REVISTA ECUATORIANA DE
ORNITOLOGÍA

ARTÍCULO/ARTICLE

Breeding biology of the Sparkling Violetear *Colibri coruscans* in Quito

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Biología reproductiva del Orejivioleta Ventriazul *Colibri coruscans* en Quito

Resumen

El Orejivioleta Ventriazul *Colibri coruscans* tiene distribución geográfica extensa y es generalmente abundante. Sin embargo, el conocimiento sobre su biología reproductiva es escaso y en su mayoría limitado a observaciones anecdóticas. Por ello, en este estudio presentamos nuevos datos sobre su reproducción en la ciudad de Quito y valles circundantes, a partir de descripciones y observaciones de 45 nidadas en 39 nidos urbanos y sub-urbanos (algunos nidos fueron reusados) y 11 nidadas en bosques cerca de Quito. Presentamos medidas de los nidos y huevos, e información sobre cuidado maternal, desarrollo de los polluelos y comportamiento reproductivo. Monitoreamos nidos que fueron reportados en redes sociales o descubiertos por los autores entre 2009–2015 y enero 2018–mayo 2020, con ayuda de binoculares, cámaras fotográficas y de video. Los nidos tuvieron forma de taza y fueron construidos en vegetación nativa y exótica, o en estructuras artificiales protegidos por un techo, y se ubicaron entre 1,2–8 m sobre el suelo. Los nidos construidos bajo techos artificiales se mantuvieron en buen estado y fueron reusados. Los materiales del nido incluyeron musgo y fibras vegetales en la capa exterior y material vegetal suave como aquenios peludos en la cámara interior. Los nidos en bosques tenían además una cobertura de líquenes en la superficie exterior. Las puestas fueron de dos huevos blancos, de forma elipsoidal. El periodo de incubación fue de 14–16 días, y los polluelos abandonaron el nido después de 20–31 días. Solamente la hembra se ocupó de la incubación y crianza de los polluelos. En algunos casos, el territorio de anidación de la hembra coincidió con el territorio de alimentación y/o de cortejo de un macho. Encontramos actividad reproductiva durante todo el año, con un pico entre noviembre y abril, correspondiente a la segunda mitad de la temporada lluviosa corta, la temporada seca corta y la primera parte de la temporada lluviosa larga.

Palabras clave: colibrí, *Colibri coruscans*, comportamiento reproductivo, cuidado parental, hábitats urbanos, huevos, incubación, nido, pichones.

Abstract

Sparkling Violetear *Colibri coruscans* has a wide geographic distribution and is generally abundant. However, knowledge about its breeding biology is scarce and often limited to anecdotal observations. Therefore, in this study we present new breeding data in Quito and surrounding valleys, based on descriptions and observations of 45 broods in 39 nests (some nests were reused) in urban and suburban habitats, and 11 broods in woodland patches near Quito. We provide data on nest and egg measurements, maternal care, nestlings' development, and reproductive behavior. We studied nests reported on social media or discovered by the authors between 2009–2015 and January 2018–May 2020, with binoculars, photo and video cameras. Nests were open cups built in native and exotic vegetation or on artificial structures, protected by a roof, at 1.2–8 m above the ground. Nests under roofs suffered little deterioration, allowing their reuse. Nest materials in the outer layer included vegetal fibers and moss, whereas the inner chamber had soft vegetal material such as hairy achenes. Nests in woodlands were covered in lichens in the outer layer. Clutch comprised two white ellipsoidal eggs. Incubation lasted 14–16 days, and offspring left the nest after 20–31 days. Only the female incubated and reared the nestlings. In some cases, males' courtship and/or feeding territory overlapped the females' nesting territory. We observed breeding activity year-round, with a peak from November to April, corresponding to the second half of the short rainy season, the short dry season and the first half of the long rainy season.

Keywords: *Colibri coruscans*, eggs, hummingbird, incubation, nest, nestlings, parental care, reproductive behavior, urban habitats.

Musschenga, M.A., Juiña, M., & Cadena-Ortiz, H. (2022). Breeding biology of the Sparkling Violetear *Colibri coruscans* in Quito. *Revista Ecuatoriana de Ornitología*, 8, 51–66.

INTRODUCTION

Sparkling Violetear *Colibri coruscans* (Trochilidae) has a broad geographic distribution from Venezuela to northern Argentina, including Guyana and northern Brazil (Züchner *et al*., 2020). Throughout this range, it occupies forest edges, open woodland, gardens, cropland and páramo, between 1700–4500 m a.s.l.; sometimes descending to 200 m a.s.l. (Züchner *et al*., 2020). In Ecuador, it is common in the inter-Andean valleys at 1000–3500 m a.s.l., in open and semi-open areas (Freile & Restall, 2018). In Quito, it is the fourth most abundant bird species after Eared Dove *Zenaida auriculata*, Rufous-collared Sparrow *Zonotrichia capensis*, and Great Thrush *Turdus fuscater* (Cisneros-Heredia *et al*., 2015).

Despite being fairly common, the breeding biology of *C. coruscans* is generally poorly understood and known only from few anecdotal descriptions (Moore, 1947; Hainsworth, 1977; Schmidt-Marloh & Schuchmann, 1980; de la Peña, 2001; Gonzáles & Castañeda, 2020). Ruschi (1965) studied captive *C. coruscans* in Río de Janeiro, Brazil, and concluded that the female builds the nest, the eggs weigh 8–9 gr, incubation lasts 15 days, the two eggs hatch the same day or on consecutive days, and nesting period is 22 days. Zerda-Ordóñez (1994) performed an extensive study on its breeding biology in the Botanical Gardens of Bogotá, Colombia, and found that *C. coruscans* establishes three types of territories: a display (males), nesting, and feeding territory (Zerda-Ordóñez, 1994). Nest building lasted *c*. 7 days, incubation of two eggs 16 days, incubation constancy (*i.e*., percentage of time spent on the nest during the day) was 69%, and the offspring left the nest after 21 days (Zerda-Ordóñez, 1994). Nests described contained moss (Schäfer, 1954; Ruschi, 1965; Zerda-Ordóñez, 1994), were externally covered in lichens (Schäfer, 1954), and had soft materials in the inner chamber (Schäfer, 1954; Zerda-Ordóñez, 1994*)*.

In hummingbirds, the female carries out alone nest building, incubation and nestling care (Ortiz-Crespo, 2011). However, Gonzáles & Castañeda (2020) observed a male *C. coruscans* perching around a nest, and there are two additional anecdotal but controversial observations of incubating male *C. coruscans* (Moore, 1947; Schäfer, 1954; see Ortiz-Crespo, 2011). Further, no evidence of male involvement in breeding duties was found in other studies of the species' reproductive behavior; neither in the wild (Zerda-Ordóñez, 1994), nor in captivity (Ruschi, 1965; Stoppelmoor, 2000).

Given the deficient knowledge about the breeding biology of *C. coruscans*, we present extensive information on the species' breeding biology and mating behavior, nests, eggs, nestlings' development, and reproductive success in Quito and surrounding valleys. Our field information was collected between 2009–2015 and 2018–2020, and includes data about 45 active broods in urban and suburban habitats. To compare these nests with those in a more natural landscape, we also collected data at montane forest patches near Quito, on the slopes of Pichincha volcano. This study fills several gaps in our knowledge of *C. coruscans* breeding biology, especially in suburban habitats. Further, we compare our results with previous breeding studies of the species and of other hummingbirds.

METHODS

Study area
Between March 2009–November 2015, we studied nests near the residence of one of the authors in San Vicente, Nayón (-0.173728, -78.446581), northeast of Quito, Pichincha province (Fig. 1). Between January 2018–May 2020, we visited nests reported on social media or discovered casually by the authors, in the following locations: north Quito (-0.18323, -78.48445; *c*. 2800 m a.s.l.); San Rafael (-0.337207, -78.47705), La Armenia (-0.27052, -78.4695), and Sangolquí (-0.33016, -78.4511) in Los Chillos valley, south-east of Quito; Cumbayá (-0.210725, -78.44109), east of Quito; and San Antonio de Pichincha (0.004568, -78.44677), north of Quito (Fig. 1). Study sites in urban and suburban areas ranged from 2350–2800 m a.s.l. Sampling effort was not standardized over the study period.

The Quito area has an average annual temperature of 13.4 °C and a total annual rainfall of 1,175.2 mm, over two rainy periods, a short one in October–November and a longer one in February–May (Pourrut *et al*., 1995). All localities described in the valleys around Quito are moderately to highly urbanized, but contain remnants of

native vegetation. Dry forest remains along creeks and steep slopes in the valleys of Cumbayá, Nayón, and San Antonio (Museo Ecuatoriano de Ciencias Naturales, 2009), which is characterized by low-stature trees such as *Acacia macracantha* (Fabaceae), dry shrubs of several species, succulents such as *Agave americana* (Asparagaceae), and *Opuntia* sp. (Cactaceae). La Armenia, San Rafael, and Sangolquí are currently dominated by exotic trees and planted gardens, with the introduced *Eucalyptus* sp. (Myrtaceae) being abundant; native shrubland patches of high Andean shrub occur mostly along creeks and slopes, in which *Baccharis* sp. (Asteraceae) and *Mimosa* sp. (Leguminoseae) are common (Museo Ecuatoriano de Ciencias Naturales, 2009).

Complementarily, in 2015 and 2020 we studied nests close to Yanacocha reserve (*c*. -0.11174, -78.58486), northwest of Quito, in an area covered in montane forest and páramo at 3200–4400 m a.s.l., and along the dirt road from Yanacocha to Alambi (*c*. -0.087288, -78.599637, *c*. 3100 m a.s.l.) (Fig. 1). In this area, forest patches remain among cattle fields, separated by living fences of native shrubs, in which families like Melastomataceae, Ericaceae, and Asteraceae are common.

