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NOTES ON GEOGRAPHIC DISTRIBUTION

New insights into the distribution of *Myotis riparius* Handley, 1960 (Mammalia, Chiroptera) in northern Central America: first records for Guatemala, Belize, and El Salvador

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Abstract. We provide new records of *Myotis riparius* Handley, 1960, expanding its known range in northern Central America. These include the first confirmed records for Guatemala, Belize, and El Salvador, as well as new localities in Honduras and Nicaragua. An individual was collected in Bocas del Polochic Wildlife Refuge, Izabal, Guatemala. Acoustic vouchers confirm its presence in the Maya Mountains of Belize and Ahuachapán and Sonsonate, El Salvador. This finding highlights the importance of combining capture and acoustic sampling, and reanalyzing archived recordings as new vocal signatures are validated.

Key words. Bioacoustics, geographic distribution, range extension, Vespertilionidae

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INTRODUCTION

The genus *Myotis* Kaup, 1829, is among the most species-rich mammalian genera, comprising over 140 recognized species worldwide (Moratelli et al. 2019b; MDD 2025; Simmons and Cirranello 2025). In the Neotropics, the genus exhibits both high species richness and remarkable diversification, including numerous endemic taxa (Carrión-Bonilla et al. 2024; Moratelli and Wilson 2011, 2014; Moratelli et al. 2011, 2013, 2016, 2017, 2019a, 2019b; Novaes et al. 2021, 2022a, 2022b, 2023, 2024). In Central America, *Myotis* is the most diverse bat genus, with 14 recognized species documented to date (Owen and Girón 2012; Martínez-Fonseca et al. 2020; Turcios-Casco et al. 2020; Ramírez-Fernández et al. 2023; Trujillo et al. 2024; Simmons and Cirranello 2025).

Central America encompasses a wide range of ecological and elevational gradients, supporting a high diversity of *Myotis* throughout the region. Guatemala harbors the highest richness, with 11 species, including the endemic *M. cobanensis* Goodwin, 1955, and several North American taxa that reach their southernmost limits in the country (Kraker-Castañeda et al. 2016; Trujillo et al. 2024). Panama and Costa Rica each host seven species, while Honduras supports six, Nicaragua five, El Salvador four, and Belize only two (Owen and Girón 2012; Martínez-Fonseca et al. 2020; Miller 2003b, 2009; Turcios-Casco et al. 2020; Simmons and Cirranello 2025).

Among the species reported in Central America is the Riparian Myotis, *Myotis riparius* Handley, 1960, a widely distributed Neotropical bat ranging from Olancho, Honduras to Buenos Aires, Argentina. This broad latitudinal range reflects its remarkable ecological plasticity, as the species occurs in habitats from lowland and montane forests to savannas and even human-modified environments such as agricultural fields and pastures (Barquez et al. 2011). Although *M. riparius* is known from sea level to about 2,000 m in elevation, most records come from lowland areas (Reid 2009; Barquez et al. 2016; Novaes et al. 2017). Despite this extensive distribution, the species had not previously been confirmed for Guatemala, Belize, or El Salvador,

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underscoring the existence of significant gaps in the distributional and taxonomic knowledge of the genus in northern Central America.

Although *M. riparius* remains poorly documented in northern Central America, recent discoveries from South America, such as the range extension reported by Bocchiglieri and Bezerra (2018) in the Atlantic Forest of northeastern Brazil, continue to refine the species' known distribution and underscore its remarkable ecological plasticity across the Neotropics. Species distribution models indicate that *M. riparius* is primarily associated with forested habitats and reveal pronounced discontinuities among populations across South American ecoregions. This spatial separation suggests that the species once formed a widespread, panmictic metapopulation that fragmented during the Middle Pleistocene, likely in response to climate-driven environmental shifts (Novaes et al. 2023). The recognition of at least four allopatric or parapatric cryptic evolutionary units further raises the possibility that Mesoamerican populations represent distinct lineages from those in South America (Novaes et al. 2023).

To address existing distributional and taxonomic gaps, we present the first confirmed record of *M. riparius*, in Guatemala, based on a collected specimen from the Bocas del Polochic Wildlife Refuge. We also report the first verified records for Belize and El Salvador, supported by acoustic vouchers from the southern V.a Mountains and the departments of Ahuachapán and Sonsonate, respectively. In addition, we provide new acoustic detections from Honduras and Nicaragua, extending the known distribution of *M. riparius* beyond previously documented localities (GBIF 2025). Collectively, these records clarify the northern limits of the species and underscore the importance of integrating acoustic monitoring into regional assessments of Myotis diversity, particularly in under-sampled areas (O'Farrell and Gannon 1999).

