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Primeros reportes de *Myotis riparius* (Chiroptera: Vespertilionidae) en los altos Andes del sur del Ecuador

First reports of *Myotis riparius* (Chiroptera: Vespertilionidae) in the high-Andes southern Ecuador

Abstract

The Vespertilionidae family is widely distributed in South America. In Ecuador, there are 20 species including *Myotis riparius*. The species has been recorded between 10 to 1240 m a.s.l. on the both eastern and western sides of the Andes cordillera. In this work we reported two new localities for southern Ecuador which include the highest records for the species and increasing in 1077 m the limit elevation previously known in Ecuador.

Resumen

La familia Vespertilionidae está ampliamente distribuida en América del Sur. En Ecuador habitan 20 especies incluyendo a *Myotis riparius*. Esta especie ha sido registrada entre 10 y 1240 metros de elevación en las estribaciones de la cordillera de los Andes. En este trabajo reportamos dos nuevas localidades para el sur del Ecuador las cuales incluyen los registros de mayor elevación para la especie e incrementan 1077 metros el límite altitudinal conocido en Ecuador.

Keywords:

Altitudinal range; Azuay; montane forest; temperate zoogeographic region; Zamora Chinchipe.

Palabras clave:

Azuay; bosque montano; piso zoogeográfico templado; rango altitudinal; Zamora Chinchipe.

The 36 species (associated in eight genera) reported for Vespertilionidae family are widely distributed across South America. In Ecuador, occur 20 species of these vesper bats and the genus *Myotis* is the most diverse with eight species (Gardner 2008, Burgin et al. 2018). The *Myotis* species list include: *M. nigricans* Schinz 1821 (Black *Myotis*); *M. oxyotus* Peters 1867 (Montane *Myotis*); *M. albescens* Geoffroy 1806 (Silver-tipped *Myotis*); *M. caucensis* Allen 1914 (Cauca *Myotis*); *M. diminutus* Moratelli and Wilson 2011 (Diminutive *Myotis*); *M. keaysi* Allen 1914 (Hairy-legged *Myotis*); *M. simus* Thomas 1901 (Velvety *Myotis*) and; *Myotis riparius* Handley 1960 (Riparian *Myotis*).

Myotis riparius occurs from sea level to about 2000 m (LaVal 1973, Novaes et al 2015). In Ecuador *M. riparius* is reported frequently at altitudes ranged between 10 to 1240 m, on both Andean slopes, inhabits dry forest, rain forest, subtropical zones and even human-modified habitats (Tirira 2017). This species is small, the forearm is 32.3 – 39.8 mm, with moderately long woolly fur; the dorsal hairs are brown and ventral hairs bicolored with yellowish tips and blackish ba-

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ses; however, these patterns have geographic variation (LaVal 1973, Novaes et al. 2017). Besides, the uropatagium lacks a fringe of hairs on the edge; the plagiopatagium is broadly attached to the foot base. The skull is medium size 13.2 – 15.2 mm of length, the third upper premolar (P3) is often displaced to the lingual position, or less frequently positioned almost in the toothrow, the sagittal and lambdoidal crests are present and can vary from high to low (López-González et al. 2001, Moratelli et al. 2013, Novaes et al. 2017).

Despite *M. riparius* distribution and the habitats that it occupies are both relative well understood, records from southern Ecuador are found in few localities (Romero 2018). Consequently, in this note we are recording two new localities for *M. riparius* in the southern Andes of Ecuador. The specimens were captured in a moist cold temperate forest in the south-eastern Andes which corresponds to the temperate zoogeographic region (Holdridge 1967, Albuja et al. 2012). The individuals were collected using mist nets (6 m × 2.40 m). The nets were located at the ground level among paths which intersect the forest. All specimens were deposited in the mammalian collection of Zoology Museum of Universidad del Azuay.

