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Breeding ecology of the Loja Hummingbird *Amazilis amazilia alticola* (Apodiformes: Trochilidae) in Loja, Ecuador

Ecología reproductiva del colibrí de Loja *Amazilis amazilia alticola* (Apodiformes: Trochilidae) en Loja, Ecuador

Leonardo Ordóñez-Delgado[1,2*], Claudio Crespo-Ramírez[1], Jorge Córdova-González[1]

[1] Museo de Zoología, Departamento de Ciencias Biológicas y Agropecuarias. Universidad Técnica Particular de Loja. Loja, Ecuador.
[2] Laboratorio de Ecología Tropical y Servicios Ecosistémicos (EcoSs-Lab). Departamento de Ciencias Biológicas y Agropecuarias,Universidad Técnica Particular de Loja. Loja, Ecuador.
* Corresponding author: <lyordonez2@utpl.edu.ec>

Abstract

We present for the first time detailed information regarding the reproductive biology of the Loja Hummingbird (*Amazilis amazilia alticola*) in the wild. This research was carried out between February and March 2022 in the city of Loja, Ecuador, through detailed observations of an active nest located in a loquat tree (*Eriobotrya japonica*). We recorded data concerning the nest, its structure, construction materials and size. We also review all available information regarding this species' breeding phenology. The nest was built using plant fibers, spider webs and lichens for insulation and camouflage. The incubation lasted 16 to 18 days, and the chicks remained in the nest for 23 days. Typical for hummingbirds, the female assumed all parental duties, including the incubation, care and feeding of the young, collecting nectar from at least eight plant species. Significant differences were observed in the care given to each chick. Our data improves our knowledge regarding the reproduction of Andean hummingbirds, and in particular of these

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common but poorly known species that have adapted to anthropic environments.

Keywords: Reproductive biology, hummingbirds, urban birds, Andes.

Resumen

Presentamos por primera vez información detallada sobre la biología reproductiva del Colibrí de Loja (*Amazilis amazilia alticola*) en estado silvestre. Esta investigación se realizó entre febrero y marzo de 2022 en la ciudad de Loja, Ecuador, mediante observaciones detalladas de un nido activo ubicado en un níspero (*Eriobotrya japonica*). Se registraron datos referentes al nido, su estructura, materiales de construcción y tamaño. También sistematizamos la información disponible sobre la fenología reproductiva de esta especie. El nido se construyó utilizando fibras vegetales, telas de araña y líquenes para aislarlo y camuflarlo. La incubación duró de 16 a 18 días, y los polluelos permanecieron dentro del nido 23 días. Como es habitual en los colibríes, la hembra asumió todas las tareas parentales, incluida la incubación, el cuidado y la alimentación de las crías, recolectando néctar de al menos ocho especies de plantas. Se observaron diferencias significativas en los cuidados prestados a cada polluelo. Nuestros datos fortalecen el conocimiento sobre la reproducción de los colibríes andinos, particularmente de esta especie común y adaptada a los entornos antrópicos, pero con significativos vacíos de información.

Palabras clave: Biología reproductiva, colibrís, aves urbanas, Andes.

INTRODUCTION

The Amazilia hummingbird (*Amazilis amazilia*) (Apodiformes: Trochilidae), until recently considered part of the genus *Amazilia*, is now the only species of the genus *Amazilis* (Remsen et al., 2025). This species has six subspecies (Cowles et al., 2022) (*A. a. caeruleigularis*, *A. a. amazilia*, *A. a. leucophoea*, *A. a. dumerilii*, *A. a. azuay* and *A. a. alticola*), of which the last two inhabit the high Andean ecosystems of the provinces of Azuay and Loja in southern Ecuador (Freile & Restall, 2018; Krabbe & Ridgely, 2010).

This hummingbird prefers open, semi-arid to arid habitats, such as scrublands, thorn forests, xerophytic steppes and desert areas, being rare in forested areas (Weller, 2000). In Ecuador, *A. amazilia* inhabits much of the deciduous forests and dry scrublands of the southwestern lowlands (Ridgely & Greenfield, 2001) and forest edges, open areas and even urban environments of the southern Ecuadorian Andes up to 2,500 m a.s.l. (Freile & Restall, 2018). Recently, wandering individuals have been reported also in the Amazon region of the country (Freile et al., 2020).