METHODS

Field records were obtained in the Reserva Natural Privada Selempim within the Refugio de Vida Silvestre Bocas del Polochic, Izabal, Guatemala,, an area of humid tropical forest located along the transition between lowland Caribbean floodplains and premontane slopes (Fundación Defensores de la Naturaleza 2003; IARNA-URL 2018). In Belize, acoustic vouchers confirmed the presence of the species in the Maya Mountains, a region characterized by extensive evergreen and submontane forests at elevations ranging from 200 to 800 m (Meerman and Sabido 2001). In El Salvador, detections were concentrated in the departments of Ahuachapán and Sonsonate, where remnant moist forests and riparian corridors persist within a mosaic of agricultural landscapes (Komar 2002).

We compiled records from independent survey efforts in each country, including mist-netting in Guatemala and acoustic surveys in Belize, El Salvador, Honduras, and Nicaragua. In Guatemala, bats were captured using four mist nets of 12 m in length, set at ground level along natural flyways such as forest trails and water bodies, following the methodology described by Kunz and Parsons (2009). Nets were opened shortly before sunset (approximately 17:30 h) and remained open for approximately 5 h. For each captured individual, morphometric data were recorded, including head and body length (HB), forearm length (FA), ear length (E), tail length (T), hindfoot length (HF), and body mass (Wt). Species identification was conducted in the field using diagnostic characters from Reid (2009), Medellín et al. (2008), and York et al. (2019), and followed current taxonomic criteria (Simmons and Cirranello 2025). All procedures adhered to the ethical guidelines of the American Society of Mammalogists (Sikes et al. 2016). The voucher specimen, comprising skin, skull, tissue, and photographic records, was deposited in the Mammal Collection of the Universidad de San Carlos de Guatemala (USAC). Specimen collection was conducted under permits issued by the Consejo Nacional de Áreas Protegidas (CONAP), as co-administrators of the protected area (Government Decree No. 93-93).

Additionally, we conducted a comprehensive reassessment of archived acoustic voucher records in northern Central America to evaluate its potential occurrence within the species' northern range. The analysis was performed using the Acoustic Data Management System (ADMS), a relational database with custom-built modules for managing and analyzing more than two million bat call records collected between 1995 and 2025 across the Neotropics, with extensive coverage in Central America. The dataset was queried for verified *M. riparius* calls, files initially identified as sonospecies, and "Myotis-like" sequences overlapping with the diagnostic characteristic frequency (Fc) of the dominant harmonic. Among the parameters used for species identification, the Fc of the dominant harmonic proved especially diagnostic, remaining consistent across full-spectrum and zero-crossing recordings and unaffected by recording amplitude or analytical configuration (Miller and Corben 2020; Corben 2025). To distinguish *M. riparius* from other *Myotis* species occurring in northern Central America, verified call parameters were compiled and compared in R (R Core Team 2025) to visualize diagnostic variation. A species-specific Anabat filter was developed using frequency, temporal, and slope parameters, as well as the proportion of maximum frequency to characteristic frequency (PMC), to exclude calls from species with partially overlapping frequency ranges (Corben 2022).

The filter was applied to more than 1.5 million archived recordings, yielding approximately 6,000 candidate files for manual review in AnalookW (v. 4.7.w; Corben 2025). Because multiple species can occur within