Field sampling

Nests. Individual nests were assigned a number (N1–N50; Appendix 1, Supplementary Material). Consecutive broods in the same nest are indicated with a letter (a-f) after the nest number (Appendix 2, Supplementary Material). Coordinates were taken from Google Earth Pro.

For each nest, we recorded at least the location, substrate (human made or vegetation), date and nest stage. Depending on time availability, access to the nest, and stage of occupancy, we further collected as much data suggested by Cadena-Ortiz (2018): nest and egg measures, clutch size, nest height, nest materials, observations on incubation and brooding sessions, provisioning rates, development of nestlings, and notes on behavior (see below). Observations were made with binoculars (Vogelbescherming Buizerd 8x42), photo cameras (Panasonic Lumix DMC-TZ60, Nikon Coolpix P900, Canon 5D Mark III), and video cameras (Sony Handycam HDR-PJ200), placed in strategic locations at a distance of 2–5 m. We recorded time sessions with a stopwatch on a smartphone Redmi M2003J15SS. We took measurements of nest, nestlings and eggs with a Pretul Vernier 1-mm precision caliper. We measured nest and substrate height with a measuring tape or we estimated it when height exceeded maximal length of the measuring tape.

When nests were accessible, we took the following measurements: inner diameter and outer diameter, outer height and inner depth. Samples vary because measures of three nests (N6, N20, N21) are incomplete. Further, two eggs were measured in N5, as well as a non-hatched egg in N17a. The latter was also checked for irregularities and microbial infections, following Van der Burg (2017). Three nests (N2, N4, N5) were dried at ambient temperature and the materials (seeds, feathers, moss, vegetal fibers, synthetic fibers, dry flowers) carefully disaggregated and separately weighed on a digital balance with a precision of milligrams.

Nesting activity. At five nests (N1, N4, N5, N17a, N19) we took notes on the females' and nestlings' behavior, as well as incubation, brooding and provisioning rates. Incubation sessions were observed with binoculars at N5 from a *c*. 3 m lookout. To calculate incubation constancy, we used Skutch (1962) formula: T=100S/(R+S), where S is the mean of sessions on the nest incubating and R the average of recesses (periods outside the nest). At N4, brooding sessions were observed with binoculars and at N17a sessions were video-recorded. Provisioning rates during and after brooding were video-recorded at a single nest (N19) and observed at four nests (N1, N4, N5 and N17a).

The nestling period was determined at 15 nests (Appendix 1 in Supplementary Material). Nestlings of six nests (N1, N4, N5, N17a, N19, N33) were photographed every 1–3 days to document their physical development. Body, bill, wing, tarsi, and tail length were measured in six nestlings at N1, N4, N5, N17a, and N17b at least once every week.

We calculated egg success (fledglings/total number of eggs) as an indicator for breeding success (Murray, 2000) in 37 broods. The remaining broods were found at a later stage of occupancy or monitored over a short period, and therefore were only included in analysis of hatching success (total number of eggs/number of hatchlings) or fledging success (total number of nestlings/number of fledglings).

Mating and territorial behavior. We video-recorded copulation behavior at one nest (N17). We also observed with binoculars five nests (N34–38) located in the courtship territory of three males and took notes about territorial behavior of males, females and fledged young. We distinguished males from females by their behavior

and plumage; only males perform aerial dive displays from a perch, and are slightly brighter and have larger ear tufts (Zerda-Ordóñez, 1994; Freile & Restall, 2018; Clark *et al*., 2018).
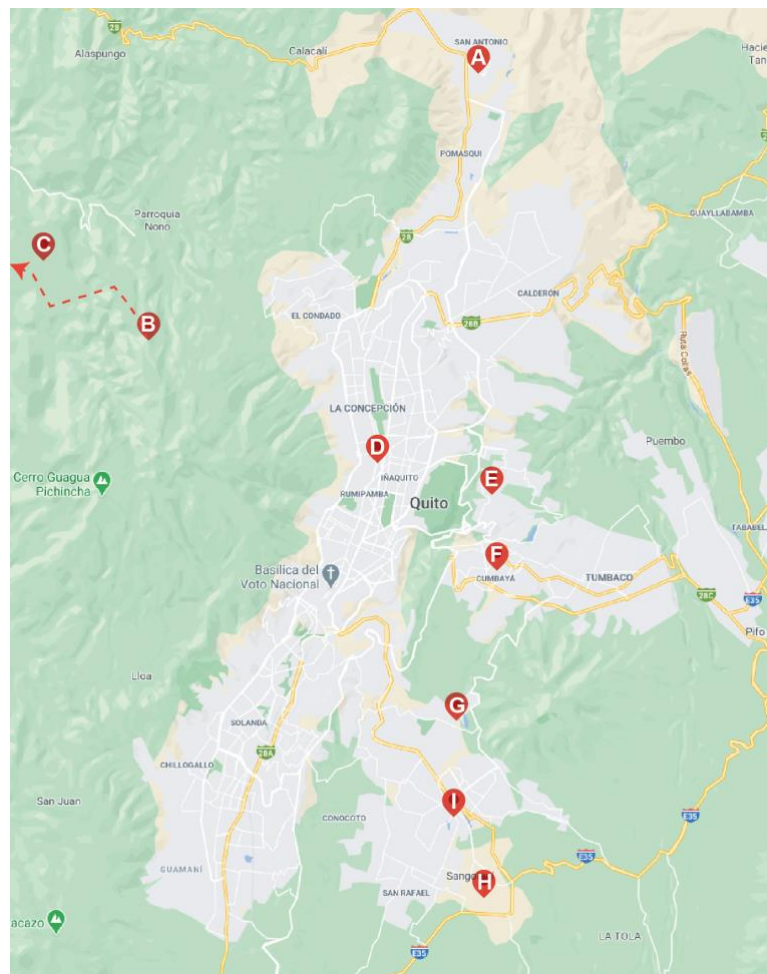

Figure 1: Study area of the breeding biology of Sparking Violetear *Colibri coruscans* in Quito, surrounding valleys and a montane rainforest reserve northwest of Quito. A) San Antonio de Pichincha; B) Yanacocha Reserve; dashed line B-C) Yanacocha-Alambi road; D) north Quito; E) Nayón; F) Cumbayá; G) La Armenia; H) Sangolquí; I) San Rafael. Adapted from Google, n.d., https://www.google.com/maps/place/Quito,+Ecuador/@-0.1865938,-78.5706257,11z. All rights reserved by Google 2020. Adapted with permission of the author.

RESULTS

Mating and territorial behavior
We observed one copulation in a small urban garden in north Quito (N19). Before copulation, the male sat on a clothesline and emitted a chip call. Suddenly, while still vocalizing, he turned his head to the opposite direction, and later turned it completely at a 45-degree angle. Meanwhile, he spread his wings while vibrating them, and extended his ear tufts. Once his ear tufts were fully extended, he held his tail and head in an upright position and vibrated his wings close to the body; vocalization stopped. Then, while turning completely at *c*. 100-degree angle, he spread his wings once more, and vibrated them again close to the body. He produced a few soft calls. Then the female perched on the clothesline, with her body at a 90-degree angle to the male's head, but her head turned towards his. The male approached her flying and landed on her. During copulation, which lasted *c*. 2 s, the female spread her wings. Afterwards, the male flew away while vocalizing. The female stayed on the clothesline, and briefly lifted her tail four times. Then she vibrated her wings close to her body for *c*. 1 s, and lifted her tail twice again.

We also observed five nests (N34–38) located in the courtship territory of three males in La Armenia. Nests were 13–18 m from each other, in native *Baccharis* sp. (Asteraceae) and *Mimosa* sp. (Fabaceae) shrubs, bordering a quiet street. Among the native shrubs, many introduced *Leonotis* sp. (Lamiaceae) grew. The males usually spent their time singing from a perch. When foraging near the nests, they were tolerated by the nesting

females. During *c*. 20 h of observation in a 3.5-month period (November 2019–March 2020), we observed twice a joint defense of the nesting territory by a female and a male against another *C. coruscans* individual. Usually only the female or only the male chased away conspecifics or other hummingbird species, such as Black-tailed Trainbearer *Lesbia victoriae*. In Nayón (N22–30), males also had their courtship territory 10–30 m from active nests, and here in one occasion we observed a male and a female defending a nest, for *c*. 5 min, against a *Turdus fuscater*. We did not observe males in the immediate surroundings of the remaining nests studied.

Nests in urban and suburban areas

All 39 nests were open cups; 6 were located in north Quito, 6 in San Antonio de Pichincha, 2 in San Rafael, 1 in Sangolquí, 5 in La Armenia, 10 in Nayón, and 9 in Cumbayá (Fig. 1). Nineteen nests were found in gardens and parks, 17 along secondary roads and streets, and 3 inside buildings.

Thirty-four nests had vegetation as substrate: 11 nests in native shrubs and trees of four different families, and 23 nests in ornamental (introduced) species of nine families (see Table 1). Five nests were located on human-made structures under a protecting structure or roof (Fig. 2): the engine of an electrical garage door; hot water tubes; security bars at a door; a metal wire clothesline; and a hanging flower pot holder made of vegetal fibers and metal. Mean heights and measures of the nests are available in Table 2.

In general, the outer layer of the nests contained moss (Fig. 2), but two nests contained winged seeds of *Tecoma stans* (Bignoniaceae). The inner chamber of the nests was covered with soft material such as *Taraxacum officinale* (Asteraceae) seeds. Materials of three nests (N2, N4, N5) analyzed included *T. officinale* seeds, moss, vegetal fibers, dried *Callistemon citrinus* (Myrtaceae) flowers, feathers, synthetic fibers, and unidentified seeds (Table 3). Another nest (N36), which was found deteriorated and therefore not included in Table 3, contained human hair (0.01 g) and spider web (0.04 g). In two other nests (N1, N4), spider web was used to attach them to branches.

