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NOTES ON GEOGRAPHIC DISTRIBUTION

First record of *Nyctinomops mbopicuare* Barquez, Tomasco, Sánchez, Boero & Díaz, 2023 (Chiroptera, Molossidae) from Paraguay and range extension in South America

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Abstract. We report the first records of *Nyctinomops mbopicuare* Barquez, Tomasco, Sánchez, Boero & Díaz, 2023 (Chiroptera, Molossidae) from Paraguay at two localities: a roost in the historic San Buenaventura Church (Yaguarón, Paraguarí Department) and an urban site in Asunción (Central Department). A colony of approximately 100 individuals was detected in the church roof; one adult was collected and deposited in the CZCEN. A second individual was recorded inside a private residence. These records extend the known distribution by 278 km to the northeast and increase the number of bat species recorded from Paraguay to 61.

Keywords. Biodiversity surveys, museum collections, Neotropical region, roosts, species occurrence, urban ecology

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Introduction

Knowledge of bat diversity in Paraguay has increased considerably in recent decades (López-González 2005), largely due to the development of research and conservation initiatives, particularly those led by the Programa de Conservación de Murciélagos del Paraguay. This progress is also driven by the incorporation of complementary survey methods such as mist-netting and acoustic monitoring (MacSwiney et al. 2008), alongside the revision of specimens deposited in scientific collections and roost searches. These efforts have improved species inventories (Novaes et al. 2025), expanded known distributions (Torres and Owen 2023; González de Weston et al. 2024; Smith et al. 2024), and enhanced understanding of bat assemblages in the country. However, important gaps persist for certain species and areas.

Bats of the family Molossidae comprise a diverse group of insectivorous species widely distributed across tropical and subtropical regions. They are adapted to fast flight in open spaces and typically

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use elevated roosts in natural cavities or human-made structures (Kunz and Lumsden 2003; Gardner 2007). The limited efficiency of conventional sampling techniques, such as mist nets, combined with the high-altitude flight behaviour of many molossid species, often leads to their underrepresentation in biodiversity inventories, hindering an accurate understanding of their distribution (MacSwiney et al. 2008; Barquez et al. 2025). In Paraguay, information on molossid species remains limited due to a lack of studies focused on roosts or acoustic monitoring, and the distribution of several species within this family likely remains incompletely documented.

This knowledge gap persists despite important recent advances in taxonomy and systematics, particularly those driven by molecular approaches, which have revealed previously unrecognized diversity, such as the description of the cryptic species *Myotis guarani* Novaes, Cláudio, Bertocchi, Oliveira, Semedo, Saldanha, Wilson & Moratelli, 2025, from Chaco, Pantanal, and Cerrado environments, including populations from Paraguay (Novaes et al. 2025). Nevertheless, these advances have been uneven across taxonomic groups, and molossid bats remain comparatively underrepresented in available data; this is even though some species have a distribution close to the Paraguay border (e.g. *Molossops neglectus* Williams & Genoways, 1980 and *Nyctinomops mbopicuare* Barquez, Tomasco, Sánchez, Boero & Díaz, 2023.

The genus *Nyctinomops* Miller, 1902, within the family Molossidae, includes large-bodied bats endemic to the Americas, with a distribution ranging from Canada to Argentina and including several Caribbean islands (Barquez et al. 2023). Until recently, four species were recognized— *N. laticaudatus* (É. Geoffroy St.-Hilaire, 1805), *N. macrotis* (Gray, 1839), *N. femorosaccus* (Merriam, 1899), and *N. aurispinosus* (Peale, 1848) (Díaz et al. 2021; Barquez et al. 2023); however, a fifth species, *N. mbopicuare*, was described from Misiones Province, Argentina, based on morphological, morphometric, and molecular evidence. At the time of its description, the species was known only from its type locality in the Upper Paraná Atlantic Forest. The specific epithet "mbopicuare", derived from the Guaraní language, means "bat of the cave," reflecting this initial observation. Despite the geographic proximity of this record, no occurrences of this species had been documented for Paraguay.

Here, we report the first records of *N. mbopicuare* from Paraguay and extend this species' known distribution 278 km to the northeast from the type locality, previously the only confirmed record of the species. This finding increases the number of bat species recorded for the country to 61. Additionally, we provide new information on the roosting habits of *N. mbopicuare*.

