

The giant returns: Rediscovery of the largest yellow-shouldered bat in the world

El retorno del gigante: Redescubrimiento del murciélago de hombros amarillos más grande del mundo

MARCO A. RODRÍGUEZ-SEGOVIA^{1*} AND ANA LUCÍA PILATASIG^{2,3}

¹Facultad de Ciencias Biológicas, Universidad Central del Ecuador. Numa Pompilio Llona y Yaguachi, Sector el Dorado, C. P. 170403. Quito, Ecuador. E-mail: marcozeus24@gmail.com (MAR-S).

²Museo de Zoología-Sección de Mastozoología, Facultad de Ciencias Exactas y Naturales, Pontificia Universidad Católica del Ecuador. Av. 12 de octubre 1076 y Vicente Ramón Roca. C. P. 170525. Quito, Ecuador. E-mail: mapilatasig@puce.edu.ec (AL-P).

^{*}Corresponding author

Sturnira aratathomasi is a rare species of bat distributed in Venezuela, Colombia, Ecuador, and Peru. Herein we report new records for *S. aratathomasi* species in Colombia and Ecuador, updating its geographic distribution. During a field expedition to Cayambe Coca National Park in eastern Ecuador, a bat with difficult taxonomic identification was collected. To find additional specimens for comparison, museum collections in Ecuador and Colombia were reviewed. These specimens were identified as *S. aratathomasi* based on a forearm length equal to or greater than 55 mm and the presence of pointed upper inner incisors. Furthermore, an updated distribution map was generated. A total of 27 geographic records for *S. aratathomasi* were obtained. We report four new records of *S. aratathomasi*: two from Ecuador and two from Colombia. The first records from Ecuador are based on a specimen collected during fieldwork in Cayambe Coca National Park and a voucher specimen from Cosanga. The new records from Colombia are based on two voucher specimens from Quebrada La Colosa and Corregimiento Juntas. Investing more time and resources in both curatorial work and field expeditions is essential for analyzing the distribution of *S. aratathomasi* and for implementing effective conservation strategies. The Cayambe Coca National Park and Los Nevados National Natural Park are considered as priority areas for the conservation and research of this rare species in the Neotropics.

Key words: Coca Codo Sinclair; epaulettes; mountain forests; Neotropics; rare species; ribs; Salado River; *Sturnira aratathomasi*; *Sturnira magna*; vertebrae

Sturnira aratathomasi es una especie rara de murciélago distribuida en Venezuela, Colombia, Ecuador y Perú. En este artículo reportamos nuevos registros para *S. aratathomasi* en Colombia y Ecuador, actualizando su distribución geográfica. Durante una expedición de campo al Parque Nacional Cayambe Coca, en el este de Ecuador, se recolectó un murciélago de difícil identificación taxonómica. Para encontrar especímenes adicionales para comparar, se revisaron colecciones de museos en Ecuador y Colombia. Estos especímenes se identificaron como *S. aratathomasi* con base en una longitud del antebrazo igual o mayor a 55 mm y la presencia de incisivos superiores internos puntiagudos. Además, se generó un mapa de distribución actualizado. Se obtuvieron un total de 27 registros geográficos para *S. aratathomasi*. Reportamos cuatro nuevos registros de *S. aratathomasi*: dos en Ecuador y dos en Colombia. Los primeros registros de Ecuador se basan en un ejemplar colectado durante el trabajo de campo en el Parque Nacional Cayambe Coca y un ejemplar testigo de Cosanga. Los nuevos registros de Colombia se basan en dos ejemplares testigo de la Quebrada La Colosa y el Corregimiento Juntas. Invertir más tiempo y recursos tanto en el trabajo curatorial como en las expediciones de campo es esencial para analizar la distribución de *S. aratathomasi* e implementar estrategias de conservación efectivas. El Parque Nacional Cayambe Coca y el Parque Nacional Natural Los Nevados son áreas prioritarias para la conservación e investigación de esta rara especie en el Neotrópico.

Palabras Clave: bosques montanos; Coca Codo Sinclair; Charreteras; costillas; especie rara; Neotrópico; Río Salado; *Sturnira aratathomasi*; *Sturnira magna*; vértebra

© 2025 Asociación Mexicana de Mastozoología, www.mastozoologiamexicana.org

The genus *Sturnira* comprises 25 recognized species and is one of the most diverse within the Phyllostomidae family (Gardner 2008, Velazco and Patterson 2013, Solari et al. 2019, Yáñez-Fernández et al. 2023). Despite this great diversity, information on the biology, foraging strategies, roosting sites, distribution, and population ecology of many *Sturnira* species occurring in Ecuador remains limited (Albuja-V 1999, Carrera et al. 2010, Rodríguez-Segovia

2022). Even some *Sturnira* species are considered rare in scientific collections and are rarely captured during field expeditions (Jarrín-V and Kunz 2011). The lack of recent field expeditions hinders understanding of the distribution of rare species and the identification of priority areas for research and conservation (Burneo and Tirira 2014).

In Ecuador, there are 14 species of *Sturnira*, ten are listed as least concern: *S. bakeri*, *S. bidens*, *S. bogotensis*,

S. erythromos, *S. giannae*, *S. ludovici*, *S. luisi*, *S. magna*, *S. oporaphilum* and *S. tildae*; two are listed as endangered: *S. perla*, *S. boadai*; one is considered vulnerable *S. koopmanhilli*; and one as data deficient *S. aratathomasi* (Tirira 2021). The last one due to the absence of records with precise geographic information.

Sturnira aratathomasi, was described based on one specimen collected in 1966 from Pance, Department of Valle in southwestern Colombia at 1,650 m (type locality) and two additional specimens from an unspecified locality in Ecuador collected prior to 1874 (Peterson and Tamsitt 1968). In the following years up to the present, records of this species have been scarce and sporadic over time. A study collected six specimens near the type locality (Thomas and McMurray 1974). One specimen collected in Monte Zerpa, expanded the distribution of this species to western Venezuela (Soriano and Molinari 1984). A few years later, two specimens were collected from the Departments of Huila and Cauca, representing the first records from the central and eastern Andean cordilleras of Colombia (Tamsitt et al. 1986).

Fieldwork carried out in Departamento del Cauca, Colombia, allowed the collection of five specimens, ranging from 1,800 to 2,600 m, from Cordillera Central and Occidental (Alberico 1987). On August 29, 1978, a juvenile male was collected from the Departamento de Amazonas at 3,165 m, in northern Peru (McCarthy et al. 1991). Solari et al. (2001) reported the presence of this species in the Department of San Martín, Peru. Pacheco and Hocking (2006) mentioned that the two specimens collected by Solari et al. (2001) in this locality, (MUSM 7305 and 7306, Museo de Historia Natural, Universidad Nacional Mayor de San Marcos), were captured at 2,000 and 2,100 m, respectively. Pacheco & Hocking (2006) also mentioned three specimens collected at Cconoc in the Department of Apurímac, at 1,925 m, in the eastern slopes of the Peruvian Andes.

A study conducted at “Recinto El Pensamiento” in the Department of Caldas, Colombia, collected one female at 2,180 m (Castaño et al. 2004). A study in the Santuario de Fauna y Flora Otún-Quimbaya, in the Central Andes of Colombia captured five individuals at 2,100 m. Three specimens were collected; two were measured and released. This study also reported the presence of seeds of *Solanum sycophanta* (Solanaceae) in fecal samples of *S. aratathomasi* (Estrada-Villegas et al. 2007), being the only known dietary record for this bat species (Castaño et al. 2018). Another study conducted in the Reserva Hidrográfica Río Blanco in the Central Andes of Colombia, reported three additional specimens at 2,500 m, in a mixture of sub-Andean and Andean Mountain Forest and plantations of *Eucalyptus globulus* and *Alnus glutinosa* (Rodríguez-Posada 2010).