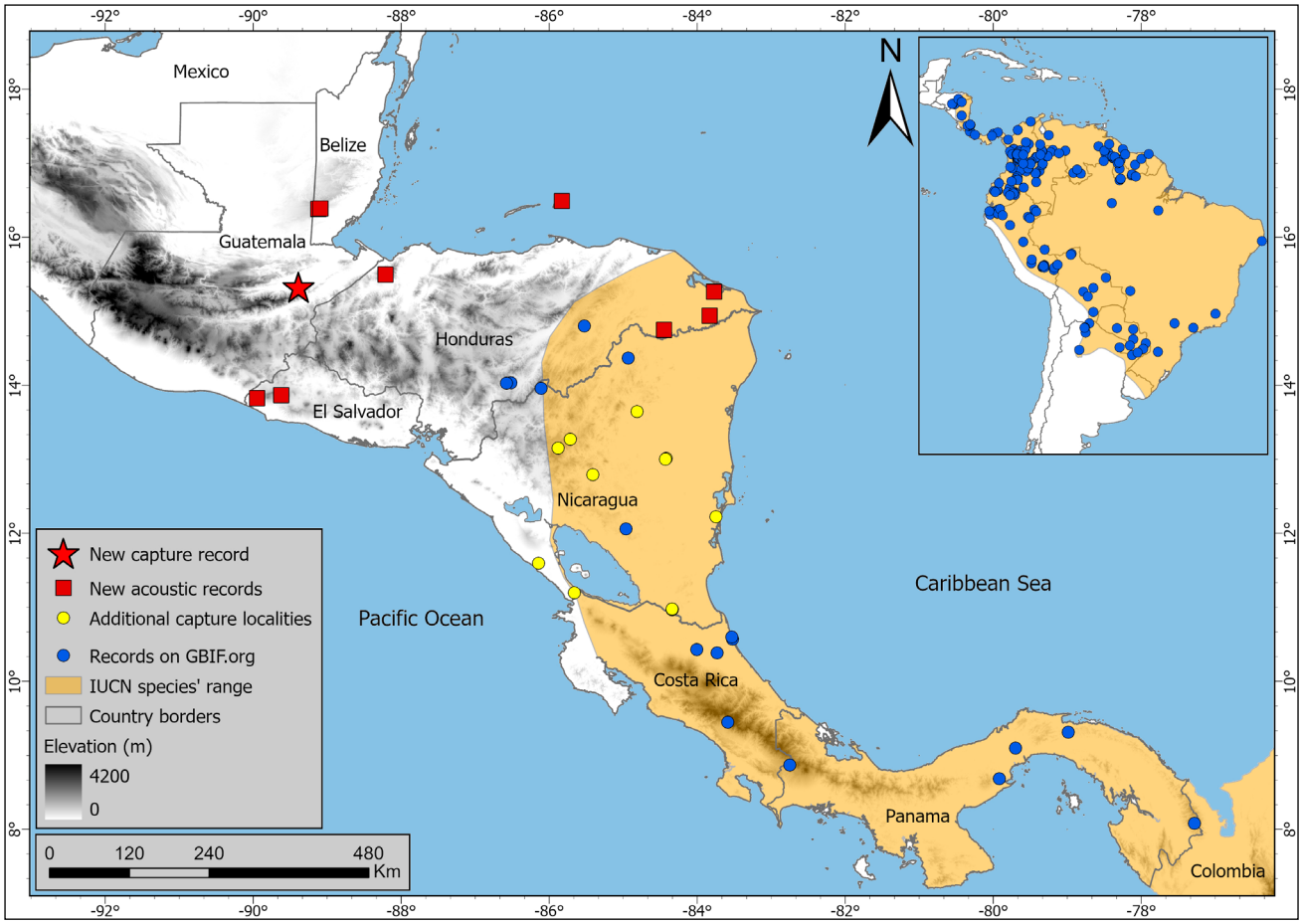

Figure 1. Updated distribution of *Myotis riparius* based on GBIF records ($n = 1,803$) and new confirmed localities in Guatemala, Belize, El Salvador, and Honduras. The newly documented records represent significant range extensions beyond previously verified occurrences.

a single 15-second call sequence, all flagged files were manually verified using split-screen comparisons with confirmed *M. riparius* vouchers. Sequences matching the diagnostic acoustic profile were updated to "Myorip" in the metadata, while uncertain or fragmentary files were reassigned or left unclassified. Verified records were georeferenced and exported as point shapefiles in ArcGIS Pro (v. 3.5.3; Esri Inc. 2025) for spatial analysis. Visualization of these data revealed numerous verified acoustic records beyond the previously recognized range of *M. riparius*, prompting a reassessment of its distributional limits in northern Central America.

A distribution map for *M. riparius* was generated using the species range provided by the International Union for Conservation of Nature (Barquez et al. 2016) as a base layer. Occurrence data available in the Global Biodiversity Information Facility (GBIF 2025) were used for reference; of the 1,803 records listed globally, only six were located within the northern portion of the range, corresponding to two localities in Honduras and four in Nicaragua (GBIF 2025). To complement this limited representation, we incorporated additional confirmed records from Nicaragua (Martínez-Fonseca et al. 2020). All occurrence data were compiled and mapped in ArcGIS Pro v. 3.5.3 to visualize the updated northern distribution of the species (Figure 1).