The first specimen (MZUA-MA406) was collected at May 18, 2018 in the Estación Científica San Francisco (ECSF) located in the province of Zamora Chinchipe (3.97°S, 79.07°W, 2200 m), 17 km from Zamora city (Fig. 1). The individual was a subadult male with abdominal testes. This specimen has a medium sized body (Table 1), reddish-brown dorsal hairs and ventral hairs with brown bases and yellowish tips (Fig. 2 A, B). The skull presents medium-sized sagittal and lambdoidal crests; the P3 is displaced on the lingual side (Fig. 3 A, B, C, D) and the ratio between the breadth across canines and postorbital breadth is >1.

The second specimen (MZUA-MA486) was collected at December 7, 2019, near Arenales camp in Mazar Hydroelectric Central (2.57°S, 78.56°W, 2317 m), 31 km from Paute city, province of Azuay (Fig. 1). The individual was an adult male with scrotal testes. This specimen is a medium sized bat (Table 1) with dark-brown dorsal hairs and bicolored ventral hairs with light-brown tips and darker bases (Fig. 2 C, D). The skull has high lambdoidal and sagittal crests; the P3 in lingual position (Fig. 3 E, F, G, H), and the ratio between the breadth across canines and postorbital breadth is >1.

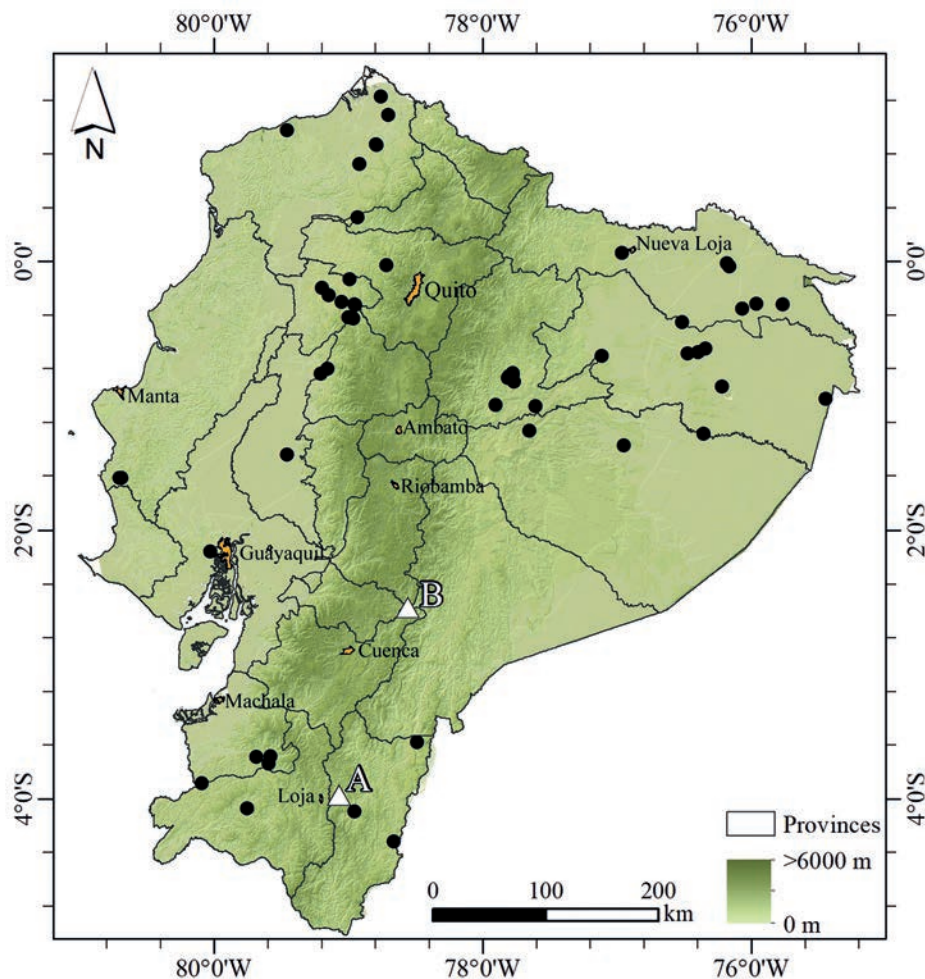


Figure 1. Records of *Myotis riparius* in Ecuador. Triangles represent the new localities in the high-Andes southern Ecuador. A) Estación Científica San Francisco, B) Arenales camp. Circles correspond to localities reported in Romero (2018).