An evolutionary study suggests that *S. aratathomasi* diverged about 5.4 Ma (4.4 - 6.7 Ma) in the Late Miocene and represents one of the earliest divergence species of the genus (Velazco and Patterson 2013). This study also analyzed DNA samples from one of the specimens collected

by Thomas and McMurray (1974), (Royal Ontario Museum, ROM-70874 ♀), and one unreported specimen collected by Alberico (1987), (Field Museum of Natural History, FMNH 189778 ♀), from Quebrada Charco Azul in the Department of Valle del Cauca, at 1,800 m, as is inferred. A taxonomy study of the genus *Sturnira* in Colombia cited two specimens deposited in the Colección Teriológica de la Universidad de Antioquia (CTUA/MUA: MUA11311 and MUA11094) (Martínez-Arias 2011). However, no geographic details were provided. Therefore, only 31 voucher specimens with accurate locality information are available.

Furthermore, there are additional mentions of *S. aratathomasi* in the literature (see Alfonso and Cadena 1994; Cuartas 1997; Muñoz-Arango 2001; Bejarano and Yate 2003; Otálora-Ardila 2004), and there is a human observation from the lowland Amazonia of Peru that deserve further research to verify the presence of *S. aratathomasi* in this region (Montenegro and Escobedo 2004; Pacheco and Hocking 2006). A study considered that there are over 46 records of this species in Colombia and Peru; however, it did not list the specimens or provide geographic information (Molinari and Lew 2015). Certainly, there are numerous unconfirmed records from Colombian institutions deposited in GBIF (2025) that warrant formal revision.

Herein we report new records for *S. aratathomasi* from Ecuador and Colombia, updating its geographic distribution. We also present valuable data to identify this species in the field and museum collections.

On January 17, 2023, a field expedition was conducted in the Cayambe Coca National Park, eastern Ecuador. A total of eight mist nets of 12 meters length were used to collect and document bat faunas in the bridge of the Gringo River, a tributary of the Salado River, west of the Coca Codo Sinclair Power Plant, Napo Province. The surrounding area was composed by remnants of native evergreen lower montane forest and pastures (MAE 2013). Following the Guidelines of the American Society of Mammalogists and the Ecuadorian Association of Mammalogy (Sikes 2016; Erazo et al. 2022), voucher specimens were collected, curated, identified, and deposited in the mammal collection of the Museo de Zoología QCAZ at Pontificia Universidad Católica (PUCE) del Ecuador with the research permit MAAE-DBI-CM-2021-0165 granted by the Dirección Nacional de Biodiversidad del Ministerio de Ambiente Agua y Transición Ecológica del Ecuador (MAATE). Frozen tissues, parasites and flies from these specimens are available at QCAZ.

One QCAZ specimen, obtained during 2023 fieldwork and of uncertain taxonomic identification, was compared with the original species description of *S. aratathomasi* and field guides (Peterson & Tamsitt 1968; Gardner 2008, Solari et al. 2019; Díaz et al. 2021). The diagnostic anatomical characters used for identification were a forearm length equal to or greater than 55 mm, pointed upper inner incisors, and serrated lower molars (Peterson and Tamsitt 1968; Soriano and Molinari 1987). All the available voucher specimens

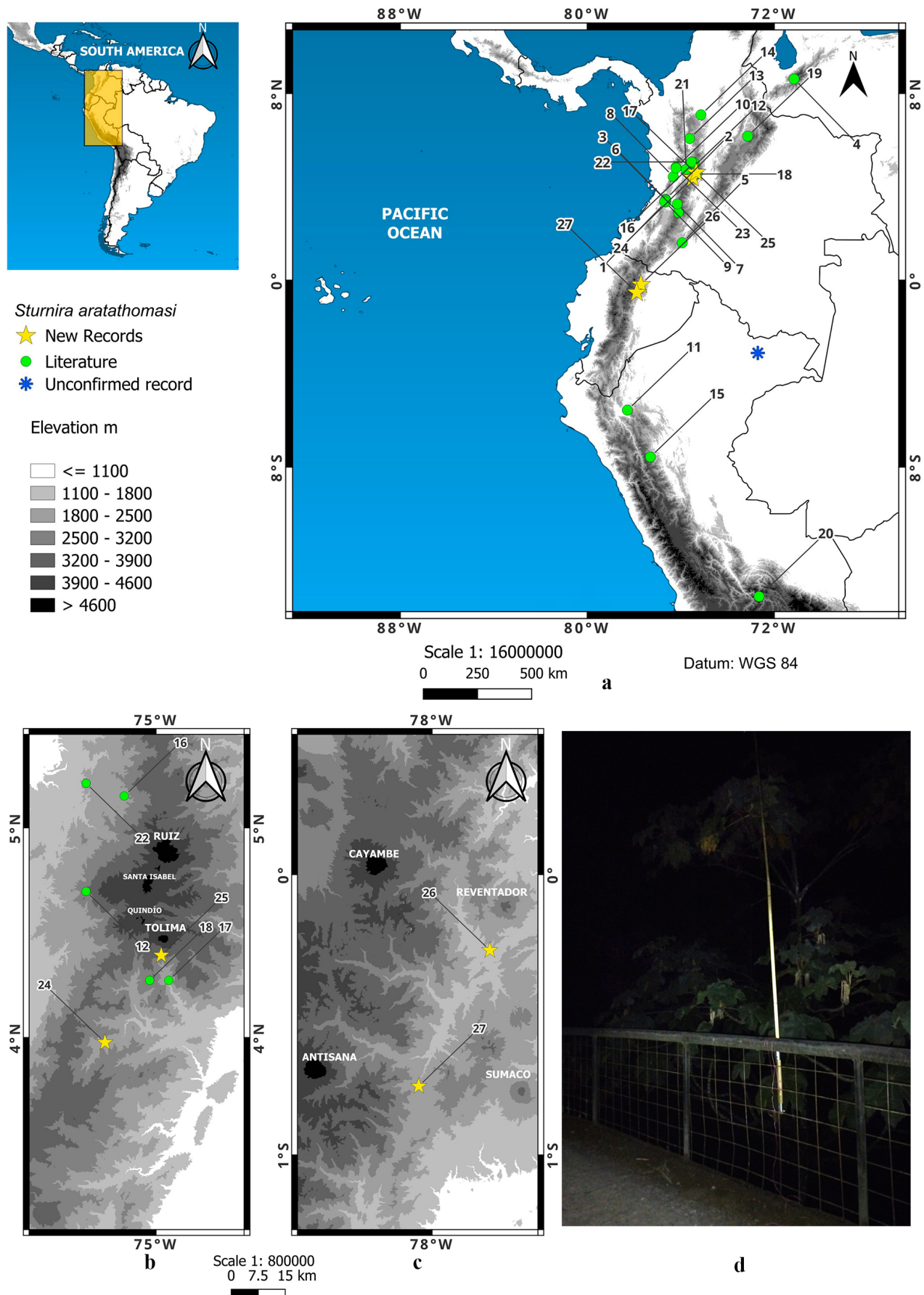


Figure 1. Distribution of *Sturnira aratathomasi*. Localities are detailed in Appendix 1. Green dot 1 corresponds to the type locality. Known records of *S. aratathomasi* (a), new records in the Central Andes of Colombia (b), and new records in eastern Ecuador (c). Detail of the bridge of the Gringo River (d) where some *Cecropia* trees with mature fruits can be seen in the image.

from large *Sturnira* species, including *S. koopmanhilli* ($n = 6$) and *S. magna* ($n = 76$), deposited in the QCAZ until January 31, 2025, were reviewed with the objective of finding any additional confused specimen (see [Rodríguez-Segovia and Pilatasig 2025](#)). *S. koopmanhilli* can be distinguished from *S. aratathomasi* by its very elongated and procumbent upper inner incisors, conspicuous diastemata between the molars, and molars with a flat appearance ([McCarthy et al. 2006](#); [Rodríguez-Segovia et al. 2025](#)). *S. magna* can be identified by the presence of broad, bilobed upper inner incisors and flat molars ([Díaz et al. 2021](#)). The age and reproductive status of each specimen were determined by seeing the fused degree of hand-wing epiphyses, pelage color, tooth eruption, and the development of nipples ([Kunz and Parsons 2009](#); [Rodríguez-Segovia 2022](#)). Photographs of the skulls, skeletons, and the skins of the *Sturnira* specimens were obtained to observe details on their anatomy.