The subspecies Loja Hummingbird (*Amazilis amazilia alticola*) is considered common in the parks and gardens of the city of Loja and its surroundings (Andrade, 2009). This is a small bird of approximately 9 to 11 cm, weighing 4.5 to 5.5 grams (Weller et al., 2021). The male has a straight, medium-sized (21 mm), flesh-red bill with a dark tip; the back is golden green; the throat is bright golden to turquoise green, usually without a white patch; the underside of the breast and belly are reddish; the upper caudal coverts and tail are reddish, the lateral rectrices are bronze green (Krabbe & Ridgely, 2010). It is a territorial bird that spends most of its time perching and feeding (Calviño-Cancela, 2006).

The only data regarding the breeding behavior of *A. amazila* come from observations made in captivity, which report the nesting of the subspecies *A. a. amazilia* (Elgar, 1986) and the subspecies *A. a. leucophoea* (Grogan, 2000) in the United Kingdom, as well as that of *Amazilis amazilia* (without subspecies identification) in the Netherlands (Landman, 1991) and in Germany (Ramel, 2023). However, for the subspecies *A. a. alticola*, information on reproduction is lacking. In this paper, we present detailed information on nesting, incubation period and parental care for this subspecies.

METHODS AND MATERIALS

Study area

The present study was conducted between February 5 and March 15, 2022, in the Estancia Norte sector (03°57'58.06"S, 79°12'21.01" W; 2,065 m a.s.l.), northeast of the city of Loja, Loja province, Ecuador (Fig. 1).

The city of Loja is located within the Hoya de Loja. The natural vegetation is Montane Evergreen Forest of the southern Eastern Cordillera of the Andes (Ministerio del Ambiente de Ecuador, 2013); however, this type of vegetation is currently restricted to some streams and inaccessible sites around the Hoya, while in the central part the landscape is dominated by urbanized areas and small remnants of exotic vegetation (Ordóñez-Delgado et al., 2016).

The climate of the Hoya de Loja is typical of the Andean region, characterized by a sub-humid temperate-equatorial climate, with an average annual temperature of 15°C, precipitation values that oscillate around 900 mm/year, and an average relative humidity of 75% (PNUMA et al., 2007). The first half of the year is the wettest, with rainfall peaks between February and April, while the second half of the year is drier, the months of September to November being considered the months with the least rainfall during the year (Maldonado, 2002).