RESULTS

***Myotis riparius* Handley, 1960**

Figure 2

New records. GUATEMALA — Izabal • El Estor, Reserva Natural Privada Selempim, Refugio de Vida Silvestre Bocas del Polochic; 15.3244, –089.3867; 33 m elev.; 10.XII.2024; Luis A. Trujillo leg.; mist net set along a forest path in a small fragment of lowland tropical rainforest; HB 48.6 mm; FA 34.8 mm; E 12 mm; T 36 mm; HF 7 mm; Wt 5 g; 1 ♂, adult, sink, skull and tissues, USAC 6607.

BELIZE —Toledo • CRFR Expedition Camp; 16.3817, –089.1208; 19–21.II.1997; BMW obs.; acoustic recording

Figure 2. *Myotis riparius* Handley, 1960 from Bocas del Polochic Wildlife Refuge, Guatemala (USAC 6607). **A.** Lateral view. **B.** Small upper P3 displaced toward the lingual side in relation to the tooth row. **C.** Ventral fur coloration.

• CRFR Expedition Camp 2; 16.38762, -89.09105; 18.II.1997; BMW obs.; acoustic recording.

EL SALVADOR — Ahuachapán • El Imposible National Park; 13.8262, −089.9473; 15.V.2003, 18.V.2003; BMW obs.; acoustic recording — Santa Ana • Volcano de Santa Ana; 13.8658, −089.6215; 14–16.V.2003; BMW obs.; acoustic recording.

HONDURAS — Gracias a Dios • Mosquitia, Auka; 14.940, −083.8323; 37 m elev.; 21–25.VII.2021; MATC obs.; acoustic recording • Mosquitia, Mavita, Rus Rus; 14.7480, −084.4488; 70 m elev.; 9–10.XII.2024; MATC obs.; acoustic recording • Prahbani, Mosquitia; 15.2634, −083.7719; 11 m elev.; 22–24.VII.2021; MATC obs.; acoustic recording • Mosquitia, Tipi; 15.2634, −083.7719; 11 m elev.; 25–26.VII.2021; MATC obs.; acoustic recording — Cortés • San Pedro Sula, Parque Nacional Cusuco; 15.4961, −088.2122; 1,606 m elev.; 4.V.2021; HDAP obs.; acoustic recording — Islas de la Bahía • Guanaja, east end; 16.4885, −085.8290; 37 m elev.; 25–26.VII.2021; MATC obs.; acoustic recording — Intibucá • Intibucá, Refugio de Vida Silvestre Mixcure; 14.9402, −088.1712; 1,951 m elev.; 2.III.2025; MATC obs.; acoustic recording.

NICARAGUA — Carazo • Santa Teresa, Rio La Chota; 11.5967, −086.1442; 47 m elev.; 8.XII.2024; JGMF obs.; FA 31mm; Wt 3.5 g; 1♂, adult, released — Jinotega • Macizo Peñas Blancas; 13.271, −085.7162; 1,067 m elev.; 14.III.2024; JGMF obs.; FA 35 mm; Wt 5 g; 1 ♂, adult, released — Región Autónoma Costa Caribe Norte • Cerro Waylawás, near Siuna; 13.6452, −084.8139; 124 m elev.; 24.II.2024; JGMF obs.; FA 34 mm; Wt 4 g; 1♀, adult, released — Región Autónoma Costa Caribe Sur • Kukra Hill, Greenfields; 12.2216, −083.7466; 5 m elev.; 24.III.2024; JGMF obs.; FA 33mm; Wt 5 g; 1♂, adult, released • Kukra Hill, Greenfields; 12.2216, −083.7466; 5 m elev.; 25.III.2024; JGMF obs.; FA 34mm; Wt 4 g; 1♂, adult, released.