The nomenclature for dental, vertebrae, and rib bones was based on information from literature ([Walton and Walton 1970](#); [Duque-Osorio et al. 2011](#); [Velazco and Patterson 2014](#); [Gaudioso et al. 2017](#); [Louzada and Pessôa 2022](#)). Standard body and cranial measures were measured with Trupper digital caliper (± 0.01 mm accuracy) and following the definitions of [McCarthy et al. \(2006\)](#). Geographic information and individual data were extracted from the label of each specimen. The terminology and symbology of this paper follows the original species description ([Peterson and Tamsitt 1968](#)).

Additional records, measurements, and photographs, were obtained from Museo de Historia Natural, Universidad de Caldas (MHNUC) and Instituto de Ciencias Naturales (ICN) at Universidad Nacional de Colombia (see [Castaño et al. 2004](#); [Estrada-Villegas et al. 2007](#); [Rodríguez-Posada 2010](#)). Measurements of the specimens analyzed in the QCAZ, MHNUC and ICN were compared qualitatively with available published records (Appendix 1, [Pacheco and Hocking 2006](#), [Rodríguez-Segovia and Pilatasig 2025](#)). The R package MorphoTools2 was used to summarize the data ([Šlenker et al. 2022](#); [R Core Team 2024](#)). Furthermore, our records plus the compiled information obtained from the literature review, allowed us to update the distribution map for *S. aratathomasi* (see, [Rodríguez-Segovia and Pilatasig 2025](#)).

A total of 27 geographic records for *S. aratathomasi* were compiled from the literature, specimen examinations, and fieldwork conducted at the Gringo River (Figure 1a, Appendix 1), this species occurs since $08^{\circ} 37' 00''$ N to $13^{\circ} 32' 47''$ N and $078^{\circ} 17' 00''$ W to $071^{\circ} 09' 00''$ W. Voucher specimens' elevation ranged from 1,301 to 3,165 m. We found two previously unreported adult specimens from Department of Tolima in the Central Andes of Colombia. The first corresponds to a specimen of unknown sex collected in Quebrada La Colosa, (MHNUC 1954), and the second to a female specimen from Corregimiento Juntas, (MHNUC 1408), (Figure 1b, localities 24 and 25, Appendix 1). Furthermore, we add two new records from Napo Province in Eastern Ecuador. The first

record, (QCAZ 19838) was an adult female collected on the bridge of the Gringo River. The second record (QCAZ 7725), is also a female specimen, initially misidentified as *S. magna*, collected 12 km northwest of Cosanga (Figure 1c - d localities 26 and 27, Appendix 1).

All the voucher specimens reviewed were identified as *S. aratathomasi* based on the following morphological characters: cranium and mandible robust (Figure 2a, c, e; j - l); depressed and elongated rostrum; canines long and directed anteriorly (Figure 2g - i); long and narrow nasal aperture (Figure 2a, c, e); posterior palate ending V shaped (Figure 2b, d, f); upper inner incisors (I1) are pointed, procumbent, and not in contact; and the outer upper incisors (I2) are tricuspidate (Figure 2m, n); tricuspidate lower inner incisors (i1) have a smaller and distinctive middle cusps wedged between lateral lobes; outer lower incisors (i2) are bicuspidate (Figure 2o, p), except in QCAZ 7725 because the left i2 is tricuspidate; serrated lower molars; m1 and m2 with a metaconid and entoconid divided by a deep notch (Figure 2q, r). QCAZ 7725 and 19828 have 7 cervical, 13 thoracic, 6 lumbar vertebrae, and 9 sacral (Figure 2t - w). The thoracic region has 13 ribs: 6 true ribs, 4 false ribs, and 3 floating ribs (Figure 2t - v).

The QCAZ and MHNUC specimens lack conspicuous shoulder glands (epaulettes). In *S. magna* QCAZ 6940 ♀, the horseshoe is fused to the upper lip, but its edge remains distinguishable (Figure 3a). In contrast, in QCAZ 7725 ♀ and QCAZ 19838 ♀, the edge is not distinguishable (Figure 3b, c), exhibiting a higher degree of fusion. QCAZ 19838 was dark grayish-brown dorsally and paler ventrally (Figure 3i - k). QCAZ 7725 was brownish dorsally and paler ventrally (Figure 3 d, g, h). The holotype USNM 395158 ♀ was very similar to this specimen dorsally and ventrally (Figure 3e, f).

The Pelage of QCAZ 7725 and QCAZ 19838 is soft and woolly. Dorsally between the shoulders of QCAZ 7725 we observed a pattern of four color bands: a whitish basal band, a dark-gray epibasal band, a whitish subdistal band, and a brown distal band (Figure 3l). Ventrally, in the abdominal region, we observed a pattern of three color bands: there was a whitish an almost imperceptible basal band, a gray subdistal band, and a whitish distal band (Figure 3m). Compared to QCAZ 7725, specimen QCAZ 19838 exhibited a similar dorsal color pattern (Figure 3n). QCAZ 19838 had four to three colors ventrally, with an almost imperceptible whitish basal band, a dark grayish epibasal band, a whitish subdistal band, and a grayish to brown distal band (Figure 3o). Both specimens have sparse hairs on the foot (Figure 3g, i). These specimens have a short fringe of hairs in the posterior edge of the uropatagium, measuring 3 mm in QCAZ 7725, 3.4 mm in QCAZ 19838, similar to 4 mm in the holotype (according to [Peterson and Tamsitt 1968](#)). The dorsal and ventral hair length of QCAZ 7725 and QCAZ 19838 were 8.23 and 4.77, and 8.51 and 4.63 mm, respectively. Our measurements were similar to those from previous records in Peru (Table 1).