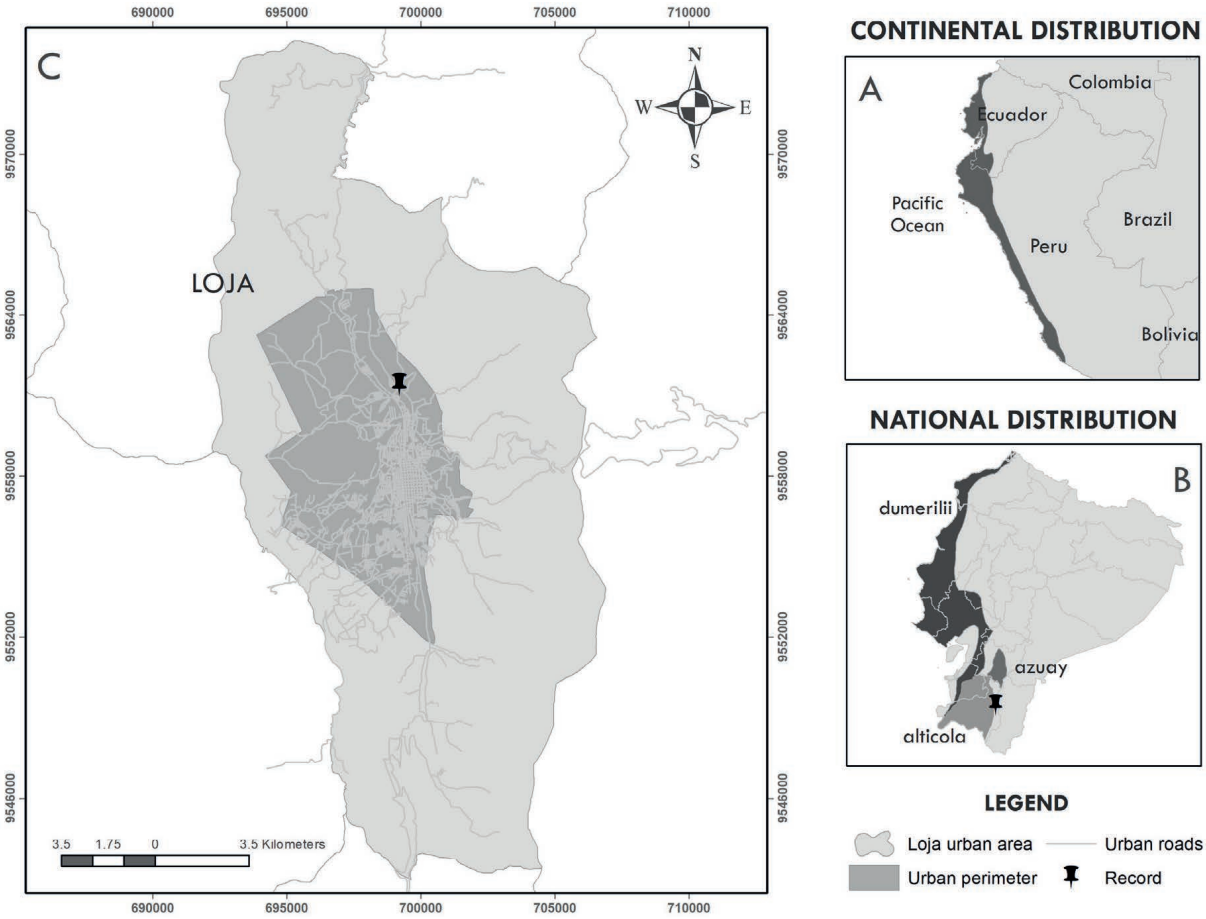

Figure 1. A: Nest site of *Amazilis amazilia alticola* in the urban perimeter of the city of Loja (dark gray). B: Distribution of *A. amazilia* in South America. C: Distribution of the subspecies *A. a. dumerilli*, *A. a. azuay* and *A. a. alticola* in Ecuador, based on McMullan & Navarrete, (2017).

Figura 1. A: Sitio de anidación de *Amazilis amazilia alticola* en el perímetro urbano de la ciudad de Loja (gris oscuro). B: Distribución de *A. amazilia* en Sudamérica. C: Distribución de las subespecies *A. a. dumerilli, A. a. azuay* y *A. a. alticola* en Ecuador, según McMullan y Navarrete (2017).

Data Collection

The nest, discovered on February 5, 2022, was fully built and contained two eggs, which made it possible to carry out a meticulous monitoring process, using as a reference the parameters analyzed in previous studies conducted in the region (see Alarcón et al., 2023; Greeney et al., 2020; Ordóñez-Delgado et al., 2016; 2022). Using binoculars and a variable zoom camera, observation sessions were conducted every third day, in the morning from 07:00 to 08:30 and in the afternoon from 16:00 to 17:30, always maintaining a safe distance from the nest (approximately 8 to 10 meters) to minimize disturbance and avoid abandonment of the clutch by the mother.

The monitoring of the nesting process included the incubation period, the rearing of the chicks, and the abandonment of the nest by the mother and her young.

These observations allowed us to document in detail the incubation, rearing and development of the chicks. Additionally, direct inspection of the nest was made on several occasions to determine its contents, the number of eggs, their hatching and the development status of the chicks.

