were: 97 x 63.5 mm internal diameter; 74.5 mm cup depth; 161.5 x 159.8 mm external diameter and 107.6 mm external height.

The second day after discovering the first nest (13 May 2020), I found that it contained two eggs (Figure 1B). The laying period likely started on 12 May 2020, as many songbirds lay their eggs alternately with one every 24 h (Fierro-Calderón et al. 2021); hence, I estimated a laying period of two days. The eggs were sky-blue with concentric and irregular black stripes on the larger pole, displaying an abstract pattern that was different for each egg (Figure 1C and D). Egg measurements were 25.4 x 19.6 mm and 26.7 x 16.6 mm, with initial weights of 4.96 g and 5.39 g, respectively. All three nests had a clutch size of two eggs, all with a sky-blue color and irregular markings. The incubation period was 14 days, calculated from the laying of the second egg to the hatching of the last egg. Eggs thus hatched alternately on 26 and 27 May 2020. Daily nest monitoring showed weight changes in the eggs over time. The eggs lost up to 12.62% of their weight during this period at a rate of 0.04 g per day ($R^2 = 0.98$, $n = 2$). In addition, rates of daily weight loss varied between the two eggs (Egg one weight loss = 0.05 g, $R^2 = 0.99$, Egg two weight loss = 0.036 g, $R^2 = 0.99$; Figure 2A).

On 26–27 May 2020, nestlings hatched with closed eyes, pale pink skin, and moderately dense olive-gray down on the dorsal, wings, and head tracts. The bill was yellowish with an egg tooth at the tip. The inner mouth was pale pink with contrasting whitish corners (Figure 3A y B). The nestlings exhibited active begging behavior when I inspected the nest. Their initial weights were 5.04 g and 4.91 g, respectively.

On 31 May 2020, the 4-day-old nestling was about three



Figure 1. Nest of the Black-winged Saltator *Saltator atripennis* in northwestern Ecuador. A) Side view of the nest, B) Nest with eggs, 13 May 2020, C) and D) Side and front view of eggs. Photos: William Arteaga-Chávez.

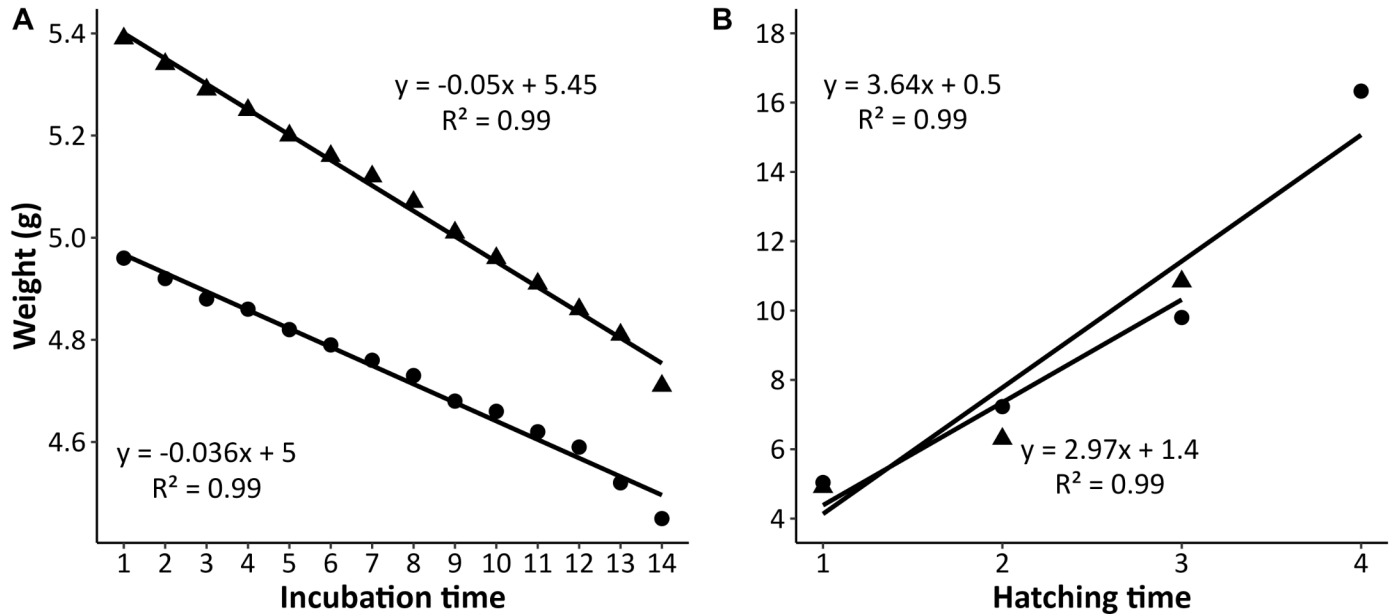


Figure 2. Daily changes in the weight of eggs and chicks during the incubation (A) and hatching period (B) of the Black-winged Saltator *Saltator atripennis* in northwestern Ecuador. A) Weight loss of eggs during incubation, and B) weight gain of chicks during incubation. The trend equation Y shows the change in egg and chick weight and R² shows the model fit.

times larger than its first day of age. Wing feathers were emerging, while feathers on the dorsal and femoral tracts were just starting to emerge from the skin (Figure 3C). During this visit, both nestlings appeared healthy and constantly begged for food. On 1 June 2020, the nestlings were not found in the nest; however, the nest was intact and there were no remains of carcasses inside it.