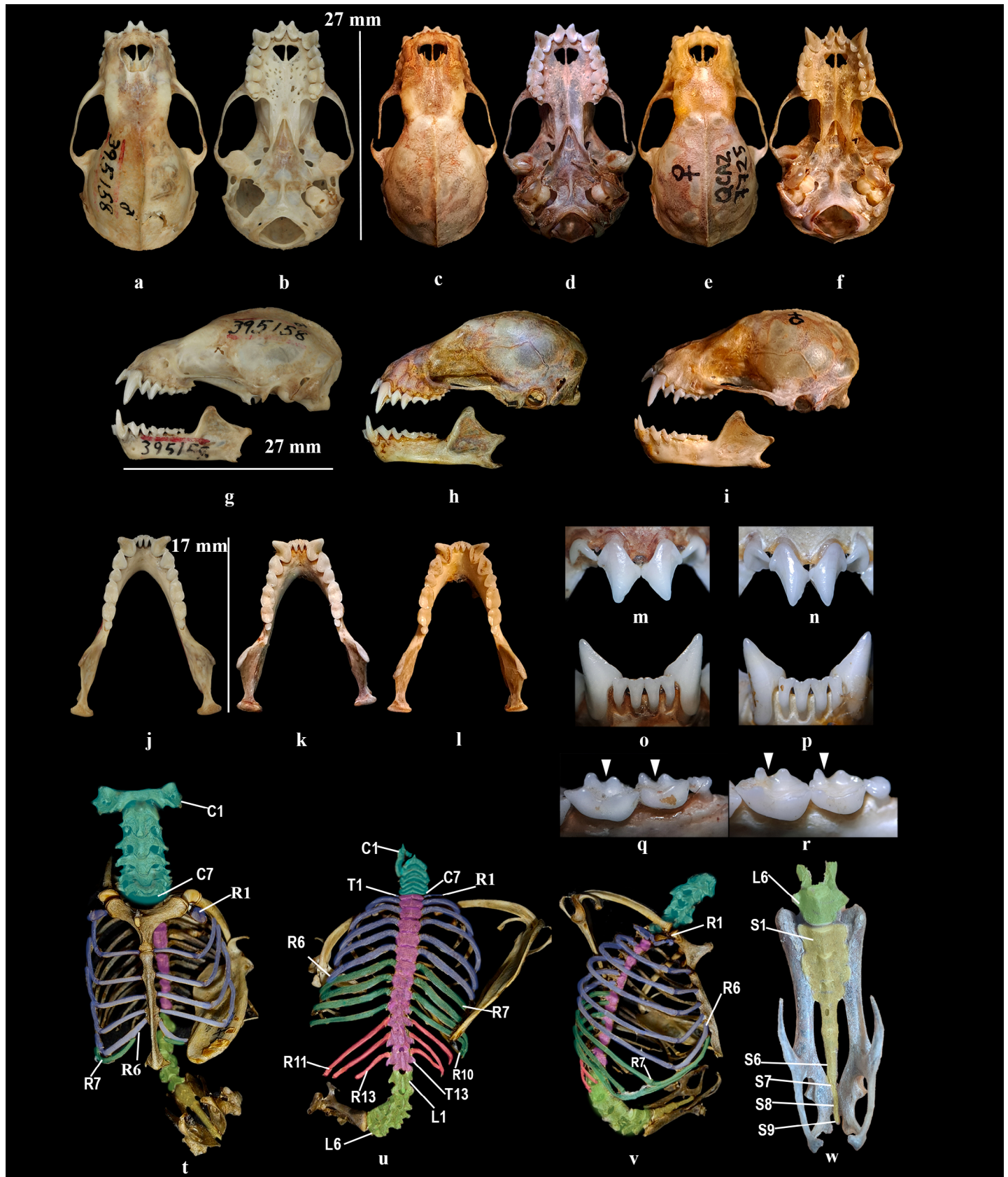


Figure 2. Details of the skull and skeleton of *Stumira aratathomasi*. Dorsal and ventral views of the cranium of USNM 395158 ♀ (a - b), QCAZ 19838 ♀ (c - d), and QCAZ 7725 ♀ (e - f). Lateral left view of the cranium and the lower jaw of USNM-395158 ♀ (g), QCAZ 19838 ♀ (h), and QCAZ 7725 ♀ (i). Dorsal view of the mandible of USNM 395158 ♀ (j), QCAZ 19838 ♀ (k), QCAZ 7725 ♀ (l). Upper inner incisors are pointed and non in contact in QCAZ 19838 ♀ (m) and QCAZ 7725 ♀ (n). Lower inner incisors are tricuspidate in QCAZ 19838 ♀ (o) and QCAZ 7725 ♀ (p). Triangles are showing a deep notch between the metaconid and entoconid of m1 and m2 in QCAZ 19838 ♀ (q) and QCAZ 7725 ♀ (r). Ventral, dorsal, and lateral view of the skeleton of QCAZ 7725 ♀ (t - v). Only the first 6 ribs are directly connected to the sternum (t, v). Ventral view of the pelvis of QCAZ 19838 ♀ (w). L5 and L6 are observed at the top of the image. Abbreviations: cervical vertebrae (C1 - C7, light blue), thoracic vertebrae (T1 - T13, pink), lumbar vertebrae (L1 - L6, light green), sacra vertebrae (S1 - S9, yellow), true ribs (R1 - R6 blue), false ribs (R7 - R10, dark green), floating ribs (R11 - R13, red). Photos: K. Sayers (a - b, g, j), MAR-S (c - f, h, i, k - w)



Figure 3. Dry skin details of *S. magna* and *S. aratathomasi*. Frontal view of the head: *S. magna* QCAZ 6940 ♀ (a), QCAZ 19838 ♀ (b), QCAZ 7725 ♀ (c). Triangles show how the horseshoe of noseleaf is fused to the upper lip in *S. aratathomasi*, while in *S. magna* this character is fused, but with a distinguishable edge. Dorsal and ventral views of the skin of USNM 395158 ♀ Holotype (e - f), QCAZ 7725 ♀ (g - h), and QCAZ 19838 ♀ (i - j). QCAZ 7725 ♀ in live (d) QCAZ 19838 ♀ in live (k). Detail of the dorsal and ventral pattern color in QCAZ 7725 ♀ (l - m) and QCAZ 19838 ♀ (n - o). Abbreviations: basal band (1), epibasalar band (2), subdistal band (3), distal band (4). Photos: courtesy of T. E. Lee Jr. (d), AL-P (k), MAR-S (a - c, g - j, l - o), K. Sayers (e - f)

Table 1. Morphometric measurements (in mm) of *Sturnira aratathomasi* specimens. Data was obtained from the museum records analyzed, scientific literature, and personal communication with curators (see Rodríguez-Segovia and Pilatasig 2025).