Fifteen days after the chicks and their mother left the site, the nest was collected and added to the reference collection of the Zoology Museum at the Universidad Técnica Particular de Loja, under the code MUT-PL-O-N-001. The nest was not disassembled and remains intact in the collection; this final procedure facilitated a detailed analysis of its size, structure, and overall composition for its description.

Data Analysis of Reproductive Seasonality

Additionally, to describe the reproductive phenology of this species, we compiled records of Amazilia hummingbird breeding (active nests: nest with eggs or chicks, or females incubating), by reviewing articles in scientific journals, unpublished observations from local collaborators, and photographs of nests published in citizen science databases such as eBird (www.ebird.org), iNaturalist (www.inaturalist.org) and EcoRegistros (www.ecoregistros.org). In this case, we did not discriminate between subspecies; the search was conducted at the species level, using the scientific names *Amazilia amazilia* and *Amazilis amazilia* as keywords on the platforms. To avoid duplicate records across platforms, each record was visually verified.

RESULTS

On February 5, 2022, JCG recorded an active nest of *A. amazilia alticola*, in the Estancia Norte sector, in the northwestern part of the city of Loja. The nest was located on a branch junction of a loquat tree (*Eriobotrya japonica* (Thunb.) Lindl., 1821 - Rosaceae), at a height of 2 m from the ground. It had the shape of a deep cup and was made of plant material, mainly grass fibers (*Cortaderia jubata* (Lem.) Stapf; Poaceae), all wrapped with spider web; on the outside, there was a large amount of lichens of the genus *Parmotrema* (Fig. 2a, b)

The nest was 4.35 cm high, 5.10 cm wide by 5.75 cm long, 1 cm at the edge of the nest and 2.23 cm deep in the center of the nest. The clutch was represented by two eggs, oval in shape and uniform white in color. We identified that the female began incubating based on the time spent in the nest; from the first day of our monitoring, it took 16 days for the first chick to emerge and 18 days for the second individual.


a
b
c
d
e
f
g
h

Figure 2. Nesting and parental care in the Loja hummingbird.
Figura 2. Anidación y cuidado parental en el colibrí de Loja.

The chicks hatched between February 21 and 23, with bare skin and completely closed eyes, dark brown skin and a very short yellow beak (Fig. 2c).

By February 27-28 (5-6 days old), the chicks had increased in size considerably and began to develop cannons on the wings and back, while the head and tail were covered with brown down, the beak was long and dark, while the maxilla and commissures were yellowish (Fig. 2d).

By March 6 (11-13 days old), the chicks grew so much that they were occupying almost the entire nest space, and, despite the development of some wing and tail feathers, approximately 70% of their bodies were covered by down (Fig. 2e, f).

Between March 9 and 12 (17-19 days old), their eyes were fully open, and they began to develop dark rufous plumage, and the appearance of a white postocular spot, one of the distinctive features of this species, was evident (Fig. 2g, h).

On March 14 (19-21 days old), the hatchlings had grown enough to protrude from the nest, so they were easily observed from a distance; at this stage, they were slightly smaller than the adults, and had full plumage, with a greenish-brown crown, nape and back, rufous wings, and whitish breast and throat. The down had almost completely disappeared, except for a small area on the rump, which had a coppery color similar to that of the adult.

On March 15 (20-22 days old), the larger hatchling was observed walking along the edge of the nest while making rapid wing movements, while the smaller hatchling remained inside the nest. On March 16 (23 days old), the larger juvenile left the nest and began to make small flights between common fig (*Ficus carica* L.; Moraceae), kidney beans (*Phaseolus vulgaris* L.; Fabaceae) and black cherry (*Prunus serotina* Ehrh.; Rosaceae) plants. Finally, on March 17 (22 days old), the smallest chick also left the nest (Fig. 2i).

After leaving the nest, the mother continued feeding both juveniles. They alerted of their presence inside the dense vegetation by emitting shrieks and batting; however, at first, the female paid more attention to the larger juvenile, until it began to fly with her. The smaller individual received significantly less attention.

The female was responsible for feeding the chicks at all times, making rounds of approximately 15 minutes to obtain nectar (Fig. 2k, l). Thus, in one hour of observation, up to five occasions were documented in which she brought food to her young. Towards the end of the parental care period, this time was reduced, and up to three rounds were observed with time intervals of approximately 10 minutes.