Methods

Field observations and specimen collection were conducted in Paraguay during February 2026. The first record was obtained during an inspection of the San Buenaventura Church in Yaguarón (Paraguarí Department) (Figure 1A, B) carried out as part of the building's restoration. A single bat colony of approximately 100 individuals was observed roosting inside cavities within the roof structure. All individuals appeared to represent the same species based on external morphology. One adult individual was captured by hand for systematic identification, for photographing, and to be preserved as a voucher specimen. This voucher specimen was deposited in the Colección Zoológica de la Facultad de Ciencias Exactas y Naturales, Universidad Nacional de Asunción (CZCEN). The second record was an opportunistic observation in an urban area of Asunción, the capital city of Paraguay (Figure 1C), where an individual was found inside a private residence, reported by the homeowner, examined by MADES personnel, and subsequently released at the site of capture. Maps were produced using QGIS v. 3.28.13 (QGIS Development Team 2023). Species identification was based on external morphological characters and morphometric measurements, following the identification key provided by Barquez et al. (2025) and the original species description (Barquez et al. 2023).

All sampling procedures, handling, and specimen collection were conducted under the scientific collecting permit no. 003/2026 issued by the Ministerio del Ambiente y Desarrollo Sostenible. During fieldwork, the Biosecurity Protocol established by the Red Latinoamericana y del Caribe para la Conservación de los Murciélagos was followed (Suárez-Álvarez and López-Berrizbeitia 2020). All procedures involving animals were conducted in accordance with the guidelines of the American Society of Mammalogists for the use of wild mammals in research and education (Sikes et al. 2016).

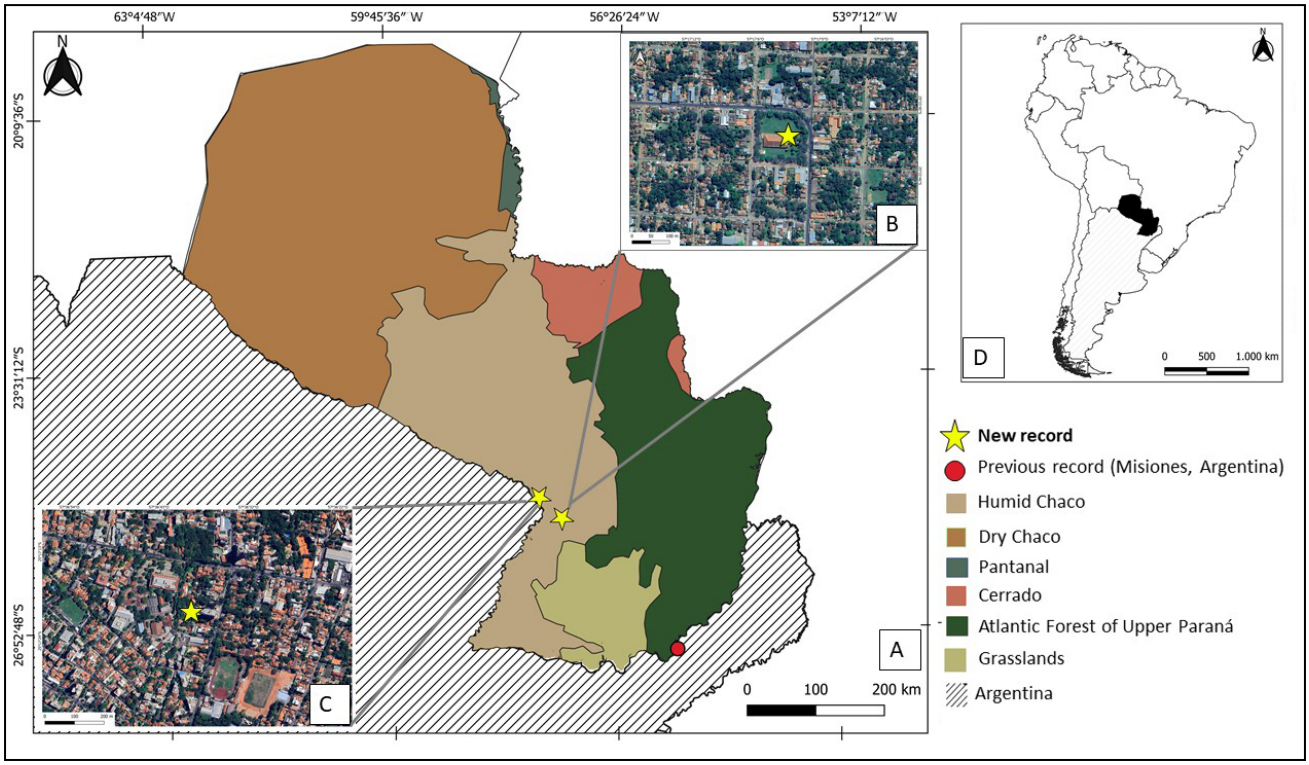

Figure 1. Geographic distribution of *Nyctinomops mbopicuare*. **A.** Map of Paraguay with ecoregions showing new records from Asunción and Yaguarón (yellow stars) and the previously known record from Argentina (red circle). **B.** Detailed view of the sampling site in Yaguarón. **C.** Detailed view of the urban sampling site in Asunción. **D.** Location of Paraguay within South America.