Measurements	Present Study Data from 26 specimens Range (MEAN $\pm$ SD) (sample)	Pacheco and Hocking (2006) Data from MUSM 7305 and 7306 at San Martín (Peru) Range (MEAN $\pm$ SD) (sample)	Pacheco and Hocking (2006) Data from MUSM 19151 - 19153 at Apurímac (Peru) Range (MEAN $\pm$ SD) (sample)
Head and Body Length	83 - 101 (91.14 $\pm$ 4.67) (n = 18)	74 - 89 (81.5 $\pm$ 10.61) (n = 2)	90 - 95 (91.7 $\pm$ 2.89) (n = 3)
Hind Foot Length	12.2 - 21 (17.22 $\pm$ 2.45) (n = 22)	18 - 18.5 (18.3 $\pm$ 0.35) (n = 2)	18.5 - 19 (18.7 $\pm$ 0.29) (n = 3)
Ear	16 - 22.43 (19.87 $\pm$ 1.53) (n = 23)	22 - 22 (22 $\pm$ 0.00) (n = 2)	20 - 20 (20 $\pm$ 0.00) (n = 3)
Tibia	18.86 - 23.8 (22.18 $\pm$ 1.73) (n = 9)	-	-
Forearm	49 - 62 (58.36 $\pm$ 2.52) (n = 26)	58.1 - 58.7 (58.4 $\pm$ 0.42) (n = 2)	55.5 - 58.7 (57.3 $\pm$ 1.61) (n = 3)
Metacarpal 3rd Digit	54.2 - 60.7 (57.27 $\pm$ 1.96) (n = 14)	53.3 - 54.8 (54.1 $\pm$ 1.06) (n = 2)	54.5 - 54.9 (54.7 $\pm$ 0.20) (n = 3)
1st Phalanx 3rd Digit	20.5 - 22.5 (21.39 $\pm$ 0.54) (n = 12)	20.3 - 21.5 (20.9 $\pm$ 0.85) (n = 2)	20.7 - 22.8 (21.6 $\pm$ 1.13) (n = 3)
2nd Phalanx 3rd Digit	26.3 - 29.66 (28.28 $\pm$ 0.91) (n = 12)	27.5 - 28.6 (28.1 $\pm$ 0.78) (n = 2)	27.9 - 28.7 (28.3 $\pm$ 0.40) (n = 3)
Metacarpal 4th Digit	53.7 - 58.8 (56.14 $\pm$ 1.64) (n = 14)	-	-
1st Phalanx 4th Digit	16.74 - 19.7 (17.69 $\pm$ 0.89) (n = 12)	-	-
2nd Phalanx 4th Digit	19.5 - 22.5 (20.25 $\pm$ 0.81) (n = 12)	-	-
Metacarpal 5th Digit	56.4 - 61 (58.44 $\pm$ 1.53) (n = 14)	-	-
1st Phalanx 5th Digit	11.65 - 14.1 (12.55 $\pm$ 0.72) (n = 12)	-	-
2nd Phalanx 5th Digit	14.1 - 18.2 (15.37 $\pm$ 1.22) (n = 12)	-	-
Greatest Length of the Skull	25.75 - 29.9 (28.29 $\pm$ 1.08) (n = 16)	27.8 - 28.3 (28.1 $\pm$ 0.37) (n = 2)	27.3 - 28 (27.7 $\pm$ 0.33) (n = 3)
Braincase Breadth	13.05 - 13.21 (13.15 $\pm$ 0.09) (n = 3)	13 - 13 (13 $\pm$ 0.00) (n = 2)	13 - 13.1 (13.1 $\pm$ 0.07) (n = 3)
Cranial Height	10.43 - 11.68 (11.22 $\pm$ 0.69) (n = 3)	-	-
Condylolincisive Length	26.52 - 27.8 (27.2 $\pm$ 0.42) (n = 15)	-	-
Condylolcanine Length	25.56 - 26.46 (26.01 $\pm$ 0.64) (n = 2)	25.1 - 25.8 (25.4 $\pm$ 0.52) (n = 2)	24.4 - 25.1 (24.8 $\pm$ 0.37) (n = 3)
Condylolbasal Length	24.2 - 26.42 (25.33 $\pm$ 1.11) (n = 3)	25.7 - 26.8 (26.2 $\pm$ 0.71) (n = 2)	25.1 - 26 (25.7 $\pm$ 0.51) (n = 3)
Palatal Length	10.15 - 13.38 (12.55 $\pm$ 0.82) (n = 13)	11.2 - 11.7 (11.4 $\pm$ 0.35) (n = 2)	11.3 - 11.6 (11.5 $\pm$ 0.16) (n = 3)
Zygomatic Breadth	16.68 - 17.8 (17.23 $\pm$ 0.37) (n = 15)	16.8 - 17.3 (17.1 $\pm$ 0.32) (n = 2)	16.7 - 16.9 (16.8 $\pm$ 0.10) (n = 3)
Mastoid Breadth	12.8 - 17.1 (15.07 $\pm$ 1.04) (n = 10)	-	-
Least Interorbital Breadth	7.5 - 8.2 (7.67 $\pm$ 0.21) (n = 12)	7.3 - 7.3 (7.3 $\pm$ 0.00) (n = 2)	7.8 - 8 (7.9 $\pm$ 0.09) (n = 3)
Postorbital Process	7.8 - 8.5 (8.03 $\pm$ 0.2) (n = 12)	8.3 - 8.4 (8.3 $\pm$ 0.06) (n = 2)	7.4 - 7.6 (7.5 $\pm$ 0.10) (n = 3)
Postorbital Constriction	7 - 7.51 (7.21 $\pm$ 0.12) (n = 15)	-	-
M1-M1	9.4 - 10.4 (10.04 $\pm$ 0.27) (n = 15)	-	-
M2-M2	8.91 - 9.32 (9.12 $\pm$ 0.29) (n = 2)	9.6 - 9.6 (9.6 $\pm$ 0.00) (n = 2)	9.6 - 9.8 (9.7 $\pm$ 0.08) (n = 3)
C-M ³	7.6 - 8.66 (8.26 $\pm$ 0.25) (n = 16)	7.7 - 8.1 (7.9 $\pm$ 0.27) (n = 2)	7.9 - 8.1 (7.9 $\pm$ 0.11) (n = 3)
C-C (upper)	7.94 - 8.7 (8.37 $\pm$ 0.2) (n = 11)	7.9 - 8.3 (8.1 $\pm$ 0.28) (n = 2)	7.7 - 7.9 (7.8 $\pm$ 0.09) (n = 3)
Length of Mandibles	17.49 - 19.5 (18.21 $\pm$ 0.46) (n = 15)	17.8 - 18.2 (18 $\pm$ 0.23) (n = 2)	17.4 - 18.1 (17.8 $\pm$ 0.34) (n = 3)
Height of Coronoid Process	7.44 - 7.45 (7.44 $\pm$ 0.01) (n = 2)	7.2 - 7.2 (7.2 $\pm$ 0.00) (n = 2)	7 - 7.2 (7.1 $\pm$ 0.10) (n = 3)
C-M ₃ (lower)	8.96 - 9.4 (9.16 $\pm$ 0.15) (n = 13)	8.7 - 8.8 (8.8 $\pm$ 0.08) (n = 2)	8.6 - 8.9 (8.7 $\pm$ 0.12) (n = 3)
Height of C1	4.18 - 4.7 (4.42 $\pm$ 0.23) (n = 4)	-	-
Height of c1	3.6 - 4.09 (3.85 $\pm$ 0.2) (n = 4)	-	-
Weight	34.5 - 67.1 (48.14 $\pm$ 8.15) (n = 16)	47.5 - 57.5 (52.5 $\pm$ 7.07) (n = 2)	46 - 50 (47.7 $\pm$ 2.08) (n = 3)

This study provides valuable data on *S. aratathomasi*, reporting for the first time precise geographic information from Ecuador and extending its known geographic distribution in Colombia. It also offers useful photographic references for identifying this species in the field and in museum collections. Implications for the conservation of this species and its anatomy are addressed.

All the characters and measurements analyzed in this paper coincide with previous reports ([Solari et al. 2001](#); [Pacheco and Hocking 2006](#)). Few studies have analyzed the post-cranial osteology of bats and there are variations in the number of vertebrae and ribs within and among species ([Walton and Walton 1970](#); [Gaudioso et al. 2017](#); [Louzada and Pessôa 2022](#)). In general, mammals possess 7 cervical, 12 - 14 thoracic, 5 - 7 lumbar, 2 - 5 sacral, and a variable number of caudal vertebrae (Romer 1966). For the genus *Sturnira*, a study considers 7 cervical, 12 thoracic, and 5 lumbar vertebrae ([Walton and Walton 1970](#)). Therefore, our data fall outside the range reported for mammals ([Romer 1966](#)) and for the genus *Sturnira* ([Walton and Walton 1970](#)), as the specimen QCAZ 7725 exhibits nine sacral vertebrae. This anatomical variation is novel for the genus. Examples of bats with more than five sacral vertebrae are rare in the literature. As an example, *Molossus fluminensis* has been reported to possess five to six sacral vertebrae ([Louzada and Pessôa 2022](#)).

The dentition and the woolly pelage of *S. aratathomasi* seems to be highly specialized in the rich vegetation and climate of the montane forests of the Andes ([McCarthy et al. 2006](#); [Jarrín and Kunz 2011](#)). However, the feeding habits of this species remain mostly unknown ([Castaño et al. 2018](#)). Additional zoological expeditions along the Salado and the Quijos River, and the Coca Codo Sinclair Power Plant are recommended to monitor the population status, natural history, ecology, and behavior of *S. aratathomasi* in Ecuador.

Natural history scientific collections are fundamental for the understanding of biological diversity over time ([Bradley et al. 2014](#)). A study suggests that investing more time and resources in curatorial work may be more efficient than investing in field expeditions when researchers aim to fill the biodiversity data gap ([Vargas et al. 2023](#)). Based on our experience, it is very common for researchers to lack both qualified personnel and sufficient funding to carry out fieldwork, making the review of natural history collections an essential alternative. Certainly, there are hundreds of unreviewed specimens deposited in other Ecuadorian and Colombian institutions, as well as in foreign collections. These materials could be sufficient for other researchers to carry out a systematic revision in search of rare species. Currently, some noteworthy records found in Ecuadorian mammal collections support this investment ([Rodríguez-Segovia and Montenegro-García 2024](#); [Vivas-Toro et al. 2024](#); [Rodríguez-Segovia et al. 2025](#)). However, we believe that both types of investments are essential

for analyzing the distribution of endangered species and for implementing conservation strategies ([IUCN 2012](#), [Camacho et al. 2018](#)).

The specimen QCAZ 7725 was reported as *S. magna* by a previous study, which stated that this was the highest known record for the species at 1,900 m; the prior maximum elevation was about 1,090 m ([Lee Jr et al. 2006](#)). Considering our findings, we hypothesize that many specimens occurring in evergreen montane forests on the eastern slopes of the Andes are likely being misidentified as *S. magna*. In this context, ecological niche modeling is highly recommended to better understand the past, present, and future distribution of *S. aratathomasi* in the Neotropics ([Molinari et al. 2023](#)). Based on available records, it is highly probable that *S. aratathomasi* occupies montane forest habitats along the western slopes of the Ecuadorian Andes. The Cayambe Coca National Park and Los Nevados National Natural Park are considered as priority areas for the conservation and research of this rare species. In these reserves, there are remnants of premontane to montane forest suitable for its survival ([MAE 2013](#)).