The female obtained nectar from eight species of plants present in the vicinity of the nest: kidney beans (*Phaseolus vulgaris* L.; Fabaceae), European plum (*Prunus domestica* L.; Rosacea), aloe vera (*Aloe vera* (L) Burm. f.; Asphodelaceae), paperflower (*Bougainvillea glabra* Choisy; Nyctaginaceae), bluegum eucalyptus (*Eucalyptus globulus* Labill; Myrtaceae), largeleaf lantana (*Lantana camara* L.; Verbenaceae) and milky widow's thrill (*Kalanchoe laxiflora* Baker; Crassulaceae), the latter being visited less frequently. Although all these species are introduced in Ecuador, they are currently considered naturalized in the country, as they maintain self-sustaining populations capable of reproducing without direct human intervention (Richardson et al., 2000).

Regarding the process of emancipation of the young (> 30 day old), the juveniles were observed to make several short and somewhat clumsy flights; as the days passed, they began to improve their flight technique, making longer and more coordinated movements.

Regarding feeding, on a couple of occasions one of the juveniles was documented attempting to feed on its own. On March 28 (35 days old), the largest individual perched on the branch of an avocado tree (*Persea americana* Mill.; Lauraceae) and began to lick the knots at the base of a leaf, as well as the lichens present on the bark of the tree; several days later, and with improved flight, the same individual flew to a liana of a bean plant, where it perched and began to lick the calyx of the flowers (Fig. 2j).

Reproductive Phenology of *Amazilis amazilia* in Ecuador

Our data search retrieved 27 breeding events of the species previously reported, of which eight were found on eBird (eBird, 2025), eight on iNaturalist (iNaturalistEc, 2025), one on EcoRegistros (EcoRegistros, 2025), eight in scientific publications, of which six from Peru (Díaz et al., 2024), and two from Ecuador (Alarcón et al., 2023). Additionally, two records were obtained from unpublished data provided by local birders. *Amazilis amazilia* nests throughout the year, February being the month that holds the highest number of events, and the first half of the year (January-June) gathering 77% ($n = 20$) of all records (see Table 1).

DISCUSSION

The hummingbird *A. amazilia* is the most common species in the family Trochilidae, inhabiting urban and peri-urban environments on the western slopes of the Andes of southern Ecuador. Surprisingly, despite being easy to observe and record, all data on its reproductive ecology comes from captive individuals in zoos and bird farms in European countries (Elgar, 1986; Grogan, 2000; Landman, 1991; Ramel, 2023), published information about its breeding behavior in the wild lacking.

Our observations show that the Loja hummingbird (*A. amazilia alticola*) has a reproductive behavior similar to that of several species of the genus *Amazilia* (Avalos, 2024), other closely related genera such as *Uranomitra* (Escobar-Lasso & Martínez, 2014), as well as other species of hummingbirds from temperate and subtropical environments of the Andes (Ortiz-Crespo, 2011).

Its nest has the shape of a low cup, located in the bifurcation of a branch, being similar to those previous descriptions for this species, and others such as *Colibri coruscans*, *Chlorostilbon melanorhynchus* (Ortiz-Crespo, 2011) or *Chaetocercus jourdanii* (Marcuk et al., 2024), and others of the Trochilidae family (Simon & Pacheco, 2005). The location of the nest in a loquat tree (*Eriobotrya japonica* (Thunb.) Lindl.), an exotic species for the study area, emphasizes the flexibility of the species to make use of accessible vegetation for its breeding. This plasticity has been recorded in both urban and rural environments and documented in *A. amazilia* nests located in plants from gardens (see ML201777431 - Carrasco, 2018), crops or roadsides (LOD, pers. obs). Nesting in both native and planted trees, and even human infrastructure, in parks and gardens has been widely documented in the family Trochilidae (Escobar-Ibáñez & MacGregor-Fors, 2015; Musschenga et al., 2022; Winkler et al., 2024).

