

First record of *Lasiurus arequipae* in the Department of Tacna, Perú

Primer registro de *Lasiurus arequipae* para el departamento de Tacna, Perú

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Lasiurus arequipae was recently described in the Department of Arequipa as a new species endemic to Perú, and its geographic distribution is poorly known. The presence of this species is reported in Lomas de Sama Grande, Department of Tacna, Perú. The specimen was collected during a study on the local fauna of bats, identified with the taxonomic key of Málaga *et al.* (2020), and compared with the holotype and paratypes deposited in the Scientific Collection of the Museum of Natural History at Universidad Nacional de San Agustín, Arequipa, Perú. The specimen is an adult female, preserved as skin, skull, and skeleton (not cleaned). One map of the current distribution of *L. arequipae* and information on the ecology of the species are included. We observed a potential shelter associated with the olive tree. This new record is located 287 km southwest of the town of Huatiapa, which is the closest record site where the first study took place in the Department of Arequipa. This finding brings to 11 the number of species of bats for the Department of Tacna. We recommend further sampling using supplementary methods to expand our knowledge of the natural history and ecology of this species and set conservation actions.

Key words: Atacama Desert; Chiroptera; Lomas de Sama Grande; shelter.

Lasiurus arequipae fue descrita recientemente en el departamento de Arequipa como especie nueva y endémica para Perú, con distribución geográfica poco conocida. Se reporta la especie en Lomas de Sama Grande, departamento de Tacna, Perú. El espécimen fue recolectado durante un estudio sobre la fauna local de murciélagos, identificado con la clave taxonómica de Málaga *et al.* (2020), y comparado con el holotipo y paratipos depositados en la Colección Científica del Museo de Historia Natural de la Universidad Nacional de San Agustín, Arequipa, Perú. Se trata de una hembra, adulto, conservado como piel, cráneo y esqueleto (sin limpiar). Además, se presenta un mapa de distribución actual de la especie y contribuciones sobre su ecología. Destaca la observación de un refugio potencial asociado con el árbol de olivo. Este nuevo registro se ubica a 287 km al suroeste de la localidad de Huatiapa, que es el sitio más cercano de registro en donde se llevó a cabo el primer estudio en el departamento de Arequipa. Este hallazgo eleva a 11 las especies de murciélagos para el departamento de Tacna. Se sugieren esfuerzos de muestreo con métodos complementarios para generar un mayor conocimiento de la historia natural y ecología de esta especie, y establecer acciones de conservación.

Palabras clave: Chiroptera; Desierto de Atacama; Lomas de Sama Grande; refugio.

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The genus *Lasiurus* Gray, 1831 belongs to the family Vespertilionidae. It is distributed throughout America, including Hawaii and the Caribbean islands (Baird *et al.* 2015), and has been reported in various habitats ranging from sea level to 3,300 m (Graham 1983). Currently, at least 20 species of *Lasiurus* are recognized, nine of which inhabit South America (Gardner 2008; Baird *et al.* 2015; Baird *et al.* 2017; Málaga *et al.* 2020): *L. atratus* Handley, 1996; *L. blossevillii* (Lesson and Garnot, 1826); *L. castaneus* Handley, 1960; *L. villosissimus* E. Geoffroy, 1806; *L. ebenus* Fazzolari-Corrêa 1994; *L. ega* (Gervais, 1856); *L. egregius* (Peters, 1870); *L. varius* Poeppig, 1835; and *L. arequipae* Málaga, Díaz, Arias and Medina, 2020.

In Perú, 4 species of the genus *Lasiurus* have been reported: *L. blossevillii*, *L. villosissimus*, *L. ega* (Pacheco *et al.* 2009), and *L. arequipae*, endemic to the country (Málaga

et al. 2020). The latter, little known, has a distribution restricted to two localities in the Department of Arequipa, on the western slope of the Andes. This paper reports a new record of *L. arequipae* that extends its geographic distribution based on one specimen collected in Lomas de Sama Grande, Department of Tacna, southern Perú. In addition, information on the ecology of this species is also provided.