Results

***Nyctinomops mbopicuare* Barquez, Tomasco, Sánchez, Boero & Díaz, 2023**
Figure 2

New records. PARAGUAY — Paraguarí Department • Yaguarón, San Buenaventura Church; 25°33′ 43.38″S, 057°17′02.71″W; 118 m elev.; 11.II.2026; Gloria González de Weston, Karen Chávez-Duré, Elías Marín leg.; roost in roof cavities of colonial building; 1 ♀ adult, CZCEN-M0276 — Central Department • Asunción, residential neighbourhood; 25°17′20.66″S, 057°36′38.65″W; 119 m elev.; 18.III.2026; Mariel Moreno obs.; individual found inside private residence; 1 ♂ adult.

Identification. Identification was based on the evaluation of external and cranial morphological characters following available descriptions for species of the genus *Nyctinomops*; this genus is characterized by having an upper lip with deep folds, ears joined at their bases, the second phalange of the fourth digit shorter than 5 mm, the skull with elongated rostrum, upper incisors long, narrow, and parallel (Figure 2C, D) (Barquez et al. 2023, 2025). The specimen exhibits diagnostic traits consistent with *N. mbopicuare*, including a medium-sized body for the genus (forearm length 45.0–47.5 mm in the type series); long ears joined at the base; long, narrow wings adapted for fast flight in open spaces; and reddish-brown, tricoloured dorsal pelage (Table 1) (Barquez et al. 2023, 2025).

Importantly, *N. laticaudatus*, which overlaps with *N. mbopicuare* in size and general morphology, can be distinguished by several key diagnostic characters. *Nyctinomops laticaudatus* typically exhibits a darker brown dorsal colouration, with weakly bicoloured hairs, whereas *N. mbopicuare* shows a characteristic reddish-brown colouration, with distinctly tricoloured hairs. In addition, cranial morphology provides further separation between these species, particularly in the development of mandibular processes and the configuration of the rostrum and dentition (Barquez et al. 2023, 2025). These differences support the identification of the Paraguayan material as *N. mbopicuare* and minimize confusion with *N. laticaudatus*.

External measurements of the voucher specimen are: total length, 111 mm; tail length, 47 mm; forearm length, 46 mm; ear length, 17 mm; hindfoot length, 8 mm; body mass, 14 g.

The roost in Yaguarón was 12 m above the ground level inside the San Buenaventura Church, an 18th-century colonial building associated with Franciscan missions. The roof structure, composed