Table 1. Body and skull morphometry (mm) of the specimens recorded in the high-Andes southern Ecuador. Specimen MZUA-MA406 Estación Científica San Francisco and specimen MZUA-MA486 Arenales camp. The abbreviation and measurements were based on López-González et al. (2001), Dias and Perachi (2007), Moratelli et al. (2013) and Novaes et al. (2017).

Trait	Abbreviation	MZUA-MA406	MZUA-MA486	Novaes et al. 2017
Total length	TL	96	91.8	73–91
Tail	T	39	38.6	28–48
Foot length	FL	8	7.3	6–10
Ear length	EL	13	10.3	7–15
Forearm	FA	39.13	39.03	32.3–39.8
Greatest length skull	GLS	13.21	13.89	13.2–15.2
Condylocanine length	CCL	12.24	12	11.3–13.4
Basal length	BAL	11.71	11.68	10.8–12.8
Zygomatic breadth	ZB	8.48	–	8.2–10
Mastoid breadth	MAB	7.23	7.45	6.7–7.9
Braincase breadth	BCB	6.68	6.67	6–7
Postorbital breadth	POB	3.48	3.69	3.1–3.9
Breadth across canines	BAC	3.75	3.98	3.4–4.3
Molariform toothrow length	M13	3.26	3.21	2.7–3.2
Maxillary toothrow length	MTL	5.26	5.22	4.7–5.7
Proportion between breadth across canines/Postorbital breadth	BAC/POB	1.07	1.07	>1
Mandibular length	MAL	10.34	10.33	9.3–11
Sagittal crest	SAC	Present	Present	Present
Lambdoidal crest	LAC	Present	Present	Present