The specimen collected corresponds to an adult female (CBT 529), preserved as skin, with the skull removed and skeleton (not cleaned) in 96° ethyl alcohol, deposited in the Tacna Biological Collection (CBT), Faculty of Sciences at Universidad Nacional Jorge Basadre Grohmann, Tacna, Perú. On 16 August 2020 at 16:00 hr, it was found perching on an olive tree (*Olea europaea* L.) and captured by hand, during a study on the local fauna of bats in the Lomas de

Sama Grande crop fields (17° 45' 46.13" S, 71° 5' 48.56" W, at 555 m). The area is adjacent to the Sama Inclán valley and the urban area of the Sama Inclán district, in the Sama River basin, located at the so-called "head of the Atacama Desert", i.e., the lowlands of the Peruvian Andes western slope. This area comprises a gently sloping terrace and volcanic earth. The local vegetation is seasonal herbaceous, influenced by winter mists; it was converted into agricultural fields, especially for cultivating olive trees, and is surrounded by hills with ravines and dry riverbeds with sparse xeric vegetation (INEI 2000; INEI 2017).

Summers are hot, arid, and generally cloudy, and winters are cool, dry, and mostly clear. Throughout the year, the temperature ranges from 11 °C to 25 °C and rarely drops below 9 °C or above 28 °C. Rainfall is very scarce all year round (Ministerio de Agricultura 2010).

The specimen was identified using the taxonomic key for the genus *Lasiurus* by Málaga et al. (2020). It was compared with the external and cranial description of the holotype (MUSA 21058) and paratypes (MUSA 21891, MUSA 21853) of adult specimens deposited in the Scientific Collection of the Museum of Natural History at Universidad Nacional de San Agustín, Arequipa, Perú (MUSA). We recorded the following external and craniodental measurements with a precision caliper ± 0.01 mm, following the nomenclature with which Málaga et al. (2020) described the species: total length, ToL; tail length, TL; ear length, EL; hindfoot length, HFL; weight (gr); forearm length, FA; greatest length of skull, GLS; post-

orbital constriction, PC; least interorbital breadth, LIB; zygomatic breadth, ZB; breadth of braincase, BB; palatal length, PL; condylobasal length, CBL; mastoidal breadth, MB; width across canines, C-C; width across molars, M-M; length of mandible, LM; length of mandibular tooththrow, LMdT; length of maxillary tooththrow, LMxT.

The specimen has the morphological characteristics of *L. arequipae* (Table 1; Málaga et al. 2020). It differs from other species of the genus *Lasiurus* by the following combinations of diagnostic characters: dorsal coloration is cinnamon to orange with tricolored hairs (black at the base, yellowish in the middle, and cinnamon to dark brown at the tip; Figure 1a); yellowish ventral coloration with bicolored hairs (black at the base and yellowish at the tip; Figure 1b); blackish wing membranes with opaque orange spots along the forearm and metacarpus in dorsal and ventral views (Figure 1c); uropatagium covered with hairs not exceeding the edge in dorsal view (Figure 1d); whitish patches at the insertion of the wings (Figure 1e).

In the skull, the tympanic ring is circular (Figure 1f), V-shaped anterior edge of nasal bones (Figure 1g), and ocular orbits oval in shape in dorsal view (Figure 1h). The specimen metrics, such as forearm length of 47.9 mm and length of maxillary tooththrow of 6.1 mm, are within the range reported by Málaga et al. 2020 (Table 1). *Lasiurus arequipae* is morphologically most similar to *L. atratus*, *L. castaneus*, *L. blossevillii*, and *L. varius*, and differs from these species in that the latter are reddish to dark brown, with U-shaped

Table 1. Comparison of external morphological and craniodental measurements (mm) and weight (gr) of *Lasiurus arequipae* specimens reported by Málaga et al. (2020) and in the present study. Abbreviations are defined in the text.