Morphological identification. *Myotis riparius* is currently recognized as a complex of at least four cryptic species exhibiting allopatric and parapatric distributions. The specimen examined in this study (Figure 2A) is morphologically distinguishable from closely related congeners in the region, including *M. nigricans* Schinz, 1821, *M. extremus* Miller & Allen, 1928 (Novaes et al. 2024), and *M. pilo*satibialis LaVal, 1973. Diagnostic features include the position of a small upper P3 displaced lingually relative to the tooth row (Figure 2B), and distinct differences in pelage and skin coloration (Reid 2009; Novaes et al. 2017). The dorsal fur of *M. riparius* is long and woolly, typically reddish-brown to cinnamon, with sharply bicolored ventral hairs (dark bases and yellowish tips), a pattern that creates a strong contrast within the pelage (Figure 2C). This marked differentiation is distinctive when compared to the less-contrasting, shorter, and darker pelage of *M. nigricans*, and to the paler, grayish tones with only subtle contrast in *M. pilosatibialis*. Additionally, facial skin pigmentation is a diagnostic trait: *M. riparius* shows a distinctive pinkish-brown facial skin coloration (Figure 2A), contrasting with the blackish skin observed in *M. nigricans* and *M. extremus*. Finally, *M. riparius* can be separated from *M. pilosatibialis* by the near absence of hair on the uropatagium and feet, whereas *M. pilosatibialis* bears dense fur along the tibia extending onto the legs, feet, and tail membrane, a feature that readily distinguishes the two taxa.

Acoustic identification. Field identification of *M. riparius* and *M. pilosatibialis* based on external morphology can be challenging due to their similar size and general appearance; however, the two species are readily distinguished by their echolocation calls (Figure 3). As demonstrated in prior studies, *Myotis* species

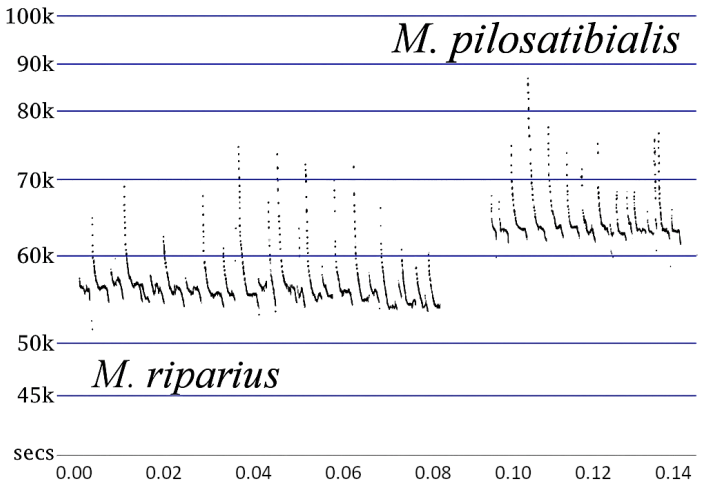

Figure 3. Comparison of the two *Myotis* species recorded in the Maya Mountains clearly demonstrates differences in the frequency of maximum energy (*Fc*). Frequency is shown on a logarithmic scale, and time (in milliseconds) is displayed in compressed mode, with intervals between pulses visually removed.

that are difficult to differentiate morphologically can often be reliably identified by their vocal signatures (O'Farrell 1999). A comparison of the characteristic frequency (*Fc*) among all Myotis species potentially occurring in the region reveals clear separation between taxa (Figure 4). A summary of the vocal signature of *M. riparius*, based on confirmed calls from free-flying individuals, is presented in Table 1. The diagnostic Fc, ranged from 54.05 to 56.74 kHz in 90% of recorded calls. This range matched the Fc values of the unidentified *Myotis* recorded in Belize in 1997 and El Salvador in 2003. These findings support the acoustic identification of *M. riparius* from archived voucher files and represent the first verified records of the species for both countries. Although call parameters allow reliable identification using Fc (Figure 4) in most cases, partial overlap V. occur within individual variation among other Myotis species of similar size, emphasizing the need for continued development of regional acoustic libraries to refine species-level discrimination in northern Central America.

DISCUSSION

This study provides the first specimen of *Myotis riparius* from Guatemala, and first acoustic detection for the species in Belize and El Salvador, significantly extending the known northern distribution of the species in Central America. These records fill critical gaps in its documented range and expand its global distribution by approximately 390 km northeastward into the Maya Mountains of Belize. Prior to this study, the northernmost verified occurrence was from Olancho, Honduras (GBIF 2025). In addition to refining distributional limits, these new records increase the number of documented bat species to 106 in Guatemala (Kraker-Castañeda et al. 2016; Trujillo et al. 2020, 2021, 2024), 72 in Belize (Herrera et al. 2018), and 66 in El Salvador (Owen and Girón 2012).