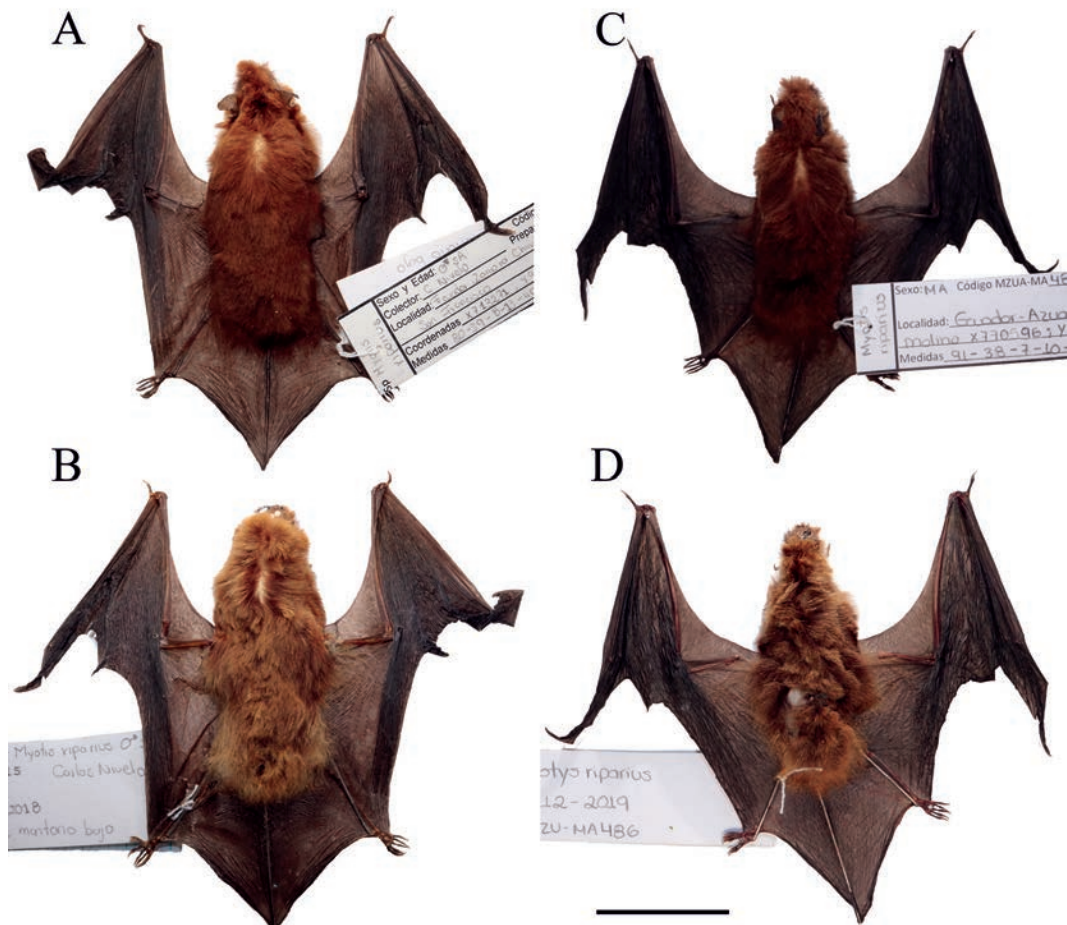


Figure 2. Specimens of *Myotis riparius* recorded in the high-Andes southern Ecuador. A, B) MZUA-MA406 Estación Científica San Francisco and C, D) MZUA-MA486 Arenales camp. A-C) dorsal view, B-D) ventral view. Scale bar = 30 mm.