Table 1: Mean measures of Sparkling Violetear *Colibri coruscans* nests in Quito and surrounding valleys (Nayón, Cumbayá, Los Chillos, San Antonio). Outer height refers to the vertical length of the cup. Substrate plant (Subst.) height and nest height in m, remaining values in cm; diam. = diameter.

	Subst. height	Nest height	Inner diam.	Outer diam.	Outer height	Inner depth
Mean ± SD, n	3.9 ± 2.8, n = 21	2.1 ± 1.3, n = 27	4.2 ± 0.4, n = 13	6.2 ± 0.8, n = 14	5.1 ± 1.6, n = 15	2.7 ± 0.7, n = 13
95% conf. interval range	2.7–5.1 1.6–15	1.6–2.6 1.2–8	3.9–4.4 3.5–5	5.7–6.7 5–8	4.2–6.0 2–8	2.2–3.1 1–4

One nest (N41), located in a suburban garden, was used four consecutive times in the same breeding season; another (N17) was used 11 times in 30 months. Before reusing the nest, the female inspected it and added new material. Since individuals were not marked, we do not know if it was the same female that reused the nest. Nine nests (N2–N30) were built in the same location on the same substrate: a stolon of *Cynodon dactylon* (Poaceae) hanging from the embankment of a secondary road in Nayón, between 2009–2015. See Appendix 1 in Supplementary Material for details on nest locations, substrate type, nest measures and nest materials.

Breeding season

We observed active nesting periods for 45 broods in 39 urban and suburban nests (Fig. 3). We found active nests year-round, either in incubation, brooding and/or nestlings' provisioning. Only 11 nests were active in May–October, two of these were still active until November, while 35 were active exclusively in November–April. March and April were the most active months with 10 and 11 active nests, respectively (see Appendix 2 in Supplementary Material).

N4

N15

N36

N17

Figure 2: Eggs and nests of Sparkling Violetear *Colibri corucans* in Quito and surrounding valleys. N4 in a natural substrate in Cumbayá, February 2018; substrate plant is a *Ficus benjamina* (Moraceae). N36 in a *Baccharis* sp. (Asteraceae) shrub in La Armenia, December 2019. N25 in an artificial substrate: security bars at an entrance door in Cumbayá, April 2018. N17a in a clothesline in north Quito, December 2018 (Maartje Musschenga).

Eggs
We observed eggs in 41 out of 45 broods studied. Thirty-eight of these clutches contained two eggs and two clutches had only one egg. In the remaining brood, the first egg laid was depredated before the second was laid (Appendix 2, Supplementary Material). Egg laying occurred at 24–48 h intervals (observed in N17a, N41a, N41b). Incubation started when the second egg was laid, as observed in three broods (N40, N41a, N41b). Incubation period observed in eight broods was 14–16 days (Appendix 2 in Supplementary Material for details).

All observed eggs were ellipsoidal and immaculate white (Fig. 2). Mean egg width was 0.9 cm (SD = 0.05; n = 3; range 0.9–1.0 cm), and mean length 1.5 cm (SD = 0.1; n = 3; range 1.4–1.6 cm). An unhatched egg had an intact egg shell and contained healthy-looking yolk and albumen, not presenting any signs of microbial infections.
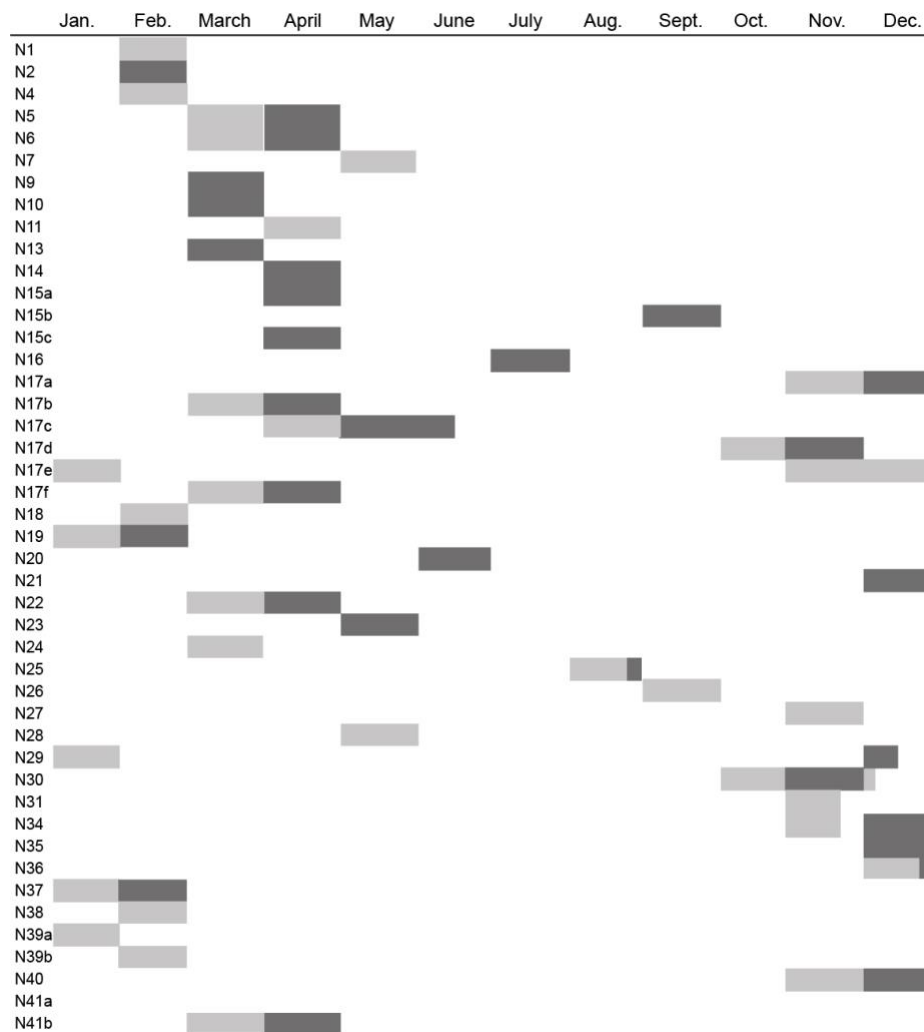
	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.

N1, N2, N4, N5, N6, N7, N9, N10, N11, N13, N14, N15a, N15b, N15c, N16, N17a, N17b, N17c, N17d, N17e, N17f, N18, N19, N20, N21, N22, N23, N24, N25, N26, N27, N28, N29, N30, N31, N34, N35, N36, N37, N38, N39a, N39b, N40, N41a, N41b

Figure 3: Breeding activity of 45 Sparkling Violetear *Colibri coruscans* broods in Quito and adjacent valleys in 2009–2015 and 2018–2020. Light gray: incubation; darker gray: brooding and nestlings provisioning. Not all broods were monitored from incubation to fledging.

Table 2: Plant species used as nest substrate in 34 urban and suburban nests of Sparkling Violetear *Colibri coruscans* in Quito and surrounding valleys. Five nests not included in this table had artificial structures as substrate. N refers to plant species native to Ecuador, I to introduced species. Nine nests (N22–N30) in *Cynodon dactylon* (Poaceae) row were attached to the same *C. dactylon* stolon, hanging from the embankment of a road.

Plant species	Family	No. of nests
Mimosa quitensis (N)	Fabaceae	3
Baccharis sp. (N)	Asteraceae	6
Citharexylum ilicifolium (N)	Verbenaceae	1
Chionanthes pubescens (N)	Oleaceae	1
Campsis radicans (I)	Bignoniaceae	1
Codiaeum variegatum (I)	Euphorbiaceae	2
Ficus benjamina (I)	Moraceae	1
Eucalyptus sp. (I)	Myrtaceae	1
Callistemon citrinus (I)	Myrtaceae	1
Bougainvillea sp. (I)	Nyctaginaceae	1
Rosa sp. (I)	Rosaceae	1
Hedera helix (I)	Araliaceae	1
Schefflera sp. (I)	Araliaceae	4
Dracaena sp. (I)	Asparagaceae	1
Cynodon dactylon (I)	Poaceae	9

Maternal care

We only observed females attending their offspring. In general, before approaching the nest, females perched on a branch or electrical wire at *c*. 15 m from the nest. During incubation, the female changed her position on the nest and also moved her underbody periodically from side to side. During 13 h of observation, from 9h00–16h00, spread over 5 days, one female (N5) remained 9 h 50 min incubating. The incubation constancy using Skutch's formula was 74.8%.

Siblings in the same brood hatched the same day in two nests (N1, N40) or 24 h after each other in two other nests (N41a, N41b). In N4, the female stayed 48% of 6 h 27 min brooding on day 5 since hatching, whereas in N17a the female spent 51% of 6 h on day 6 since hatching. In N41a, the female brooded the nestlings during daytime until day 8 since hatching and at night until day 9.

Nestling provisioning occurred every 55 min on day 4 since hatching in N17a; totaling seven visits in 6 h 28 min (Table 4). In N21, nestling provisioning occurred every 30 min on day 5 since hatching; totaling eight visits in 3 h 57 min. After the brooding period –*i.e.*, when female did not cover nestlings anymore with her body, at *c*. day 9 since hatching–, nestling provisioning occurred every 20–45 min in five different broods (mean 33.8; SD = 9.3; n = 5); in N1, N4, N5, N17a, and N19. Both nestlings were fed during every feeding session.