Acknowledgments

This paper would not have been possible without S. Estrada-Villegas (Departamento de Biología de la Universidad del Rosario), J. H. Castaño (Grupo de investigación en Biología de la Conservación y Biotecnología de la Corporación Universitaria de Santa Rosa de Cabal), H. Ramírez-Chávez (Museo de Historia Natural de la Universidad de Caldas), M. Rodríguez-Posada (Fundación Reserva Natural La Palmita Centro de Investigación), H. L. Arévalo and C. C. González (Universidad Nacional de Colombia), T. E. Lee Jr. (Abilene Christian University), J. Molinari (Universidad de los Andes), and N. Louzada (Federal University of Rio de Janeiro). They kindly provided specimens details, measures, photographs, papers, and genetic sequences. S. Burneo and M. Camacho (Museo de Zoología QCAZ at Pontificia Universidad Católica del Ecuador PUCE) allowed access to the collections and laboratories. E. Montalvo (Museo de la Escuela Politécnica Nacional, MEPN) allowed access to the institution's libraries. AL-P is indebted to D. Medina, J. Lopez, G. Nuñez, R. Farinango and the forest rangers of the Cayambe Coca National Park for the opening and guidance for the collection of the bat. K. Sayers (National Museum of Natural History) shared the photographic material of the holotype for the world of science. J. P. Carrera-E (Centro de Investigación para la Salud en América Latina, CISEAL) kindly reviewed the first version of this paper and enriched it with valuable comments. We are grateful to the Editor and anonymous reviewers for their thoughtful comments.

Literature cited

ALBERICO, M. S. 1987. Notes on distribution of some bats from Southwestern Colombia. *Fieldiana: Zoology* (N.S) 39:133-135.

- ALBUJA-V, L. 1999. Murciélagos del Ecuador (2da Ed). SENACYT y FUNDACYT, Escuela Politécnica Nacional, Cicetronic CIA Ltda Offset. Quito, Ecuador.
- ALFONSO, A., AND A. CADENA. 1994. Composición y estructura trófica de la comunidad de murciélagos del PRN Ucumarí. Pp. 361–377 in *Ucumarí: un caso típico de la diversidad biótica andina* (Rangel, E., ed.). CARDER. Pereira, Colombia.
- BEJARANO, D. A., AND A. YATE. 2003. Caracterización de la fauna quiróptera en un transecto establecido desde el valle del Magdalena hasta el páramo del Nevado del Tolima. Thesis. Universidad de Tolima. Ibagué, Colombia.
- BADLEY, ET AL. 2014. Assessing the Value of Natural History Collections and Addressing Issues Regarding Long-Term Growth and Care. *BioScience* 64: 1150–1158.
- BURNEO, S. F., AND D. G. TIRIRA. 2014. Murciélagos del Ecuador: un análisis de sus patrones de riqueza, distribución y aspectos de conservación. *Therya* 5:197–228.
- CAMACHO, M. A., ET AL. 2018. An accounting approach to calculate the financial value of a natural history collection of mammals in Ecuador. *Museum Management and Curatorship* 33:279–296.
- CARRERA, J. P. ET AL. 2010. Bats of the tropical lowlands of western Ecuador. *Special Publications, Museum of Texas Tech University* 57:1–37.
- CASTAÑO, J. H., ET AL. 2004. Murciélagos en agroecosistemas cafeteros de Colombia. *Chiroptera Neotropical* 10:196–199.
- CASTAÑO, J. H., ET AL. 2018. Diet and trophic structure in assemblages of montane frugivorous phyllostomid bats. *Acta Oecologica* 91:81–90.
- CUARTAS, C. 1997. Mamíferos, diversidad y ecología: Alto de San Miguel-Caldas, Antioquia. Convenio Instituto Mi Río-Universidad de Antioquia. Medellín, Colombia.
- DÍAZ, M. M., ET AL. 2021. Clave de Identificación de los Murciélagos Neotropicales. Publicación Especial N° 4, Programa de Conservación de los Murciélagos de Argentina (PCMA). Tucumán, Argentina.
- DUQUE-OSORIO, J. F., ET AL. 2017. Mamíferos: evolución y nomenclatura dental. *Revista Estomatología* 17:30–44.
- ESTRADA-VILLEGAS, S., ET AL. 2007. Nuevo reporte sobre la dieta de *Sturnira aratathomasi* y algunas notas sobre su distribución en Colombia. *Chiroptera Neotropical* 13:297–304.
- ERAZO, S. ET AL. 2022. Lineamientos éticos y procedimientos para el estudio y manejo de mamíferos silvestres en el Ecuador. Asociación Ecuatoriana de Mastozoología y Ministerio del Ambiente, Agua y Transición Ecológica del Ecuador. Quito, Ecuador.
- GARDNER, A. L. 2008. Genus *Sturnira* Gray, 1842. Pp. 363–376 in *Mammals of South America. Volume 1. Marsupials, Xenarthrans, Shrews, and Bats* (Gardner, A. L. ed.). University of Chicago Press, Chicago, Illinois, U. S. A.
- GAUDIOSO, P. J., ET AL. 2017. Morphology of the axial skeleton of seven bat genera (Chiroptera: Phyllostomidae). *Anais da Academia Brasileira de Ciências* 89:2341–2358.
- GLOBAL BIODIVERSITY INFORMATION FACILITY (GBIF). 2025. GBIF Occurrence Download (*Sturnira aratathomasi*). Available in: <https://doi.org/10.15468/dl.7rrgf2>. Accessed on June 26, 2025.
- JARRÍN-V, P., AND T. H. KUNZ. 2011. A new species of *Sturnira* (Chiroptera: Phyllostomidae) from the Choco forest of Ecuador. *Zootaxa* 2755:1–35.
- KUNZ, T. H., AND S. PARSONS. 2009. Ecological and behavioral methods for the study of bats (2nd Ed). The Johns Hopkins University Press. Baltimore, U.S.A.
- INTERNATIONAL UNION FOR CONSERVATION OF NATURE (IUCN). 2012. IUCN Red List categories and criteria: version 3.1, second edition. IUCN, Gland, Switzerland. Gland, Switzerland, and Cambridge, United Kingdom. Available in <https://portals.iucn.org/library/node/10315>. Accessed on 2025-02-12.
- LEE JR, T. E., ET AL. 2006. Report on a mammal survey of the Cosanga River Drainage, Ecuador. *Occasional Papers, Museum of Texas Tech University* 260:1–20.
- LOUZADA, N. S. V., AND L. M. PESSÔA. 2022. External and Skeletal Morphology of *Molossus fluminensis* Lataste, 1891 (Chiroptera, Molossidae) with Notes on Quadrupedal Locomotion and Habitat Use. *Acta Chiropterologica* 24:415–436.
- MARTÍNEZ-ARIAS, V. M. 2011. Taxonomía de *Sturnira lilium* y *Sturnira ludovici* (Chiroptera: Phyllostomidae) para Colombia. Thesis. Universidad de Antioquia, Facultad de Ciencias Exactas y Naturales, Instituto de Biología. Medellín, Colombia. Available in <https://bibliotecadigital.udea.edu.co/server/api/core/bitstreams/4346e448-23cf-49a4-a08f-76fc08288e7d/content>. Accessed on June 25, 2025.
- MINISTERIO DEL AMBIENTE DEL ECUADOR (MAE). 2013. Sistema de clasificación de los ecosistemas del Ecuador continental. Subsecretaría de Patrimonio Natural. Quito, Ecuador.
- MCCARTHY, T., ET AL. 2006. A new species of Chocoan *Sturnira* (Chiroptera: Phyllostomidae: Stenodermatinae) from western Ecuador and Colombia. *Annals of Carnegie Museum* 75:97–110.
- MCCARTHY, T., ET AL. 1991. Significant range extension of the giant Andean fruit bat, *Sturnira aratathomasi*. *The Texas Journal of Science* 43:437–438.
- MONTENEGRO, O., AND M. ESCOBEDO. 2004. Mammals. Pp. 80–87 in *Perú: Ampiyacu, Apayacu, Yaguas, Medio Putumayo. Rapid Biological Inventories Report 12* (Pitman, N., et al., eds.). The Field Museum. Chicago-Illinois, U. S. A.
- MOLINARI, J., AND D. LEW. 2015. Murciélago frugívoro gigante andino, *Sturnira aratathomasi*. P 58 in *Libro Rojo de la Fauna Venezolana Cuarta Edición* (Rodríguez, J. P., García-Rawlins, A. and Rojas-Suárez, F. eds.). Provita y Fundación Empresas Polar. Caracas, Venezuela. Available in https://www.provita.org.ve/wp-content/uploads/2022/09/Provita_Libro_Rojo_Fauna_Venezolana_4ed_Rodriguez-et-al-2015.pdf. Accessed on June 25, 2025.
- MOLINARI, J., ET AL. 2023. Systematics and biogeography of *Anoura cultrata* (Mammalia, Chiroptera, Phyllostomidae):