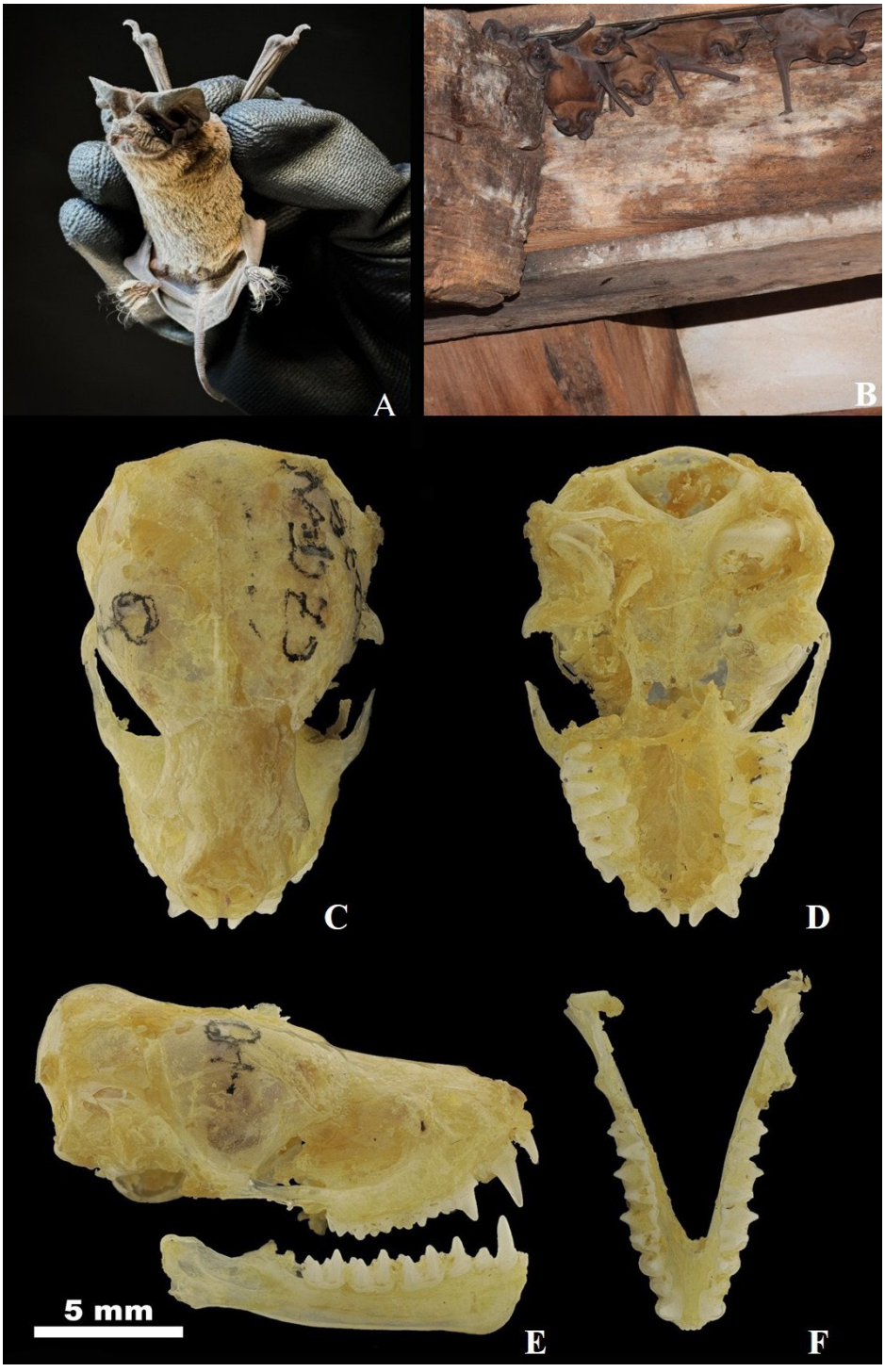

Figure 2. *Nyctinomops mbopicuare* [CZCEN-M0276]. **A.** Adult individual from Yaguarón (Paraguarí Department). **B.** Day roost used by the colony in the wooden structure of San Buenaventura Church, Yaguarón, Paraguarí Department, Paraguay. **C.** dorsal view of cranium. **D.** ventral view of cranium. **E.** lateral view of the skull and mandible. **F.** dorsal view of mandible. Scale bar: 5 mm.

Table 1. External and cranial measurements of *Nyctinomops mbopicuare* from Paraguay compared with *N. mbopicuare* and *N. laticaudatus* from Barquez et al. (2023) (in mm unless otherwise indicated).

	N. mbopicuare		*N. laticaudatus*
	In this study [CZCEN-M0276]*	**Barquez et al. (2023)**	**Barquez et al. (2023)**
Total length	111.0	108.0–110.0	107.0–110.0
Tail length	47.0	55.0	43.0–48.0
Hind foot length	8.0	7.90–8.50	7.8–8.0
Ear length	17.0	18.0	18.4–21.0
Forearm length	46.0	45.0–47.5	43.1–45.1
Body mass (g)	14.0	12.0–16.0	11.0–12.5
Greatest length of skull	17.0	18.7–18.8	18.0–18.5

* Voucher specimen from Yaguarón, San Buenaventura Church, Paraguarí Department, Paraguay.

mainly of wooden beams and elements, contains cavities and spaces used by bats as a diurnal roosting site. During the inspection, colony size was visually estimated at approximately 100 individuals. Bats were occupying spaces between beams and other structural components (Figure 2B).

In Asunción, an individual was recorded inside a residential building, where it was found on the floor of a terrace by the homeowner and subsequently delivered to the Ministerio del Ambiente y Desarrollo Sostenible. The specimen was received by ministry personnel, who documented it through photographic records and performed taxonomic identification based on external morphological measurements. After the measurements were taken, the individual was released at the site of capture. Both records indicate that *N. mbopicuare* uses human constructions as roosting sites, including large historic buildings and smaller residential structures in urban environments.