Our findings demonstrate that *M. riparius* is distributed more broadly across the northern Central American region, encompassing Guatemala, Belize, El Salvador, and Honduras, within what has been referred to as Nuclear Central America (Schuchert 1935). This core area, lying between the Isthmus of Tehuantepec and the Nicaraguan depression, is characterized by a complex physiography that spans dry Pacific lowlands, interior valleys, and humid Caribbean slopes (McCarthy et al. 1993). The occurrence of *M. riparius* across this heterogeneous landscape indicates that the species is not constrained by sharp ecological barriers but in-

Table 1. Summary of key call parameters of *M. riparius* with the diagnostic Fc of the dominant harmonic bolded. Included are values of where 90% of call pulses occur. Dur is pulse duration measured in ms, frequencies are in kHz, and the characteristic slope (Sc) is measured as octaves per second.

Variable	*N*	Min.	Max.	Mean	Std. dev.	Median	90%
Dur	145	2.08	6.70	3.77	1.12	3.56	5.36
Fmin	145	52.12	57.55	54.58	0.99	54.61	55.86
Fmax	145	58.39	108.11	74.20	13.41	69.57	96.39
Fmean	145	55.15	64.83	58.86	2.42	58.16	62.89
Fc	145	54.05	57.76	55.65	0.85	55.56	56.74
Sc	145	–34.19	104.91	31.26	28.11	33.55	62.91

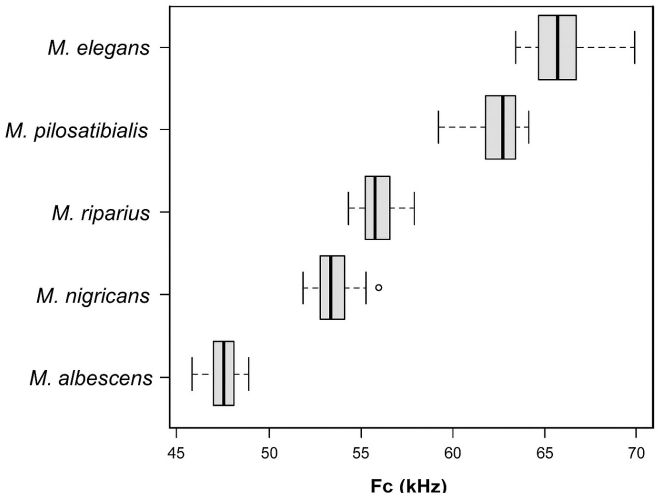

Figure 4. Characteristic frequency (*Fc*) values of five *Myotis* species from northern Central America, including species of similar body size and phylogenetic relatedness to *M. riparius*. Note the clear separation in the frequency of maximum energy, with interquartile range (50%), median (dark bar), and outliers.

stead persists in diverse environments associated with water bodies and forest cover, from lowland riparian systems to submontane forests (Barquez et al. 2011). In this context, the species exemplifies broader biogeographical patterns in a region where Nearctic, Neotropical, and Pan-American faunal elements converge, underscoring both its ecological flexibility and the role of northern Central America as a transitional zone for bat assemblages (McCarthy et al. 1993; Barquez et al. 2016).

Central America harbors a substantial proportion of the global range of *M. riparius* and represents both the northernmost and southernmost range boundaries for several taxa (Trujillo et al. 2024). Integrative analyses show that *M. riparius* is monophyletic but genetically structured into at least four cryptic evolutionary units with no haplotype sharing across populations (Novaes et al. 2023). Thus, the new Central American records are taxonomically important, as they help define the limits of northern lineages and provide an opportunity to reassess relationships both within the *M. riparius* complex and with other members of the ruber group, such as *M. elegans* and *M. pilosatibialis* (Novaes et al. 2023).

The integration of multiple lines of evidence is essential for documenting and reassessing species boundaries in *Myotis*. In this regard, archived acoustic recordings play a role comparable to museum specimens, serving as time-stamped vouchers that can be revisited as taxonomic knowledge advances (Miller et al. 2024). Their value is particularly evident for sequences originally identified only to the sono-species level, which can later be reanalyzed as vocal signatures are validated and taxonomic frameworks refined. Moreover, acoustic datasets extend beyond species diagnoses, as Ochoa et al. (2000) demonstrated that they also capture diagnostic features at higher taxonomic levels, including genera and families. From this perspective, acoustic vouchers complement morphological and genetic evidence, ensuring that past records remain scientifically relevant. Collectively, these elements underscore the enduring contribution of acoustic archives to refining species identifications and advancing our understanding of bat diversity.