- a morphometric, niche modeling, and genetic perspective, with a taxonomic reappraisal of the genus. *Zootaxa* 5297:151-188
- MUÑOZ-ARANGO, J. 2001. Los murciélagos de Colombia: sistemática, distribución, descripción, historia natural y ecología. Editorial Universidad de Antioquia. Medellín, Colombia.
- OTÁLORA-ARDILA, A. 2004. Relación del gradiente interior-borde de fragmentos de bosque andino sobre la comunidad de murciélagos en Encino (Santander, Colombia). Thesis. Universidad Nacional de Colombia. Bogotá D. C. Colombia.
- PACHECO, V. R., AND P. HOCKING. 2006. Notably range extension of *Sturnira aratathomasi* Peterson and Tamsitt 1969 in Perú. *Acta Chiropterologica* 8:561-566.
- PETERSON, R. L., AND J. L. TAMSITT. 1968. A new species of bat of the genus *Sturnira* (Family Phyllostomatidae) from Northwestern South America. *Life Sciences Occasional Papers of the Royal Ontario Museum*, 12:1-8.
- R CORE TEAM. 2024. R: A Language and Environment for Statistical Computing. R Foundation for Statistical Computing. Viena, Austria. Available in <https://www.R-project.org/>. Accessed on December 24, 2024.
- RODRÍGUEZ-POSADA, M. E. 2010. Murciélagos de un bosque en los Andes centrales de Colombia con notas sobre su taxonomía y distribución. *Caldasia* 32:167-182.
- RODRÍGUEZ-SEGOVIA, M. A. 2022. New records of *Sturnira bakeri* in northwestern Ecuador: field notes about the species. *Therya Notes* 3:168-175.
- RODRÍGUEZ-SEGOVIA, M. A., AND F. MONTENEGRO-GARCÍA. 2024. Catalog of specimens deposited in the Laboratorio-Museo de Zoología Gustavo Orcés at Universidad Central del Ecuador, Quito, Ecuador. Part 1: Mammals. *Mammalia aequatorialis* 6:9-47.
- RODRÍGUEZ-SEGOVIA, M. A., ET AL. 2025. New records of *Sturnira koopmanhilli* (McCarthy, Albuja & Alberico, 2006) (Chiroptera, Phyllostomidae) from western and eastern Ecuador. *Check List* 21: 304-311
- RODRÍGUEZ-SEGOVIA, M. A AND A. L. PILATASIG. 2025. Gazetteer for *Sturnira aratathomasi*. Available in <https://doi.org/10.5281/zenodo.15986709>. Accessed on July 16, 2025.
- ROMER, A. S. 1966. *Vertebrate Paleontology* (Third Edition). The University of Chicago Press. Chicago and London.
- SIKES, R. S. 2016. Guidelines of the American Society of Mammalogists for the use of wild mammals in research and education. *Journal of Mammalogy* 97:663-688.
- ŠLENKER, M., ET AL. 2022. MorphoTools2 version 1.0.2.0. Available in <https://cran.r-project.org/web/packages/MorphoTools2/index.html>. Accessed on January 4, 2025.
- SOLARI, S., ET AL. 2001. Small mammal diversity from several montane forest localities (1300–2800 m) on the eastern slope of the Peruvian Andes. Pp. 262–264 in *Biological and social assessments of the Cordillera de Vilcabamba*, Peru (Alonso, E. A., A. Alonso, T. S. Schulenberg, and F. Dallmeier, eds.). RAP Working Papers 12 & SI/MAB Series 6. Conservation International. Washington D.C., U.S.A.
- SOLARI, S., ET AL. 2019. Family Phyllostomidae (New World Leaf-nosed Bats). Pp. 444–583 in *Handbook of the Mammals of the World, Volume 9: Bats* (Wilson, D. E., and R. A. Mittermeier, eds.). Lynx Edicions. Barcelona, Spain.
- SORIANO, P. J., AND J. MOLINARI. 1984. Hallazgo de *Sturnira aratathomasi* en Venezuela (Mammalia: Chiroptera) y descripción de su cariotipo. *Acta Científica Venezolana* 35:310-311.
- SORIANO, P. J., AND J. MOLINARI. 1987. *Sturnira aratathomasi*. *Mammalian species* 284:1-4.
- TAMSITT, J. R., ET AL. 1986. Records of bats (*Sturnira magna* and *Sturnira aratathomasi*) from Colombia. *Journal of Mammalogy* 67:754-757.
- THOMAS, M. E., AND D. N. McMURRAY. 1974. Observations on *Sturnira aratathomasi* from Colombia. *Journal of Mammalogy* 55:834-836.
- TIRIRA, D. G. 2021. Lista roja de los mamíferos del Ecuador, en: Libro rojo de los mamíferos del Ecuador (3ra edición). Asociación Ecuatoriana de Mastozoología, Fundación Mamíferos y Conservación, Pontificia Universidad Católica del Ecuador y Ministerio del Ambiente, Agua y Transición Ecológica del Ecuador. Publicación Especial sobre los mamíferos del Ecuador 13. Quito, Ecuador.
- VARGAS, C. A. ET AL. 2023. How to fill the biodiversity data gap: Is it better to invest in fieldwork or curation? *Plant Diversity* 46:39-48.
- VELAZCO, P. M., AND B. D. PATTERSON. 2013. Diversification of the Yellow-shouldered bats, Genus *Sturnira* (Chiroptera, Phyllostomidae), in the New World tropics. *Molecular Phylogenetics and Evolution* 68:683-698.
- VELAZCO, P. M., AND B. D. PATTERSON. 2014. Two new species of yellow-shouldered bats, genus *Sturnira* Gray, 1842 (Chiroptera, Phyllostomidae) from Costa Rica, Panama and western Ecuador. *ZooKeys* 402:43-66.
- VIVAS-TORO, I., ET AL. 2024. First record of *Cyttarops alecto* in Ecuador. *Therya Notes* 5:5-10.
- WALTON, D. W., AND G. M. WALTON. 1970. Post-Cranial Osteology of Bats. *Fondren Science Series* 1:93-126.
- YÁNEZ-FERNÁNDEZ, V., ET AL. 2023. On the Taxonomic Identity of *Sturnira nana* Gardner and O'Neil, 1971 (Chiroptera: Phyllostomidae), from Ecuador, with the description of a new species of *Sturnira*. *American Museum Novitates* 2023:1-27.

Associate editor: Beatriz del S. Bolívar Cimé

Submitted: January 31, 2025; Reviewed: July 23, 2025.

Accepted: July 28, 2025; Published on line: October 09, 2025

Appendix

Appendix 1. Gazetteer for *Sturnira aratathomasi*. Numbered localities (#), as shown in Figure 1, are listed in the first row of the following table. Further details are provided by Rodríguez-Segovia and Pilatasig (2025).