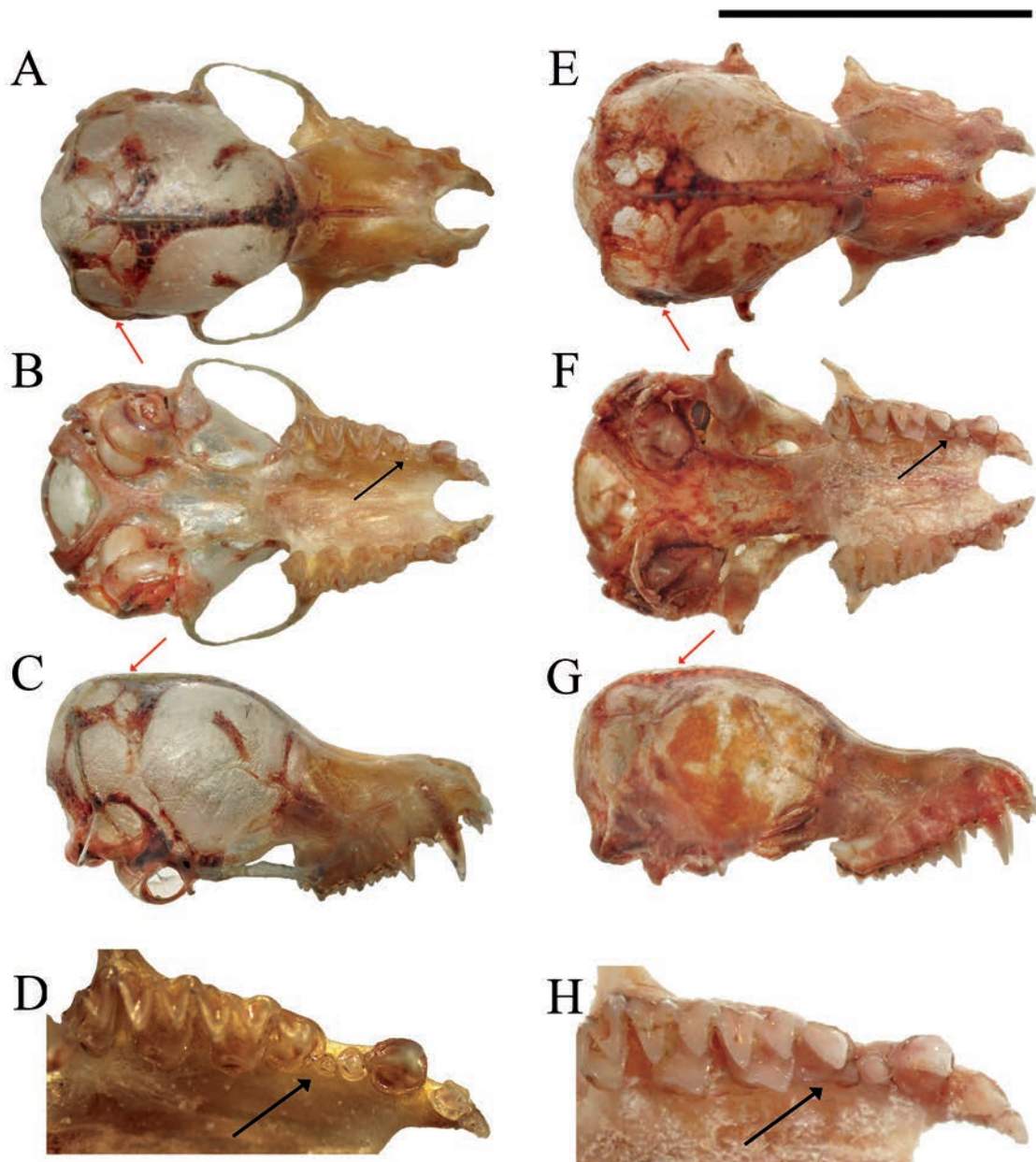


Figure 3. Skull views of *Myotis riparius* specimens recorded in the high-Andes southern Ecuador. A, B, C, D) MZUA-MA406 Estación Científica San Francisco and E, F, G, H) MZUA-MA486 Arenales camp. A-E) dorsal view, B-F) ventral view, C-G) lateral view, D-H) magnification of the right upper toothrow. Red arrows mark the sagittal and lambdoidal crests, and the black arrows indicate the third upper premolar (P3) in lingual position. Scale bar = 5 mm.

The all characters of the specimens reported correspond to the species description of *Myotis riparius* (Barquez et al. 1999, López-González et al. 2001, Moratelli et al. 2013, Lutz et al. 2016, Novaes et al. 2017). Therefore, the skull traits used to recognize the species identity: i) presence of sagittal and lambdoidal crests; ii) the relation between breadth across canines and postorbital breadth > 1 (BAC/POB) and; iii) the position of P3 in relation to toothrow. In addition, the presence of sagittal and lambdoidal crests differentiated these specimens from *Myotis nigricans* (Barquez et al. 1999, López-González et al. 2001, Moratelli et al. 2013, Lutz et al. 2016, Novaes et al. 2017).

Myotis riparius records in South America are below 2000 m in ecosystems such as tropical rain forest, savanna, deciduous forest and anthropic environments (Barquez et al. 1999, Novaes et al. 2015). The only record of this species in montane forest is reported in Central America (Costa Rica) at 2000 m (LaVal 1973). Consequently, these records would be the first in South America for *M. riparius* in montane forests upper the 2000 m above the known limits for the species. Thus, Arenales camp becomes in the known highest record for this species (Fig. 1A).

The record of *M. riparius* in the high Andes can be explained by its plasticity in habitat choice, because the specie has been recorded in diverse habitats in its geographic distribution range. (LaVal 1973, Novaes et al. 2015). In Ecuador, the ecosystems of the south-eastern slope of the Andes cover large forests which are interconnected (Kvist et al. 2006). This phenomenon may allow to *M. riparius* and other bats to move across forests with potential elevation movements along the Andean slope. Within this framework, this study improves the knowledge of distribution patterns for southern Ecuador due to we demonstrated that *M. riparius* occurs in high-altitude Andean forest at least seasonally. Finally, more studies are necessary to determine which particular factors influence the distribution and movement of this species.

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The authors declare no conflict of interest.

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