Our results provide solid acoustic evidence for the occurrence of *M. riparius* in Belize and El Salvador. However, reliance on bioacoustic data alone to delimit the occurrence of *Myotis* should be approached with caution. The genus exhibits high diversity, frequent cryptic species, and poorly documented intraspecific variation (Novaes et al. 2023), while comprehensive acoustic verification remains lacking for most Neotropical taxa (Zamora-Gutiérrez et al. 2020). Moreover, the presence of other *Myotis* species of similar size and with partially overlapping call parameters highlights the risk of misidentification, particularly when records depend solely on unverified acoustic data or on automated classification algorithms without expert validation. Therefore, the collection of voucher specimens or genetic samples remains essential for confirming species identity and expanding the reference base needed to refine acoustic diagnostics (Miller et al. 2023; Ochoa et al. 2025). At the same time, the development of open-access regional call libraries will be critical for documenting geographic variation in echolocation and, together with voucher material, will provide a more comprehensive framework for understanding the evolutionary history of the *M. riparius* complex in northern Central America.

Taken together, these findings reinforce the role of northern Central America as a key region for bat diversity and demonstrate how combining mist-netting with acoustic monitoring enhances the detection of cryptic or under-recorded species such as *M. riparius*. From a conservation perspective, documenting *M. riparius* in new localities has direct implications for riparian and forested habitats in Guatemala, Belize, and El Salvador, where ongoing pressures from deforestation, agricultural expansion, and watercourse alteration V. threaten populations at the edge of their distribution.

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ADDITIONAL INFORMATION

Conflict of interest

The authors declare that no competing interests exist.

Ethical statement

No ethical statement is reported.

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Author contributions

Conceptualization: LAT, BM, JGMF. Data curation: LAT, BM, JGMF. Investigation: LAT, BM, DIOM, DS, HAP, NE, DM, KH. WAJ, JGMF. Writing – original draft: LAT. Writing – review and editing: LAT, BM, DIOM, DS, HAP, NE, DM, KH. WAJ, JGMF. Visualization: LAT, BM, JGMF.

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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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APPENDIX

Table A1. Verified records of *Myotis riparius* in northern Central America, from Guatemala to Nicaragua.

Country	Department	Locality	Date	Latitude	Longitude	Source	Data type
Guatemala	Izabal	El Estor, Refugio de Vida Silvestre Bocas del Polochic	10.XI.2024	15.3242	−089.3867	New record	Museum record
Belize	Toledo	CRFR Expedition Camp 1	19–21.II.1997	16.3817	−089.1208	New record	Acoustics
Belize	Toledo	CRFR Expedition Camp 2	18.II.1997	16.3876	−089.0911	New record	Acoustics
El Salvador	Ahuachapán	El Imposible National Park	15–18.V.2003	13.8262	−089.9473	New record	Acoustics
El Salvador	Santa Ana	Santa Ana Volcano	14–16.V.2003	13.8658	−089.6215	New record	Acoustics
Honduras	Gracias a Dios	Auka, Mosquitia Honduras	21–25.VII.2021	14.9402	−083.8323	New record	Acoustics
Honduras	Gracias a Dios	Guanaja, East end - Honduras	25–26.VII.2021	16.4885	−085.8290	New record	Acoustics
Honduras	Gracias a Dios	Mavita, Rus Rus, Gracias a Dios	9–10.XII.2024	14.7480	−084.4488	New record	Acoustics
Honduras	Cortés	Parque Nacional Cusuco, SPS, Cor.	4.V.2021	15.4961	−088.2122	New record	Acoustics
Honduras	Gracias a Dios	Prahbani, Mosquitia Honduras	22–24.VII.2021	15.2634	−083.7719	New record	Acoustics
Honduras	Gracias a Dios	Tipi, Mosquitia Honduras	25–26.VII.2021	15.2634	−083.7719	New record	Acoustics
Honduras	Intibucá	Refugio de Vida Silvestre Mixcure	2.III.2025	14.9402	−088.1712	New record	Acoustics
Honduras	El Paraiso	7 km E Danli, 620 m	14.VIII.1967	14.0333	−086.5182	GBIF.org 2024 https://doi.org/10.15468/dl.s3hytu	Museum record
Honduras	El Paraiso	7 km E Danli, 620 m	14.VIII.1967	14.0333	−086.5182	GBIF.org 2024 https://doi.org/10.15468/dl.s3hytu	Museum record
Honduras	El Paraiso	1 km SE Danli, 780 m	19.VIII.1967	14.0270	−086.5767	GBIF.org 2024 https://doi.org/10.15468/dl.s3hytu	Museum record
Honduras	Olancho	40 km E Catacamas, 500 m	21.IV.1967	14.7997	−085.5263	GBIF.org 2024 https://doi.org/10.15468/dl.s3hytu	Museum record
Honduras	Olancho	40 km E Catacamas, 500 m	19.IV.1967	14.7997	−085.5263	GBIF.org 2024 https://doi.org/10.15468/dl.s3hytu	Museum record
Honduras	Olancho	40 km E Catacamas, 500 m	19.IV.1967	14.7997	−085.5263	GBIF.org 2024 https://doi.org/10.15468/dl.s3hytu	Museum record
Honduras	Olancho	40 km E Catacamas, 500 m	15.IV.1967	14.7997	−085.5263	GBIF.org 2024 https://doi.org/10.15468/dl.s3hytu	Museum record
Nicaragua	Matagalpa	Matiguas	17.II.2004	12.7929	−085.4125	Martínez-Fonseca et al. 2020	Capture
Nicaragua	Rio San Juan	Refugio Bartola	13.XI.2011	10.9725	−084.3375	Martínez-Fonseca et al. 2020	Capture
Nicaragua	Rio San Juan	Refugio Bartola	14.XI.2011	10.9739	−084.3394	Martínez-Fonseca et al. 2020	Capture