Table 3: Nest material weight (in g) of three Sparkling Violetear *Colibri coruscans* nests in Quito and Cumbayá. Seeds belong to *Taraxacum officinale* (Asteraceae); fibers are vegetal; flowers belong to *Callistemon citrinus* (Myrtaceae).

	Total nest	**Seeds**	**Moss**	**Fibers**	**Flowers**	**Feathers**
Mean ± SD, n	2.9 ± 0.38, n = 3	0.7 ± 0.35, n = 3	0.7 ± 0.52, n = 3	0.4 ± 0.24, n = 3	1.2 ± 1.03, n = 2	0.05 ± 0.06, n = 2
95% confidence interval	2.6–3.4	0.4–0.9	0.4–1.1	0.1–0.4	0.5–0.9	

Table 4: Nestling provisioning in seven Sparkling Violetear *Colibri coruscans* broods, monitored from 2018 to 2020 in Quito; in brooding (br) and after brooding (af) period. Observ. time = total observation time per nest; Number = total number of times nestlings were fed during observation time; Rate = average provisioning rate per hour (observation time/total provisioning).

Brood	**Observ. time**	**Number**	**Rate**
N17a: br	6 h 28 min	7	55
N21: br	3 h 57 min	8	30
N17a: af	4 h 30 min	7	38
N1: af	13 h 52 min	41	20
N4: af	8 h 13 min	11	45
N5: af	11 h 45 min	20	35
N19: af	35 h 6 min 11 s	67	31

Nestling development

We analyzed photographs of nine nestlings at N1, N4, N17a, N19, and N33, from 0–19 days since hatching, and until day 28 in N5. Nestlings hatched featherless, with orange bill, dark gray/black dorsal skin, dark pink ventral skin, and two tracts of orange neossoptiles on the back (Fig. 4). On day 5 since hatching, feather shafts on the dorsal side started to emerge, and 1–2 days later, feathers appeared on the head and wings. Ventral feathers lagged behind throughout development (the ventral apterium). From day 8 since hatching onwards, the bill became blacker, and feather growth on the dorsal side was in full development. Nestlings in four different broods opened their eyes at days 8, 9, 11 and 12. On days 14–15 since hatching, feathers on the dorsal side were green with a golden edge, and showed almost fully broken shafts. On day 16 since hatching the tail was still very short. On day 19, nestlings showed the diagnosable blue-purple malar stripe, as well as the blue-purple patch on the belly. However, the ventral apterium had not been covered yet, and feather sheaths in underwings and tail coverts had not disappeared. After fledging, wings and tail continued to grow and juveniles were recognizable even after 6 weeks by a golden edge on body feathers, a faint white malar stripe, and a white postocular spot. Measures of six nestlings of different ages are shown in Table 5.

Observation of 10 nestlings in six broods from hatching to fledging showed that on day 1 since hatching, nestlings started opening their bills after detecting any movement in the nest. From day 7 to 14 since hatching, nestlings usually rested, responding only to their mothers' presence by active begging (Fig. 4). From day 14 to 21 since hatching, nestlings became more active repeatedly preening, stretching and flapping their wings, and pecking at the nest. They also started to produce high-pitched sounds in the presence of their mother. Nestlings stayed for 20–31 days in the nest (mean 24.6 days; SD = 3.73; 95% confidence interval = 22.5–26.7; n = 12).

We observed fledging events in seven broods. In four broods, one nestling left the nest two days after its sibling (N17a, N17b, N21, N40). In two broods, there was a 1-day difference in fledging (N41a, N41b) and in another brood, the second nestling left the nest 5 days later (N17e). Juveniles started feeding by themselves 14–18 days after fledging in N5 and N19, but in one case they were fed by the female up to 24 days after nest abandonment (N5). In another brood (N17b), the female started incubating again one week after fledging of the previous brood. Some days later, these fledglings approached the nest again but the mother did not interact with them. After fledging, two juveniles of two different nests (N36, N37) stayed for some time in the nest territory –in a suburban habitat– feeding and even singing near their nest and within a male's courtship territory. No negative interactions were seen between males and juveniles. However, juveniles and resident females extended their ear tufts when they approached each other closely while foraging. Fledged juveniles in N37 frequently perched on *Leonotis* sp. stems while sipping nectar, in contrast to adults, which usually fed by hovering.

Breeding success
Hatching success was 81%; 55 out of 68 eggs hatched. The two eggs of N33 were preyed upon; N24 and N26, containing both two eggs, were abandoned during the incubation phase, possibly due to drought and disturbance by children, respectively. The remaining seven eggs (N5, N17a, N17b, N17f, N22, N39a) were found complete but unhatched in the nest.

Fledging success was 77%; 48 hatched eggs that were monitored until fledging, produced 37 fledglings. Four nestlings were preyed upon by *Turdus fuscater*, in N9, N19, and N30; one nestling disappeared from N4; nest N36 was found destroyed 6 days after hatching with no trace of its two nestlings; three nestlings were found dead inside their nest (N16, N39b) and the nest of N22a was removed by an unidentified person; it is uncertain what happened to its nestling.

Overall breeding success was 60% (62 eggs in 37 broods followed-up from incubation to fledging, produced 37 fledglings). See Appendix 2 in Supplementary Material for details on eggs, incubation, nest periods, hatching intervals, surviving nestlings, and fledging intervals.

Nests in natural areas
Eleven nests (N32, N33, N42–50) were located in and around Yanacocha reserve. Two nests (N32, N33), found in January 2015, were 50 m apart from each other. N32 was located at the bottom of a hanging vertical branch in a living fence of native vegetation (substrate species unidentified), at the embankment of a secondary road near the entrance of the reserve. It had the following measures (cm): inner diameter 3.8, outer diameter 6.2, outer height 7.4, and inner depth 2.9. The inner chamber included pieces of white and green lichens and the outer surface had moss. It was under construction on 28 January 2015; hatching of two eggs occurred between 26–28 February; on 16 March two fledglings were observed. N33 was under a roof, attached to a light cord connected to an outdoor restroom at the entrance of the reserve. It was found on 28 January 2015 under construction; on 10 February it contained two eggs, and on 8 March broken eggshells were observed, possibly caused by depredation.

The remaining nine nests (N42–N50), found on 13 May 2020, were in vegetation bordering the road from Yanacocha to Alambi. Three nests were attached to a stolon of *Cynodon dactylon*, hanging vertically from the embankment towards the ground, whereas six nests were in native shrubs: one in an unidentified Rosaceae species, another in an unidentified Asteraceae species, and the remaining in unidentified plants. Eight nests were in incubation stage of two eggs, and one nest contained a single egg. All nests contained moss, and six nests had lichens in the outer layer.

Figure 4: Development of Sparkling Violetear *Colibri coruscans* nestlings in Quito from hatching day through day 28. Day 16 and 19 photos from brood N1; remaining photos from brood N5 (all photos by Maartje Musschenga, excepting days 0, 5, 7, 23 and 28 by Oswaldo Ponce).

DISCUSSION

Our observations of 45 broods in 39 urban and suburban nests, including some reused nests, and 11 nests in natural woodlands in Quito and adjacent valleys, represent the first extensive effort to document the breeding biology of *C. coruscans* in Ecuador. Generally, data fit into previous descriptions of the species' breeding biology (Ruschi, 1965; Hainsworth, 1977; Schmidt-Marloh & Schuchmann, 1980; Zerda-Ordóñez, 1994; Stoppelmoor, 2000; de la Peña, 2001; Gonzáles & Castañeda, 2020). Additionally, we present data about nests adapted to urban habitats, the use of artificial structures as nest substrates, and nesting under roofs, which provide protection to nests and favor consecutive use of the same nest site.

Copulation, as observed in this study, was different from that described by Zerda-Ordóñez (1994), because we observed the female approaching the perching and vocalizing male, contra this author's observation. Further, Zerda-Ordóñez did not describe the male's wing vibration and upheld position of tail that we observed.

We distinguished males and females by behavior and subtle plumage differences (Zerda-Ordóñez, 1994; Freile & Restall, 2018; Clark *et al*., 2018). Even though sex identification was not always straightforward due to rapid movements of the hummingbirds or inadequate light conditions, we never observed two individuals simultaneously at any single nest, suggesting that females alone attend their nests, as occurs in most hummingbird species (Ortiz-Crespo, 2011). Nevertheless, our observations suggest that in some cases –15 observed broods in suburban habitats; for instance, in areas with high density of nectar rich flowers like *Leonotis* sp.– females' nesting and/or feeding territories overlap with males' courtship and/or feeding territories (see Ruschi, 1965; Zerda-Ordóñez, 1994; Gonzáles & Castañeda, 2020). We observed males being tolerated by the breeding females and vice versa, whereas other individuals of *C. coruscans* were chased away, as also observed by Ruschi (1965) in captive *C. coruscans*. Wolf & Stiles (1970) suggested that it is a reproductive advantage for a male 'helping' the female he has mated with, by giving her access to a secure nectar source and tolerating her in his territory.

We observed three instances of joint defense of the nesting area by male and female. Given that not all broods received extensive monitoring, we cannot determine the frequency of this behavior. Whether nest defense by males is intentional or is a by-product of males' defense of their own feeding and/or courtship territories needs further investigation. Besides these observations of males overlapping territories with nesting females, we did not observe males around or nearby other 30 nests, consistent with previous observations of nesting *C. coruscans* (Hainsworth, 1977; Schmidt-Marloh & Schuchmann, 1980). Further, we did not find evidence of males incubating, as was suggested by Moore (1947) and Schäfer (1954). The conditions under which females nest and forage in males' territories should be studied further.