The comparison of the Paraguayan material with the original species description is particularly relevant given that *N. mbopicuare* is a recently described species that remains poorly represented in scientific collections.

The record of *N. mbopicuare* in Paraguay extends the known distribution of the species in southern South America by 278 km to the northeast. This species was only recently described and, until now, had been recorded exclusively in Argentina. The present record therefore represents the first occurrence outside its type locality and the first record for the Humid Chaco ecoregion, suggesting that its distribution may be broader than currently documented.

Discussion

The Mammal Diversity Database (https://www.mammaldiversity.org/) currently lists Argentina as the only country with confirmed records for *Nyctinomops mbopicuare*. However, recent regional syntheses have suggested its potential occurrence in Brazil based on geographic proximity and biogeographic continuity (Garbino et al. 2024). In this context, the records presented here represent the first confirmed occurrence of *N. mbopicuare* in Paraguay, increasing the number of bat species recorded for the country to 61, and constitute a significant extension of its known distribution. The records presented here reveal important gaps in the occurrence of molossid bats in the region and reinforce the need for integrative sampling approaches, including roost surveys and acoustic monitoring, to enhance species detection. These findings suggest that the species likely has a broader distribution than currently documented and that its apparent rarity may be partly due to detection limitations.

Beyond their value for biodiversity conservation, these roosts are particularly relevant in the context of architectural restoration, as interventions in historic buildings may affect bat colonies that have occupied these sites over long periods. Documenting bat colonies in heritage structures is therefore essential for promoting management strategies that reconcile cultural heritage conservation with wildlife protection. The use of both a historical building and a residential structure as roosting sites emphasizes the relevance of anthropogenic environments for the species and underscores the importance of integrating bat conservation into urban and heritage management contexts.

From a biogeographic perspective, the species was previously restricted to the Atlantic Forest of the Upper Paraná ecoregion, whereas the new records reported here extend its occurrence to the Humid Chaco ecoregion, following the ecoregional classification of Clay et al. (2005). These records support a pattern of distribution between northeastern Argentina and eastern Paraguay, a plausible scenario given regional proximity and the limited number of studies conducted in the country. Thus, the absence of prior records in Paraguay likely reflects a sampling gap rather than true absence. This finding also highlights the need to re-examine specimens previously assigned to *N. laticaudatus*, as well as to intensify targeted surveys in roosts and complementary sampling in the Atlantic Forest and other ecoregions of the country.

The incorporation of a voucher specimen from Paraguay deposited in CZCEN therefore represents an important taxonomic contribution, providing material support for the range extension and strengthening the reliability of the identification.

Continued sampling in previously unexplored areas of Paraguay is likely to yield additional records and contribute to ongoing systematic knowledge. At a broader scale, further research will be essential to elucidate the distribution, ecological characteristics, and conservation status of *N. mbopicuare* across southern South America. In this context, a critical reassessment of specimens deposited in scientific collections is necessary, as individuals of this species have likely been historically misidentified as *N. laticaudatus*, resulting in an incomplete understanding of its distributional range. These findings also highlight the need to increase bat inventory and monitoring efforts in Paraguay, particularly through

the integration of complementary approaches such as roost inspections, acoustic monitoring, and targeted sampling, to improve knowledge of the diversity and distribution of poorly detected groups such as molossids.

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Additional information

Conflict of interest

The authors declare that no competing interests exist.

Ethical statement

No ethical statement is reported.

Use of artificial intelligence (AI)

The authors accept full responsibility for the content of the manuscript, including the disclosure of any use of AI. No AI tools were used in the preparation of this manuscript.

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Author contributions

Conceptualization: GGW, KCH, MMD. Data curation: GGW, KCH, EFMR, MNMB. Formal analysis: GGW, KCH, MNMB. Funding acquisition: MJDG. Investigation: GGW, KCH, EFMR, MJDG. Methodology: GGW, KCH, EFMR. Resources: GGW, KCH, EFMR, MJDG, MNMB. Supervision: MMD. Visualization: GGW, KCH. Project administration: GGW, MJDG. Validation: MMD. Writing – original draft: GGW, KCH. Writing – review and editing: GGW, KCH, EFMR, MBBC, MET, MJDG, MNMB, MMD

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Data availability

All data that support the findings of this study are available in the main text.

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