Country	Department	Locality	Date	Latitude	Longitude	Source	Data type
Nicaragua	Rio San Juan	Refugio Bartola	15.XI.2011	10.9723	−084.3367	Martínez-Fonseca et al. 2020	Capture
Nicaragua	Rio San Juan	Puesto MARENA Bartola-Sendero	16.XI.2011	10.9697	−084.3403	Martínez-Fonseca et al. 2020	Capture
Nicaragua	Rio San Juan	Refugio Bartola	18.XI.2011	10.9760	−084.3383	Martínez-Fonseca et al. 2020	Capture
Nicaragua	RACS	Presa de Lira - CHN	20.IV.2016	13.0115	−084.4182	Martínez-Fonseca et al. 2020	Capture
Nicaragua	RACS	Finca de JoseMaximino Lopez - CHN	27.IX.2016	13.0016	−084.4291	Martínez-Fonseca et al. 2020	Capture
Nicaragua	Rivas	Finca Santa Isabel, Don Miguel Soto	26.V.2015	11.1956	−085.6606	Martínez-Fonseca et al. 2020	Capture
Nicaragua	Jinotega	La Bastilla	18.II.2019	13.1523	−085.8819	Martínez-Fonseca et al. 2020	Capture
Nicaragua	RACCS	Greenfields #1	25.III.2024	12.2215	−083.7466	New record	Capture
Nicaragua	Carazo	Rio La Chota	8.XII.2023	11.5967	−086.1442	New record	Capture
Nicaragua	RACCS	Greenfields #1	24.III.2024	12.2216	−083.7466	New record	Capture
Nicaragua	Jinotega	Macizo Penas Blancas	14.III.2024	13.2710	−085.7162	New record	Capture
Nicaragua	RACCN	Waylawas	24.II.2024	13.6452	−084.8139	New record	Capture
Nicaragua	Chontales	Villa Sandino, 1 km N, 2.5 km W of	6.VIII.1967	12.0590	−084.9604	GBIF.org 2024 https://doi.org/10.15468/dl.s3hytu	Museum record
Nicaragua	Nueva Segovia	JALAPA, 4.5 KM N, 2 KM E OF	21.VII.1967	13.9605	−086.1068	GBIF.org 2024 https://doi.org/10.15468/dl.s3hytu	Museum record
Nicaragua	Rio San Juan	1km S El Castillo, 130m	9.V.1967	NA	NA	GBIF.org 2024 https://doi.org/10.15468/dl.s3hytu	Museum record
Nicaragua	RACCN	Bosawas Biosphere Reserve, Kipla Sait Tasbaika Indigenous Territory	16.VIII.2008	14.3653	−084.9349	GBIF.org 2024 https://doi.org/10.15468/dl.s3hytu	Museum record
Nicaragua	Rio San Juan	Rio San Juan	21.II.1893	NA	NA	GBIF.org 2024 https://doi.org/10.15468/dl.s3hytu	Museum record