The peak of *C. coruscans*' breeding season in Quito and adjacent suburban valleys is November–April; we found lower nesting activity in May–October. However, as 10 nests were found in May in Yanacocha (northwest of Quito), the breeding season in the Quito area might extend into May or vary locally. The peak of breeding season in our study area covers the second half of the short rainy season (October–November), the short dry season (December–January), and the majority of the long rainy season February–June (Pourrut *et al*., 1995; Ortiz-Crespo, 2011). Study effort was not equal throughout the year, as we visited nests reported by people in social media or nests we incidentally discovered. Yet, the breeding seasonality we suggest for *C. coruscans* has already been described for this species by Ortiz-Crespo (2011) and broadly overlaps with breeding season of *L. victoriae* in Quito (September–April; Narváez-Izurieta, 2022). Zerda-Ordóñez (1994) found nests of *C. coruscans* in April, May and October in Bogotá, which corresponds to the first rainy season (late March–mid June; López-Jiménez, 2012) and the second rainy season (late September–early December). Given that *C. coruscans* forages on a wide range of flowers (Züchner *et al*., 2020), nectar availability probably has little influence on breeding activity as in other more specialist species (Stiles, 1985). There might be a relation with insect abundance, necessary for the nestlings' growth, but this relation needs further investigation. Quito is experiencing increasing temperatures (Cáceres *et al*., 1998), and projections for 2023 predict more extreme minimum and maximum temperatures, heavier rainfall, and more droughts in some places (Serrano *et al*., 2017). This climatic change might influence *C. coruscans* breeding season and reproductive success in the future.

All nests were cup shaped, as is typical for Trochilidae (Ortiz-Crespo, 2011), and were attached at their base or sides to the substrate (branches or artificial structures). The majority of nests we observed had green moss on the outer layer, as observed previously in this species and other hummingbirds (Ruschi, 1965; Schmidt-Marloh & Schuchmann, 1980; Zerda-Ordóñez, 1994; Stoppelmoor, 2000; de la Peña, 2001; Fierro-Calderón & Martin, 2007; Gonzáles & Castañeda, 2020). One nest contained spider web as part of the nest binding material and in two nests spider web was used to adhere the nest to supporting branches (see Ruschi, 1965; Zerda-Ordóñez, 1994; Stoppelmoor, 2000; de la Peña, 2001; Fierro-Calderón & Martin, 2007; Ortiz-Crespo, 2011; Gonzáles & Castañeda, 2020). It seems plausible that we overlooked this material in other nests. The inner chamber of our nests was always covered with soft, whitish material, as noted in earlier studies of the species (Schmidt-Marloh & Schuchmann, 1980; Zerda-Ordóñez, 1994; Ortiz-Crespo, 2011; Gonzáles & Castañeda, 2020), likely to protect and insulate the eggs and nestlings (Winkler, 2016).

Table 5: Measures (cm) of six Sparkling Violetear *Colibri coruscans* nestlings in five different broods in Quito and adjacent valleys, between day 4 and 20 since hatching. In day column, a and b indicate different nestlings in the same brood. In the remaining broods only one nestling was alive during the study period.

Brood	Day	Body	Bill	Left wing	Right wing	Tail
N1	13a		1	3.1	3.4	1
	17a		1.3	4.6	4.5	2
	19a		1.4	5.1	5	2.4
	20a		1.4	5.3	5.3	
	13b		1.1	3.2	3.1	1
	17b		1.3	4.3	4.2	2
	19b		1.3	4.5	4.6	2
	20b		1.3	4.9	5.0	2.1
N4	4	3.5				
	8	4.8		1.9	1.9	
	14			3.6	3.5	1.3
N5	6	3.5	0.5			
	13	7.4	0.7	2.8	2.8	0.7
	20			4	4.1	2.9
N17a	3	3				
	10	4.5	0.9	2.1	1.9	
	20	8	1.5	5.1	5.3	3.7
N17b	11		0.8	2.5	2.5	0.5
	15		1.3	4.6	4.6	1.3

We also studied nests in montane woodlands around Yanacocha reserve, where lichens were present in 6 out of 10 nests. Lichens were also reported by other authors in nests of *C. coruscans* (de la Peña, 2001; Gonzáles & Castañeda, 2020) and other hummingbirds in natural habitats (Fierro-Calderón & Martin, 2007; Ortiz-Crespo, 2011). The absence of lichens in suburban and urban nests in our study area may reflect a low abundance of lichens in cities, due to drier climates (Brodo, 1966), a lack of wooded areas, or air pollution (Coffey & Fahrig, 2012). The whitish winged seeds of *Tecoma stans* we observed in the outer layer of two nests in a suburban area could be an alternative to the camouflage function of lichens (Hansel, 1996), as *C. coruscans* has also been reported using other whitish material on the outer layer, such as pieces of newspaper (Ortiz-Crespo, 2011).

Colibri coruscans nests in a variety of native and exotic plants and shrubs, but also takes advantage of human-made structures; even in natural areas such as Yanacocha reserve, we observed a nest located on a light cord under a roof. Several hummingbird species nest occasionally on bridges, under roofs, and in empty (Freeman & Arango, 2012) or even occupied buildings (Ward *et al.*, 2020), which protect nests from rain and predators (Triana & Sandoval, 2011; Freeman & Arango 2012; Ward *et al.*, 2020). Nesting in or under artificial 'refuges' that prevent nest deterioration might benefit breeding hummingbirds because a single nest can be used several consecutive times in a same breeding season –up to 11 times in subsequent seasons as observed in our study–, often by adding new materials to the nest (see Ortiz-Crespo, 2011; Ward *et al.,* 2020). We also observed nests attached to a vertical *C. dactylon* stolon hanging from a road embankment. In this case, nests were not reused, but rebuilt from zero at least 10 times between 2009 and 2015.

Thirty-six out of 41 clutches studied consisted of two eggs, which is common in hummingbirds (Ortiz-Crespo, 2011). In two broods, the second egg was laid 24 h after the first, and in one brood between 24 and 48 h afterwards. Incubation in three nests started when the second egg was laid. Ruschi (1965) observed a 2-day interval between egg laying in *C. coruscans* and incubation started one day after the second egg was laid. Other hummingbird species typically lay the second egg within 24–48 h after the first egg (Ortiz-Crespo, 2011; Fierro-Calderón & Martin 2007; Ornelas, 2010), and incubation started after laying of the second egg in Azure-crowned Hummingbird *Saucerottia cyanocephala* (Ornelas, 2010). More data are needed to confirm timing of egg laying and start of incubation in *C. coruscans*. In our study, hatching in two broods occurred on the same day and in two other broods occurred on consecutive days. Zerda-Ordóñez (1994) observed a typical 2-day difference in hatching with exceptions of hatching on the same day, whereas Ruschi (1965) recorded a hatching interval of 0–1 day.

We found an incubation constancy of 75%. Skutch (1962) mentions at least 60% for hummingbirds and Zerda-Ordóñez (1994) recorded a constancy of 60–72% on different days, increasing towards the end of incubation, in *C. coruscans*. Brooding constancy, on the contrary, was 48–51% at the end of the first week (day 5–6) in two nests studied, which is well within the range of tropical hummingbirds (Fierro-Calderón & Martin, 2007). Zerda-Ordóñez (1994) observed a constancy of 39% on day 5 since hatching in the morning, 22% on day 5 since hatching in the afternoon, and 11% on day 6 since hatching. The nestlings' provisioning rate we found was comparable to other hummingbird species (Fierro-Calderón & Martin, 2007).

The physical and behavioral development of nestlings in our study agree with observations of Zerda-Ordóñez (1994) in Bogotá and Ruschi (1965) in captive *C. coruscans* in Brazil. In another species observed in Quito (*L. victoriae*), down feathers were also present at hatching but later covered the whole body, contour feathers and rectrices developed some days earlier than in *C. coruscans*, but no lag in the development of the ventral pteryllium was mentioned, as we found in *C. coruscans* (see also Ruschi, 1965; Zerda-Ordóñez, 1994). *Lesbia victoriae* nestlings opened their eyes on day 17, while in *C. coruscans* they opened eyes between days 8–12.

The nesting period of 20–31 days found in our study was highly variable compared to previous studies about the same species: 21–25 days (Ruschi, 1965; Zerda-Ordóñez, 1994; Schmidt-Marloh & Schuchmann, 1980, Stoppelmoor, 2000). However, it lies within the range reported for other hummingbird species in Quito (25–28 days in Western Emerald *Chlorostilbon melanorhynchus*, Ortiz-Crespo 2011; 25–27 days in *L. victoriae*, Narváez-Izurieta, 2022). Similarly, the closely related Mexican Violetear *Colibri thalassinus* had a nesting period of 19–28 days in Mexico (Wagner, 1945), while a nesting period of 19–40 days is reported for hummingbirds in general (Ortiz-Crespo, 2011). The length of the nesting period might be related to food availability and weather conditions (Ortiz-Crespo, 2011). We also observed that one juvenile started looking for food on its own almost two weeks after fledging, but was fed by its mother for two more weeks (see also Ruschi, 1965; Hainsworth, 1977; Stoppelmoor, 2001). Hainsworth (1977) concluded that by provisioning fledglings with food, independence is delayed and juveniles can practice food search by themselves before abandoning the nesting area. On the contrary, failure to provide the necessary energy by the mother may force early fledglings' independence. In one nest we studied, the female laid a new brood one week after fledging of the previous brood, which forced the two fledglings to abandon the nesting area earlier.

We conclude that *C. coruscans* in Quito and surroundings is versatile in its choice of nesting sites and nest materials. In urban and suburban habitats, the use of human-made structures aids in preservation of the nests; therefore, the same nest can be reused several times during the same or over consecutive breeding seasons. We also found that females' nest and males' feeding and/or courtship territories might overlap. In this case, males are indirectly involved in the defense of the nest area, but are not involved in other breeding duties. In future studies, territories of males and females should be mapped in order to determine how and under which circumstances they overlap. Also, in further investigations sampling effort should be equivalent over the whole year, in order to define the breeding season more precisely, as well as to monitor more nests from egg laying to fledging.