Table 1. Monthly distribution of nesting records of *Amazilis amazilia*. **Source**: Authorship of the record. **Peru / Ecuador**: Number of reported records per country. **Month**: Time when nesting was observed. **Total**: Sum of records reported per month. **Link**: Corresponds to the links of the records published online.

Tabla 1. Distribución mensual de registros de anidación de *Amazilis amazilia*. **Fuente**: Autoría del registro. **Perú / Ecuador**: Número de registros reportados por país. **Mes**: Fecha en que se observó la anidación. **Total**: Suma de registros reportados por mes. **Enlace**: Corresponde a los enlaces de los registros publicados en línea.

Source	Peru	Ecuador	Month	Total	Link
Días et al. 2024	1		Jan	3	
Paul Molina		1			https://macaulaylibrary.org/asset/205725751
Patricia Mancilla		1			https://www.inaturalist.org/observations/56364066
Días et al. 2024	1		Feb	5	
Agustin Carrasco		1			https://macaulaylibrary.org/asset/201777431
Paul Molina		1			https://macaulaylibrary.org/asset/201711891
Laurie Koepke		1			https://macaulaylibrary.org/asset/24650971
Pedro Peralta		1			Unpublished data
Jorge Correa		1	Mar	2	Unpublished data
Dana Silva		1			https://www.inaturalist.org/observations/43231663
Lisa Brunetti		1	Apr	5	https://macaulaylibrary.org/asset/616905250
Alarcón et al. 2023		1			
Alarcón et al. 2024		1			
Roger Barbz		1			https://www.inaturalist.org/observations/158499767
Gabriela Palacio		1			https://www.inaturalist.org/observations/105395019
Días et al. 2024	1		May	4	
Ibeth Alarcón		1			https://macaulaylibrary.org/asset/337078181
Kárlom Herrera		1			https://macaulaylibrary.org/asset/233435471
Ibeth Alarcon		1			https://www.inaturalist.org/observations/78416408
Días et al. 2024	1		Jun	1	
Días et al. 2024	1		Jul	2	
Stephanie Navas		1			https://www.inaturalist.org/observations/173208751
Lisa Brunetti		1	Aug	1	https://macaulaylibrary.org/asset/479496211
Antonio Salas		1	Sep	1	https://www.inaturalist.org/observations/96316787
	0	0	Oct	0	
Días et al. 2024	1		Nov	2	
Rob Westerduijn		1			https://www.inaturalist.org/observations/38709734
	0	0	Dec	0	
Total	**6**	**20**		**26**	

The materials that make up the nest are efficient and practical. The external lining made of grass fibers (*Cortaderia jubata* (Lemoine) Stapf) and spider web give it support, thermal insulation and elasticity, the latter being a key factor that provides the nest with the ability to expand as the young develop (Ortiz-Crespo, 2011). On the other hand, the use of lichens confers camouflage against potential predators (Oniki et al., 2000; Ornelas, 2010; Winkler et al., 2024).

The mother's territorial behavior and high time and energy investment in the nutrition and care of the chicks is a well-documented characteristic in hummingbirds, where there is no biparental care and only the mother is in charge of nurturing the young (Baltosser, 1996; Barba-Bedolla & Mendoza-Cuenca, 2017; Fierro-Calderón & Martin, 2007; García & Botero-Delgadillo, 2013; Ridgely & Cooper, 2012). The rapid growth of hatchlings, that go from completely naked nestlings, characteristic of altricial species, to juveniles capable of autonomous flight in a period of less than four weeks confirms that in the family Trochilidae the development of nestlings is rapid and does not exceed six weeks at the most, as proposed by Winkler et al., (2024). However, the unequal distribution of maternal care between chicks is striking, this issue requiring further analysis in future work, as this behavior could be part of an evolutionary strategy aimed at maximizing the survival of at least one offspring under unfavorable environmental conditions and with limited resources (Ricklefs, 1984), such as urban and periurban environments (Ordóñez-Delgado et al., 2022). This behavior has been documented in several bird species (Gótmark & Ahlström, 1997).