#	Type of Record	Localities	Specimen	Institution	Latitude	Longitude	Elevation	Reference
-	Unconfirmed record	Departamento de Loreto, Río Apayacu	Released individual	-	03° 07' 00" S	072° 42' 00" W	120 - 250	Montenegro and Escobedo (2004)
-	Literature	Unknown locality	IRSNB 237/3267 ♂	Institut Royal des Sciences Naturelles de Belgique	-	-	-	Peterson and Tamsitt (1968)
-	Literature	Unknown locality	IRSNB 237/3267 / ROM 46349 ♀	Institut Royal des Sciences Naturelles de Belgique/Royal Ontario Museum	-	-	-	Peterson and Tamsitt (1968)
1	Literature	Department of Valle, Colombia, 2 km south of Pance (approximately 20 km southwest of Cali) (Type Locality)	TU 635/USNM 395158 ♂ Holotype	Universidad del Valle-Tulane/ United States National Museum	03° 21' 00" N	076° 38' 00" W	1,650	Peterson and Tamsitt (1968)
2	Literature	Departamento del Valle, dense forest over 10kms southwest of Felidia, over a small Stream (Río Felidia)	USNM 501064 ♀	United States National Museum	03° 27' 32.2" N	076° 38' 32.9" W	1,800	Thomas and McMurray (1974)
3	Literature	Departamento del Valle, 15 km southwest of Cali, near Peñas Blancas (Río Pichindé)	ROM 70874 ♀, ROM 70875 ♂, ROM 70876 ♂	Royal Ontario Museum	03° 25' 57.5" N	076° 38' 54.9" W	1,800	Thomas and McMurray (1974)
			USNM 501066 ♀, USNM 501065 ♂	United States National Museum	03° 25' 57.5" N	076° 38' 54.9" W	1,800	Thomas and McMurray (1974)
4	Literature	Merida, Monte Zerpa, 4 km NW of Merida	CVULA-I-1303 ♂	Colección de Vertebrados de la Universidad de los Andes	08° 37' 00" N	071° 09' 00" W	2,000	Soriano and Molinari (1984, 1987)
5	Literature	Departamento del Huila, El Parque Nacional Natural de la Cueva de Los Guácharos	INDERENA / IAVH 2298 ♀	Instituto de Desarrollo de los Recursos Naturales Renovables y del Ambiente/ Instituto de investigación de recursos biológicos Alexander von Humboldt	01° 36' 00" N	075° 56' 00" W	1,800	Tamsitt et al. (1986)
6	Literature	Department of Cauca, Municipality of Pérez (Belalcázar), near Irlanda, Parque Nacional Natural Nevado de Huila	ICN ♂	Instituto de Ciencias Naturales, Universidad Nacional de Colombia	02° 54' 00" N	076° 06' 00" W	2,820	Tamsitt et al. (1986)
7	Literature	Departamento del Valle del Cauca, Hacienda Los Alpes, 6 km S, 11 km E of Florida	UV 3482 ♀	Universidad del Valle	03° 16' 00" N	076° 09' 00" W	2,400	Alberico (1987)
8	Literature	Departamento del Valle del Cauca, Cordillera Occidental: Betania, 10 km N, 15 km W Bolivar	UV 3876 ♀	Universidad del Valle	04° 26' 00" N	076° 19' 00" W	1,800	Alberico (1987)
9	Literature	Departamento del Valle del Cauca, Parque Nacional "Los Farallones de Cali", 1 km S, 1 6 km W Cali,	UV 3373 ♀	Universidad del Valle	03° 22' 00" N	076° 41' 00" W	2,600	Alberico (1987)
10	Literature	Departamento del Valle del Cauca, Paso de Galapagos, 8 km N and 4 km E of El Cairo	UV 4131 ♂, UV 4133 ♂	Universidad del Valle	04° 50' 00" N	076° 12' 00" W	1,800	Alberico (1987)
11	Literature	Departamento de Amazonas, Cordillera Colán, east of La Peca	LSUMZ 21484 ♂	Museum of Zoology Louisiana State University	05° 34' 00" S	078° 17' 00" W	3,165	McCarthy et al. (1991)
12	Literature	Departamento de Risaralda, Parque Regional Natural Ucumari	-	-	04° 47' 00" N	075° 32' 00" W	2,100	Alfonso and Cadena (1994)
13	Literature	Departamento de Antioquia, Municipio de Caldas, Monte San Miguel	-	-	06° 04' 00" N	075° 37' 00" W	1,950 – 2,700	Cuatras (1997)
14	Literature	Antioquia, Anorí	-	-	07° 05' 00" N	075° 08' 00" W	1,535	Muñoz-Arango (2001)
15	Literature	Departamento de San Martín, ca. 32 km NE de Patáz, Las Palmas, Parque Nacional del Río Abiseo	MUSM 7305 ♂, MUSM 7306 unknown sex	Museo de Historia Natural, Universidad Nacional Mayor de San Marcos	07° 34' 12.65" S	077° 17' 50.64" W	2,000 - 2,100	Solari et al. (2001) , Pacheco and Hocking (2006)
16	Literature	Departamento de Caldas, Municipio de Manizales, Recinto el Pensamiento	MHNUC 312 ♀	Museo de Historia Natural, Universidad de Caldas	05° 02' 00" N	075° 26' 00" W	2,180	Castaño et al. (2004)
17	Literature	Departamento de Tolima, Municipio de Ibagué, Sito las Juantas	-	-	04° 33' 00" N	075° 19' 00" W	1,900	Bejarano and Yate (2003)
18	Literature	Departamento de Tolima, Municipio de Ibagué, Sito El Filtro	-	-	04° 36' 00" N	075° 22' 00" W	2,950	Bejarano and Yate (2003)

#	Type of Record	Localities	Specimen	Institution	Latitude	Longitude	Elevation	Reference
19	Literature	Departamento de Santander, Municipio El Encino, Finca La Desdichada	-	-	06° 10' 00" N	073° 08' 00" W	2,000	Otálora-Ardila (2004)
20	Literature	Department of Apurímac, Cconoc, at the border of the Río Apurímac	MUSM 19151 ♂, MUSM 19152 ♂, MUSM 19153 ♀	Museo de Historia Natural, Universidad Nacional Mayor de San Marcos	13° 32' 47" N	072° 38' 39" W	1,925	Pacheco and Hocking (2006)
21	Literature	Departamento de Risaralda, Municipio de Pereira, Santuario de Fauna y Flora Otún Quimbaya	MUJ 1111 ♂, MUJ 1117 ♂, MUJ 1128 ♂	Museo de Historia Natural de la Pontificia Universidad Javeriana	04° 45' 00" N	075° 46' 00" W	2,100	Estrada-Villegas et al. (2007)
			Released/ Measured individuals (n = 2)	-	04° 45' 00" N	075° 46' 00" W	2,100	Estrada-Villegas et al. (2007)
22	Literature	Departamento de Caldas, ciudad de Manizales, vereda Las Palomas, Reserva Hidrográfica Río Blanco, Fundación Ecológica Gabriel Arango Restrepo, estación Viveros	ICN 16988 ♀, ICN 16989 ♀, ICN 16990 ♀	Instituto de Ciencias Naturales, Universidad Nacional de Colombia	05° 04' 00" N	075° 32' 00" W	2,500	Rodríguez-Posada (2010)
23	Literature	Departamento de Valle del Cauca, Quebrada Charco Azul, approx. 5 km E Alto de Galápagos, El Cairo	FMNH 189778 ♂	Field Museum of Natural History	04° 48' 00" N	076° 12' 00" W	1,800	Velazco and Patterson (2013)
24	New Record	Department of Tolima, Municipality of Cajamarca, La Colosa, Quebrada La Colosa	MHNUC 1954 unknown sex	Museo de Historia Natural, Universidad de Caldas	04° 23' 13.9" N	075° 29' 02" W	2,309	Present Study
25	New Record	Department of Tolima, Municipality of Ibagué, Corregimiento Juntas	MHNUC 1408 ♀	Museo de Historia Natural, Universidad de Caldas	04° 36' 56.4" N	075° 20' 11.1" W	2,648	Present Study
26	New Record	Napo, El Chaco, Santa Rosa, Cayambe Coca National Park, Salado, Guataringo, Bridge of the Gringo River	QCAZ 19838 ♀	Museo de Zoología QCAZ de la Pontificia Universidad Católica del Ecuador	00° 11' 20.6" S	077° 42' 20.5" W	1,301	Present Study
27	New Record	Napo, 12 km NW Cosanga	QCAZ 7725 ♀	Museo de Zoología QCAZ de la Pontificia Universidad Católica del Ecuador	00° 31' 42" S	077° 52' 59.4" W	1,900	Present Study