ACKNOWLEDGEMENTS

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COMUNICACIÓN CORTA/SHORT COMMUNICATION

New records of Cinereous Harrier *Circus cinereus* (Accipitridae) in the high Andes of southern Ecuador

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Nuevos registros del Aguilucho Cinéreo *Circus cinereus* (Accipitridae) en los Andes del sur del Ecuador

Resumen

El Aguilucho Cinéreo *Circus cinereus* es una especie localista en Ecuador, que habita en herbazales agrícolas y páramo desde el norte hasta el centro-sur de los Andes. Se conoce poco acerca de su distribución en el sur del país. En esta región, los registros son escasos y no han sido debidamente documentados. Presentamos el primer registro en video de una hembra adulta y un avistamiento de un macho adulto en los páramos del Área Nacional de Recreación Quimsacocha, provincia de Azuay, suroeste del Ecuador. Nuestros hallazgos sugieren que *C. cinereus* puede estar localmente distribuido más al sur de la distribución actualmente conocida y que prefiere hábitats abiertos, particularmente el páramo de almohadilla, humedales y marismas en los altos Andes y los valles húmedos interandinos.

Palabras clave: Ecosistema páramo, Área Nacional de Recreación Quimsacocha, rapaz, vegetación de almohadilla.

Abstract

Cinereous Harrier *Circus cinereus* is a local species in Ecuador, occurring in agricultural grasslands and páramo from north to central-south Andes. Little is known about its distribution in southern Ecuador. In this region, records are scarce and have not been adequately documented. We present the first video record of an adult female and a sighting of an adult male in the páramo of Quimsacocha National Recreation Area, Azuay province, southwest Ecuador. Our findings suggest that *C. cinereus* may be locally distributed further south of the currently known distribution and that it prefers open habitats, particularly cushion páramo, wetlands, and marshes in the high Andes and humid inter-Andean valleys.

Keywords: Cushion vegetation, páramo ecosystem, raptor, Quimsacocha National Recreation Area.

Cinereous Harrier *Circus cinereus* occurs in the southern lowlands of South America, from Argentina and Chile, through Uruguay, southeastern Brazil, Paraguay, Bolivia, Peru, and along the high Andes of Ecuador and Colombia (Fjeldså & Krabbe, 1990). *Circus cinereus* occupies distinct habitats including pastures, croplands, and natural grasslands throughout arid or semi-arid zones (Thiollay, 1994). In the high Andes, the species prefer marshes, reed beds, wetlands, páramo, and small woody vegetation surrounded by bunchgrass (Fjeldså & Krabbe, 1990; Ferguson-Lees & Christie, 2001).

Circus cinereus is considered as vulnerable in Ecuador (Freile *et al*., 2019), but as least concern globally (BirdLife International, 2022). It inhabits agricultural terrains, shrubby grasslands, and páramo from north to south-central Andes of Ecuador, above 3000 m a.s.l. (Ridgely & Greenfield, 2001; Henry & Aznar, 2009; Freile & Poveda, 2019). It is common to see *C. cinereus* foraging at the ground level in open habitats, occasionally descending to the plains, and perching on the ground or at low heights, but seldom in trees or bushes (Jiménez & Jaksic, 1988; Fjeldså & Krabbe, 1990).

There are scarce and infrequent records of *C. cinereus* in southern Ecuador, even in highly visited and studied places, and the few available observations are undocumented and do not include descriptions of the habitats occupied (Henry & Aznar, 2009). We present new records of *C. cinereus*, including the first documented one, of this species in southern Ecuador, within Quimsacocha National Recreation Area, Azuay province.

In the páramo ecosystem of Quimsacocha National Recreation Area (hereafter, Quimsacocha; Fig. 1), we video-recorded an adult female perched on the ground (Fig. 2) on 21 October 2020 (-3.047359, -79.248029, 3805 m a.s.l.). On 1 December 2020, we observed an adult male in flight outside the limits of Quimsacocha (-3.042191, -79.216438, 3765 m a.s.l.), 3.55 km east of the first locality. Individuals were identified by plumage (Fjeldså & Krabbe, 1990; Ridgely & Greenfield, 2001; Ferguson-Lees & Christie, 2001; Freile & Restall, 2018). The adult female was greyish-brown with numerous white dots on the back and chestnut to white underparts, while the adult male was grey on the back with rufous and pale grey underparts.

Cushion páramo covered by *Plantago rigida* (Plantaginaceae) and *Oreobolus ecuadorensis* (Cyperaceae) (Neil, 1999; Minga & Verdugo, 2007) was the dominant habitat where we recorded the species. The cushion páramo is an open habitat in humid areas associated with tussock grass of the genus *Calamagrostis* (Poaceae), with a short vegetation profile and little shrub cover of the genus *Loricaria* (Asteraceae) (Minga & Verdugo, 2007; Minga *et al*., 2013).

Few undocumented records come from the southern Andes of Ecuador. A record from Cañar province, from the XIX century, suggested that *C. cinereus* might be present in the region (Salavadori & Festa, 1990). Seven additional reports (Carrasco, 2009; Bjorklund, 2010; Tinoco, 2013; Cisneros-Heredia, 2018; Matamoros, 2018; Molina, 2022; Normand, 2022) correspond to new occurrences in Azuay province (Cajas National Park and San Gerardo) and Cañar province (Ingapirca Ruins) (Fig. 1). Our results contribute to the few documented records of *C. cinereus* in the southern Ecuadorian Andes. Our two new records suggest that the distribution range of *C. cinereus* extend further south of the current distribution in Ecuador, and that it is locally distributed across the high-Andes of Azuay and Cañar provinces. Within our study region, the species occupied the páramo ecosystem, suggesting that it also prefers natural grasslands, particularly cushion páramo and high-altitude agricultural landscapes across the Ecuadorian Andes.
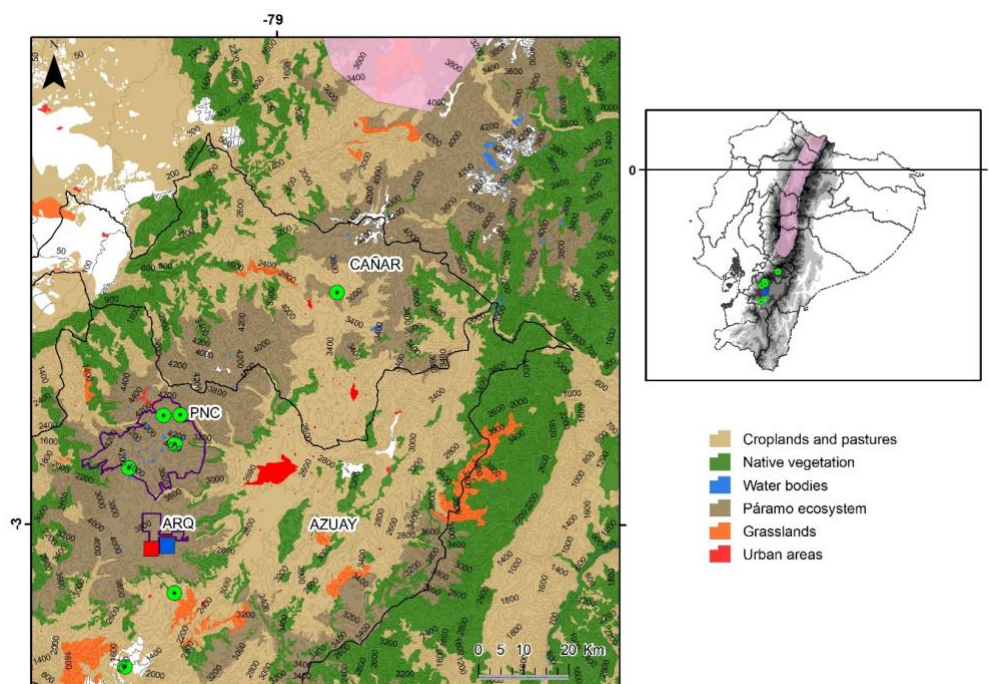

Figure 1: Occurrences of Cinereous Harrier *Circus cinereus* in southern Ecuador. The green-filled circles with dots are eBird reports (2022). Red (adult female) and blue (adult male) squares are new reports from this study. The purple polygons represent the national system of protected areas (PNC: Cajas National Park; ARQ: Quimsacocha National Recreation Area). The pink-filled polygon is the species distribution range in Ecuador by Ridgely *et al*. (2007), but modified according to Ridgely & Greenfield (2006) and Freile & Restall (2018).

ACKNOWLEDGMENTS

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Figure 2: Adult female Cinereous Harrier *Circus cinereus* in Quimsacocha National Recreation Area, Azuay province, 21 October 2020 (video capture) (Barros, 2020).

Notas sobre la dieta del Zambullidor Plateado Norteño *Podiceps occipitalis juninensis*

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El Zambullidor Plateado Norteño *Podiceps occipitalis juninensis* se distribuye desde los Andes del sur de Colombia hasta el norte de Chile y Argentina. Las poblaciones de esta subespecie que habitan en humedales altoandinos de Ecuador se encuentran principalmente en dos lagunas: Micacocha y Colta (Guevara *et al.*, 2016). En Ecuador, *P. o. juninensis* ha sido catalogado como Vulnerable debido a su reducido tamaño poblacional y a su limitada distribución, concentrada en los dos sitios mencionados (Freile *et al.*, 2019). En Colombia se la considera como En Peligro Crítico debido a su distribución restringida (Renjifo *et al.*, 2016), y en escala global, BirdLife International (2022), a más de considerar a *P. juninensis* como especie separada de *P. occipitalis,* la clasifica como Casi amenazada. *Podiceps occipitalis*, al igual que otros zambulidores, se alimenta principalmente de macroinvertebrados acuáticos que, generalmente, encuentra en la vegetación subacuática (Guevara *et al.*, 2016). En esta nota reportamos información anecdótica sobre la dieta de *P. o. juninensis*, la cual se obtuvo en base al análisis de contenido estomacal de cuatro individuos encontrados muertos en las lagunas de Micacocha y Colta.