The interaction of the mother with at least eight plant species to obtain food emphasizes the importance of plant diversity as a key element for its survival; this corroborates the hypothesis that the greater the diversity and structural complexity of the vegetation of an environment, the greater the probability of sustaining more diverse communities (MacArthur & MacArthur, 1961); in this case a greater availability of resources from different plants provides a better chance of survival for the offspring.

The use of several plant species, all exotic, but naturalized in the study area, supports the hypothesis that this is a generalist, having an adaptive advantage over other species of the Trochilidae family that have particular requirements that limit their presence in anthropized environments (Chaves, 2024). In any case, it would be interesting to evaluate the quality of nectar from these plants, determining their nutrient supply, which could further be used in urban vegetation management strategies aimed at facilitating the presence and maintenance of healthy populations of this and other local species.

A relevant behavioral observation is the gradual learning process where the fledglings start to feed, firstly attempting to lick some lichens or exploring the calyx of flowers. These findings allow us to verify that the young individuals of the species use a process of hit-miss learning to determine the food sources in their environment, common in many bird species (Ackerman, 2017). Additionally, this highlights the importance of diverse vegetation in the vicinity of the nest for the successful development of the chicks in this critical stage of their life.

Finally, the data regarding active nests that we encountered on citizen science platforms (eBird, iNaturalist) confirms that the species breeds throughout the year (Winkler et al., 2024), with a peak of breeding records in the month of February, indicating that there would be a direct relation-

ship between the start of the rainy season in the area where the species is distributed, and its reproduction. This suggests that during this interval there is a greater availability of resources, such as more flowering plants, that provide a higher possibility of success for the incubation and rearing of chicks.

Although these data provide an initial estimate of the species' reproductive phenology, we consider it necessary to confirm these findings through the implementation of systematic annual nest monitoring, in order to strengthen our understanding of this process.

This work constitutes a first step in the understanding of the breeding behavior in the subspecies *A. a. alticola*. It is essential to continue documenting the ecology and reproductive processes of this species, as this will allow us to propose adequate strategies for its long-term conservation at the local level. Among these, a simple yet impactful action for this and other species inhabiting the city of Loja is the use of native flowering plants in gardens and parks, aiming to make the urban environment more friendly to local wildlife.

CONCLUSION

This paper presents the first detailed record, in the wild, on the reproductive ecology of the Loja hummingbird (*Amazilis amazilia alticola*), contributing to our knowledge of the natural history of this poorly known subspecies. Our detailed observations confirm that the reproductive behavior of this bird is similar to that of other Andean hummingbirds, building a cup-shaped nest, using plant fibers, spider webs and lichens, which provide support, insulation and camouflage. This subspecies shows an interesting ecological plasticity, using exotic plant species for breeding and feeding, thus showing high adaptability to anthropized urban environments, which makes it a suitable subspecies to understand the effects of urbanization on Andean biodiversity. As is common in hummingbirds, we corroborated the exclusive maternal care of the brood, but with a marked inequality in the care given to the chicks, which would reflect an adaptive strategy in the face of limiting environmental conditions, such as urban environments, where the quantity of food resources can constrain the presence of some bird species. We observed a gradual learning process in the hatchlings, evidencing the importance of the surrounding plant diversity for their successful development. Finally, data from citizen science platforms corroborate that the species reproduces throughout the year, with a notable peak in February, suggesting synchronization with the availability of floral resources linked to the local rainy season (January-June). These findings reinforce the need to conserve heterogeneous and diverse urban habitats, as well as to continue researching the reproductive biology of *A. a. alticola*, to implement effective strategies for its long-term conservation.

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AUTHOR'S CONTRIBUTION

Conceptualization, LOD. and JCG.; Methodology, LOD. and JCG.; Formal Analysis, LOD. and JCG. Investigation, JCG.; Writing – Original Draft Preparation, LOD.; Writing – Review & Editing, LOD, JCG, CCR.

CONFLICTS OF INTEREST / COMPETING INTERESTS

The authors declare that they have no conflict of interest.

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