Measurements of the nestlings during the four days of monitoring showed a progressive weight increase at an average

daily rate of 3.35 g and they increased their weight by 61% relative to their initial weight. However, each nestling showed a different daily weight gain (Nestling one weight gain: 3.64 g, R² = 0.99, Nestling two weight gain 2.96 g, R² = 0.99; Figure 2B).

DISCUSSION

My observations provide the first data on nest characteristics, laying period, eggs, incubation period, and the initial stage of nestling development as well as the weight change of eggs and



Figure 3. Nest of the Black-winged Saltator *Saltator atripennis* in northwestern Ecuador. A) and B) Newly hatched nestlings, 27 May 2020. C) Lateral view of 4 days-old nestlings, 31 May 2020. Photos: William Arteaga-Chávez.

nestlings over time for *S. atripennis*. I estimated a laying period of two days and incubation period of 14 days. Nestling growth could only be followed for 4 days, as the nestlings disappeared from the nest, presumably due to predation.

These reproductive observations of *S. atripennis* in May and June correspond to the transition between the rainy and the dry seasons in the study area. My observations are a little later than reports of breeding activity in December and February in Ecuador (Brewer 2020), although they seem to be more in line with reports from December, February, and April in Colombia (Hilty & Brown 1986, Forrester 2015). However, these studies do not mention the seasonal context of their reported reproductive events. My records also partially resemble the nesting events recorded during the rainy season (February–May) for its congener *S. maximus* in the same study area (Arteaga-Chávez 2023). It is likely that the reproductive period of *S. atripennis* extends into the rainy season, similar to that of its congeners.

The nest structure and materials of *S. atripennis* were similar to previous anecdotal observations of this species (Hilty & Brown 1986, Forrester 2015, Brewer 2020). Materials found in the middle layer of the nest, such as long plant fibers from banana leaves or monocotyledons, match the detailed descriptions of *S. maximus* (Skutch 1954, Arteaga-Chávez 2023). The nest structure of *S. atripennis* composed of three plant layers has also been found in *S. maximus* (Skutch 1954, Arteaga-Chávez 2023) and Masked Saltator *S. cinctus* (Ortiz Mendoza 2013), although the composition may vary depending on the species and its habitat. In addition, the cup-shaped nest is similar to reports of other *Saltator* species: Streaked Saltator *S. striatipectus* (Hallinan 1924), Bluish-gray Saltator *S. coerulescens* and Orinocan Saltator *S. orenocensis* (Ramo & Busto 1984), and *S. cinctus* (Ortiz Mendoza 2013). Additionally, the location of *S. atripennis* nests low above the ground and within dense shrubbery is consistent with observations by Hilty & Brown (1986), and for other species in the genus (Skutch 1954, Ortiz Mendoza 2013, Greeney et al. 2020, Arteaga-Chávez 2023).

Clutch size and egg coloration of *S. atripennis* are similar to those documented by Forrester (2015). They are also like the eggs of *S. striatipectus* (Skutch 1954, Greeney et al. 2020), but have a thinner pattern of marks on the major pole than those of *S. maximus* (Skutch 1954, Arteaga-Chávez 2023). The incubation period matches that reported for *S. maximus* and *S. striatipectus* (Skutch 1954, Arteaga-Chávez 2023), but is shorter than the incubation period for *S. cinctus* (18 days, Ortiz Mendoza 2013). These differences are probably related to the fact *S. atripennis*, *S. maximus* and *S. striatipectus* occur at lower elevation than *S. cinctus*, and lower altitude species tend to have shorter incubation periods than higher elevation species (Badyaev 1997, Beissinger et al. 2005), possibly due to stable temperature conditions at low elevations (DuRant et al. 2013).

Additionally, *S. atripennis* eggs lost weight more slowly than many other species. I found that the 12.6% weight loss of eggs during incubation was lower than the only known value for the *Saltator* genus, with a 14.2% weight loss of eggs obtained from *S. maximus* (Arteaga-Chávez 2023). The weight loss of eggs in my study is also lower than the reported value of 18% for a set of 145 species (Rahn & Ar 1974), as well as for the Peruvian Antpitta *Grallaricula peruviana* (18%; Greeney 2006), but is marginally higher than the documented value of 11.9% for the Red-bellied Grackle *Hypopyrrhus pyrohypogaster* (Ocampo et al. 2012). The 0.04 g daily rate of egg weight loss of *S. atripennis* in my study was the same as that found for *S. maximus* (Arteaga-Chávez 2023), which may be due to their congeneric status and use of similar nesting habitats.

In this study, the nestlings of *S. atripennis* had similar down color to *S. maximus* (Skutch 1954, Arteaga-Chávez 2023). While it was not possible to document their entire brooding period due

to potential predation, it is important to note that in the first 4 days, nestlings showed an average 3.30 g daily weight increase, almost double the 1.87 g daily weight increase reported for *S. maximus* in a similar time period (Arteaga-Chávez 2023). This difference in weight increase may be due to the presence of two parasitic nestlings of the Shiny Cowbird *M. bonariensis* in the *S. maximus* nest (Arteaga-Chávez 2023), resulting in a lower provision of food for host nestlings (Gloag et al. 2012). Therefore, the variability found in the weight gain of *Saltator* nestlings suggests the need for systematic studies on their growth.

The *S. atripennis* nests I studied were found in syntopy with *S. maximus*. The similarity in their breeding seasonality, nesting habitat, nest structure and composition, clutch size, and incubation periods, have not prevented coexistence, potentially due to resource partitioning or differences in foraging behavior that reduce direct competition between the two species. Further studies are needed to understand the reproductive biology and success of these species. An improved understanding of the reproductive biology of *S. atripennis*, a widespread species that thrives in successional environments, may offer insights into the mechanisms underlying their adaptation to human-altered environments.

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