El 6 de diciembre de 2013 encontramos una hembra y un macho muertos atrapados en redes de pesca abandonadas en la laguna de Colta (-1,738039, -78,755292, 3250 m s.n.m.), provincia de Chimborazo, y una segunda hembra fue encontrada muerta y colectada el 16 de julio de 2021 por José María Loaiza y Juan Freile. Por otra parte, el 16 de febrero de 2016 hallamos una hembra muerta, atrapada en redes de pesca abandonadas, en Micacocha, provincia de Napo (-0,543383, -78,209892, 3900 m s.n.m.). Realizamos una incisión para acceder a la cavidad estomacal y extraer el contenido estomacal de los especímenes, el cual fue conservado en alcohol al 70% para su posterior análisis. Todo el material biológico extraíble fue depositado en la colección de ornitología del Instituto Nacional de Biodiversidad (MECN 9709, 9803, 10200).

El contenido estomacal de los cuatro individuos fue identificado hasta el máximo nivel taxonómico posible, considerando la calidad de las muestras, las cuales fueron clasificadas dentro de cuatro ítems alimenticios y dos ítems no alimenticios (Tabla 1), siguiendo la clasificación propuesta por Hilsenbeck (1979). Una vez culminado el proceso de identificación, los restos de los contenidos estomacales analizados fueron descartados debido a que sus condiciones no permitían su preservación. Los crustáceos malacostráceos del género *Hyalella* (orden Amphypoda) (Fig. 1a), crutáceos carentes de caparazón presentes en cuerpos de agua dulce, fueron el ítem alimenticio más abundante y el único presente en todos los individuos analizados. El orden Odonata (Insecta) tuvo un porcentaje de representatividad bajo (restos de ninfas encontradas en los contenidos estomacales), mientras que la clase Ostracoda (crustáceos microscópicos) tuvo la menor representatividad y, al igual que insectos no odonatos, encontrados en los individuos de Colta de 2013. En lo correspondiente a ítems no alimenticios, se observaron restos de plumas en las cuatro muestras analizadas, además de una forma parasitaria del orden Cestoda (Platyhelminthes) en dos especímenes de Colta, uno del 2013 y en el del 2021 (Fig. 1b).

Hilsenbeck (1979) analizó el contenido estomacal de tres individuos colectados en la laguna de Cuicocha, provincia de Imbabura, y reportó ninfas de *Aeshna* sp. (Odonata). En nuestro estudio no pudimos identificar los odonatos al mismo nivel taxonómico, pero encontramos restos del mismo orden en uno de los individuos colectados en Colta en 2013. Encontramos tres ítems alimenticios y dos no alimenticios en Colta que también reportó Hilsenbeck (1979), mientras que un ítem alimenticio y un ítem no alimenticio encontrados en Micacocha fueron comunes con los hallazgos de este autor. Los fragmentos de plumas presentes en las tres poblaciones podrían funcionar como "coladores" durante el proceso de digestión, como protección del tracto digestivo o para reducir la carga parasitaria (Jehl, 2017).

No está claro si las diferencias observadas en la composición de ítems alimenticios entre Colta, Micacocha (presente estudio) y Cuicocha (Hilsenbeck, 1979) obedecen a diferencias en las preferencias alimenticias entre las distintas poblaciones, a diferencias en la disponibilidad de recursos o son, simplemente, un sesgo del contenido disponible en los estómagos, pues todos los ejemplares analizados fueron hallados muertos. Consideramos que un factor importante al momento de analizar posibles cambios en la dieta de las especies es la influencia del efecto antrópico sobre los humedales. Por ejemplo, la contaminación de los cuerpos de agua por deseños orgánicos e inorgánicos y la introducción de especies exóticas como la trucha arcoíris (*Oncorhynchus mykiss*), la cual ha sido propuesta como una amenaza para esta y otras especies de zambullidores (O'Donnell & Fjeldså, 1997; Roesler *et al.*, 2016; Lancelotti *et al.*, 2017, 2020), pueden alterar la composición trófica de los mismos, ya que estos dependen de los macroinvertebrados que proliferan en la vegetación acuática de las lagunas altoandinas (Hilsenbeck, 1979; Martín-Torrijos *et al.*, 2016). Por ello, un estudio sobre la diversidad y riqueza de insectos y otros macroinvertebrados, junto con observaciones sistemáticas del comportamiento de los zambullidores, así como seguimientos para entender las posibles variaciones estacionales en la disponibilidad y diversidad de recursos, pueden ayudar a entender mejor la dieta de esta especie.

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Tabla 1: Contenido estomacal de los especímenes de Zambullidor Plateado Norteño *Podiceps occipitalis juninensis* colectados en las lagunas de Colta, diciembre de 2013 y julio de 2021, y Micacocha, febrero de 2016. Adicionalmente, se incluyen los ítems reportados anteriormente para tres individuos en Cuicocha (Hillsenbeck, 1979). Los valores de Odonata y *Aeschna* de Hillsenbeck (1979) se agruparon en el orden Odonata en general. Los restos de plumas considerados fueron aquellos iguales o mayores a 0,5 cm.

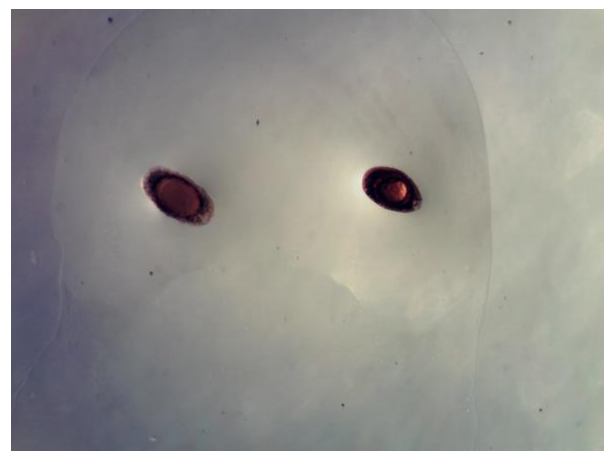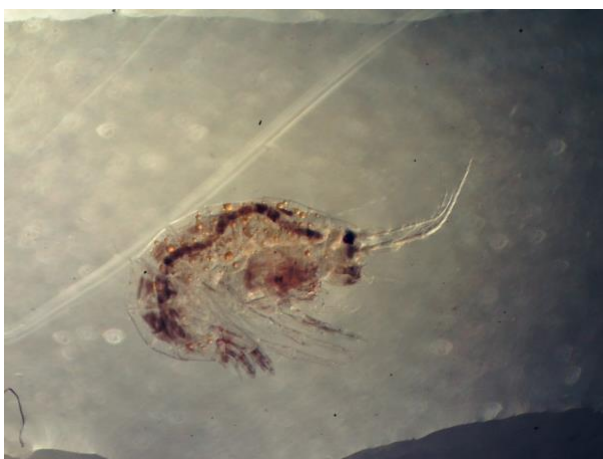| Ítems alimenticios	Colta 2013	Colta 2013	Colta 2021	La Mica 2016	Cuicocha
Ostracoda (Crustacea)	2	9	0	0	0
Odonata (Insecta)	16	0	0	0	830
Otros Insecta	18	2	0	0	9
Hyalella sp. (Amphypoda)	688	321	56	124	9
Ítems no alimenticios					
Cestoda (Platyhelminthes)	4	0	3	0	214
Restos de plumas (Raquis ≥ 0,5 cm)	556	194	31	129	866

Figura 1: A) Ejemplar de *Hyalella sp.* (Amphypoda) encontrado en el contenido estomacal del espécimen del Zambullidor Plateado Norteño *Podiceps occipitalis juninensis* colectado en Colta el 16 de julio del 2021 (Karla Mena y Nathaly Reyes). B) Huevos de Cestoda (Platyhelminthes) encontrado en el contenido estomacal del espécimen del Zambullidor Plateado Norteño *Podiceps occipitalis juninensis* colectado en Colta el 16 de julio del 2021 (Karla Mena y Nathaly Reyes).

NOTAS DE CAMPO/FIELD NOTES

Matorralero Cejigrís *Arremon assimilis*, longevidad

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La información sobre longevidad de aves neotropicales está incrementándose constantemente y proviene principalmente de aves anilladas y luego recapturadas (Verea *et al*., 2007; Scholer *et al*., 2018). En la Reserva Yunguilla, Santa Isabel, provincia de Azuay (-3,2330, -79,2811; 1650–2100 m s.n.m.), Hartmann *et al*. (2014) realizaron una investigación del género *Atlapetes*, para lo cual usaron redes de niebla con la finalidad de tomar muestras de sangre para estudios genéticos. Las aves fueron capturadas en un bosque montano secundario, entre enero y mayo de 2012 y 2013, y colocadas anillas metálicas numeradas; entre otras especies, se anillaron 62 individuos de Matorralero Cejigrís *Arremon assimilis* (Hartmann *et al*., 2014).

No se cuenta con información de longevidad de *A. assimilis*, pero datos del género *Arremon* sugieren una longevidad de 6–8 años (Magalhães *et al*., 2007). En una visita al área donde Hartmann *et al*. (2014) realizaron su estudio, el 13 de marzo de 2022, P. Molina observó y fotografió un individuo de *A. assimilis* con una anilla metálica en las coordenadas -3,229586, -79,275811 W, a 1710 m s.n.m. Dadas las características de la anilla (Fig. 1), y puesto que no se conoce de otras campañas de anillamiento en la zona, se contactó a S. A. Hartmann y se confirmó que es una de las aves marcadas durante su investigación. En base a varias fotografías se pudo definir el código de la anilla como DK22742. Este número único permitió conocer que se trata de una hembra adulta anillada el 3 de febrero de 2013, lo que establece una edad de al menos 9 años, dato similar al registrado para un Matorralero Nuquirrufo *Atlapetes latinuchus* en una localidad aledaña (Aguilar, 2021). Además, esta información es coherente con la encontrada en la literatura que reporta una longevidad promedio de alrededor de 10 años en las Passeriformes neotropicales (Snow & Lill, 1974).

Esta observación incrementa el conocimiento sobre la longevidad de emberízidos andinos. Además, es un ejemplo de cómo la comunidad de observadores de aves y fotógrafos podrían contribuir a través de las fotografías, en caso de encontrar individuos con anillas, a generar información que nos permita conocer más sobre la biología de las especies.

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Figura 1: Matorralero Cejigrís *Arremon assimilis* anillado en febrero de 2013, y registrado el 13 de marzo de 2022 en la Reserva Yunguilla, Santa Isabel, provincia de Azuay (P. Molina).

Depredation of a Shiny Cowbird *Molothrus bonariensis* by a common boa (*Boa constrictor*) in Manabí, Ecuador

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Formerly native to natural grasslands of South America and several islands in the Lesser Antilles, the Shiny Cowbird *Molothrus bonariensis* has gradually expanded its distribution to Central and North America mainly due to land use changes (Crespo-Pérez *et al*., 2016). This species is common in semi open areas associated with cattle, where is a brood parasite of 232 species of birds reported to date (Lowther, 2018). As such, it is a serious concern to globally threatened species like Pale-headed Brushfinch *Atlapetes pallidiceps*, a species endemic to Ecuador (Oppel *et al*., 2004). The breeding biology of *M. bonariensis* has been extensively studied, but ecological interactions, including its role as prey, are poorly known. Recorded predators of adult *M. bonariensis* include Baron's Green Racer (*Philodryas baroni*), different species of avian raptors, presumably rice mice (*Oryzomys* spp.), whereas adult *M. bonariensis* has been reported preying upon nestlings (Wiley & Wiley, 1980; Salvador, 2016).

The Common Boa (*Boa constrictor*) is a polytypic species that occurs from Mexico to Argentina in a wide variety of habitats (Card *et al*., 2016). It is a generalist predator that feeds on a broad spectrum of small and medium-sized vertebrates (Reinert *et al*., 2021). Avian preys include Eared Dove *Zenaida auriculata*, Tropical Mockingbird *Mimus gilvus*, and Bananaquit *Coereba flaveola* (Martínez-Morales & Cuaron, 1999; Quick *et al*., 2005). There is one record of *M. bonariensis* inside the stomach contents of an invasive individual of *B. constrictor* in Aruba (Reinert *et al*., 2021), but there are no records of *B. constrictor* preying on *M. bonariensis* across the natural distribution ranges of both species. The size of prey consumed by *B. constrictor* is positively correlated with its body length; as they grow up, they consume larger prey (Reinert *et al*., 2021).

In this note, we report a depredation event by *B. constrictor* on an adult male *M. bonariensis* observed in Cañaveral (0.239442, -80.03358), northern Manabí province, Ecuador. The area is dominated by shrimp farms, coconut palm fields, and grasslands for cattle. On 20 June 2021, after a light rain, Gregorio Carrera (local birdwatcher) was observing a *M. bonariensis* flock in the ground near a small building inside a coconut palm field, when he saw a *B. constrictor* attacking a male *M. bonariensis*. The bird was identified as *M. bonariensis* by its size and plumage tone, as compared to the superficially similar Scrub Blackbird *Dives warczewiczi*, which is often found with *M. bonariensis*. After the initial observation, we placed a smartphone Samsung S5 Mini in a tripod inside the building, 2 m from the boa, to record the depredation event. The boa was not disturbed during the feeding process because the tripod was set behind a one-way window glass that allowed us to see the boa, but the boa couldn't see the observers.

After the initial sighting at 10h05, we started recording at 10h15, when the boa was coiled around the cowbird and was already swallowing the bird's head (Fig. 1). From 10h15–11h35, the boa continued contracting and slowly ingesting the bird, reaching half of the body. At 11h35–11h45, the boa almost completely ingested the bird, excepting its legs. From 11h45–11h52 it swallowed the bird entirely, and after a short period of inactivity, it started to move at 11h57.

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We translocated the boa in a plastic crate to a wetland 700 m from the palm field, where boas are regularly seen, 10 min after the boa started to move, in order to avoid regurgitation by stress. In Cañaveral area, boas are killed as soon as they are spotted by the palm field workers when they are close to farm animals, houses and inside the palm field. Before releasing the boa, we measured the snout-vent length (SVL) in a vertical and straight position with a 5-m Truper flexometer. The SVL of 50.5 cm suggested that the individual had not reached sexual maturity (Reed & Rodda, 2009). Unfortunately, several individuals of *B. constrictor* in the vicinity of Cañaveral do not reach sexual maturity because people kill adults and the more abundant juveniles (pers. observ.). According to local villagers, most juveniles are easy to spot mainly in pastures or gardens, where flocks of *M. bonariensis* are common. Due to their size, juveniles of *B. constrictor* could enter these areas to ambush *M. bonariensis* individuals due to their high availability in these habitats, suggesting that *B. constrictor* could regulate the populations of *M. bonariensis*.

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Figure 1: *Boa constrictor* contracting and swallowing an adult male Shiny Cowbird *Molothrus bonariensis* from its head; Cañaveral, Manabí province, 20 June 2021 (Martín Carrera).

NOTAS DE CAMPO/FIELD NOTES

Vaquero Brilloso *Molothrus bonariensis* y Bolsero Coliamarillo *Icterus mesomelas*: parasitismo de puesta

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El Vaquero Brilloso *Molothrus bonariensis* es un parásito de puesta generalista extremo (Mermoz *et al*., 2020). Se han registrado 270 especies parasitadas por *M. bonariensis* en todo su rango de distribución, desde el Caribe hasta Sudamérica (Lowther, 2021). Además, desde inicios del siglo XX, *M. bonariensis* ha expandido su distribución hacia nuevas áreas incluyendo el Caribe, Chile, sur de Estados Unidos (Florida) y América Central, resultando una potencial amenaza para las poblaciones de aves nativas (Mermoz *et al*., 2020).

Lowther (2021) clasifica a las especies parasitadas en víctimas, como aquellas a las que ha puesto huevos en su nido, pero que no necesariamente criaron juveniles con éxito; y hospederas, a aquellas de las que hay evidencia de cría del parásito juvenil. En Ecuador se han registrado 21 especies parasitadas por *M. bonariensis*, 4 víctimas y 17 hospederas; entre ellas, el Bolsero Coliamarillo *Icterus mesomelas* (Medrano *et al*., 2020). En esta nota reporto por segunda ocasión a *I. mesomelas* como hospedera de *M. bonariensis*, y documento por primera vez en video la relación de parasitismo entre estas dos especies.

El 18 de marzo de 2022 observé dos adultos de *I. mesomelas* alimentar a un individuo juvenil de *M. bonariensis* en el dosel de un bosque seco con predominancia de faiques (*Acacia* sp.), en Malapamba, provincia del Azuay, Ecuador (-3,27962, -79,29477, 1270 m s.n.m.). Cinco días después, en el mismo sitio observé dos adultos de *I. mesomelas* alimentar con insectos adultos y orugas a un juvenil de *M. bonariensis* por seis ocasiones en intervalos de *c*. 20 min (Fig. 1). Los adultos de *I. mesomelas* en una ocasión alimentaron a la par al juvenil y, en las restantes cinco ocasiones se turnaron, aunque el adulto que no alimentaba se mantenía cerca, mientras que el juvenil esperaba en una rama llamando y moviendo las alas antes de ser alimentado (Fig. 1). Video y audio disponibles en Molina (2022).

Malapamba y sus alrededores actualmente están sometidos a alta presión antrópica, lo que es un factor favorable para el establecimiento de *M. bonariensis* (Medrano *et al*., 2020). Además, Malapamba se sitúa apenas 6 km al sur de la reserva Yunguilla, donde habita el Matorralero Cabecipálido *Atlapetes pallidiceps*, categorizado como En Peligro de extinción a nivel mundial (BirdLife International, 2022). En esta reserva se conoce que *M. bonariensis* parasita en gran medida a *A. pallidiceps*, siendo una fuerte presión a su conservación (Oppel *et al*., 2004), por lo que se ha requerido control de las poblaciones parásitas (Krabbe *et al*., 2011).

No se puede asegurar que *M. bonariensis* puso sus huevos en el nido de *I. mesomelas*, ya que existen evidencias de volantones de varias especies de aves parásitas de cría (incluyendo *M. bonariensis*) que consiguen ser alimentados por adultos que no son los que incubaron sus huevos (Sealy & Lorenzana, 1997). Por ello, los listados de especies víctimas y hospederas podrían diferir significativamente. En Malapamba no se han registrado previamente este tipo de interacciones y, por su cercanía a un área de importancia global para la conservación de *A. pallidiceps*, es importante dar seguimiento a *M. bonariensis*.

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Figura 1: Bolsero Coliamarillo *Icterus mesomelas* alimentando a juvenil parásito de Vaquero Brilloso *Molothrus bonariensis,* 22 de marzo de 2022, Malapamba, Azuay, Ecuador. A) *M. bonariensis* reclamando comida, *I. mesomelas* entregando: B y D) una oruga, C) insecto adulto (Paul A. Molina).