	Arequipa			Tacna
	Huatiapa		Chaucalla	Sama Grande (current study)
	MUSA 21058 (male; holotype)	MUSA 21891 (female; paratype)	MUSA 21853 (male; paratype)	CBT 529 (female)
ToL	120	123	106	131.5
TL	60	64	56	64
EL	12.9	13	11	12.8
HFL	10.3	11	8.6	11.1
FA	46.4	47.6	46.7	47.9
Weight	13	12	12	12.5
GLS	14.2	14.3	13.7	14.2
PC	5	4.9	4.9	4.8
LIB	6.4	6.4	6.1	6.3
ZB	10.8	10.8	10.2	11.1
BB	8.1	8	7.9	8.2
PL	5.2	5.3	4.7	5.3
CBL	14.1	14.5	14	14.1
MB	8.9	8.9	8.6	8.9
C - C	5.4	5.8	5.4	5.9
M - M	6.5	6.8	6.6	7
LM	10.8	11.1	10.4	11.3
LMdT	5.8	6.1	5.8	6.1
LMxT	5	5.2	4.9	5.3

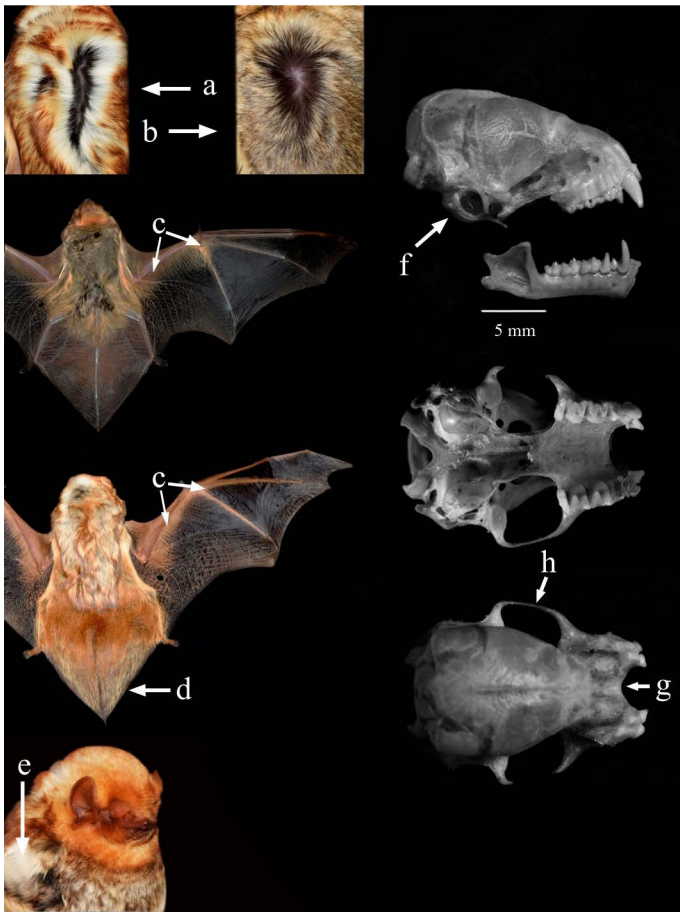


Figure 1. Female adult specimen of *Lasiurus arequipae* (CBT 529). Features of the pelage, coloration, and cranial structures are noted. Pelage and coloration: a) dorsal view, cinnamon to orange coloration with tri-colored hairs (black at the base, yellowish in the middle, and cinnamon to dark brown at the tip); b) ventra view, yellowish coloration with bicolored hairs (black at the base and yellowish at the tip); c) ventral and dorsal views, blackish wing membranes with opaque orange spots along the forearm and metacarpals; d) uropatagium covered with hairs not exceeding the edge in dorsal view; e) whitish patches at the insertion of the wings. Skull: f) lateral view, circular tympanic ring; g) dorsal view, V-shaped anterior edge of nasal bones; h) oval-shaped eye orbits in dorsal view.

anterior edge of nasal bones and oval tympanic ring. *Lasiurus arequipae* and *L. varius* share a similar dorsal coloration (cinnamon to orange) and differ in the color of the wing membrane, which is blackish mottled with opaque orange on both sides of the forearms and metacarpals in the former versus completely blackish in the latter.

The specimen was collected while perching on an olive tree branch along with three individuals, apparently of the same species based on the coloration observed when flying. This finding represents an extension of the distribution currently reported and the first record of *L. arequipae* in the Department of Tacna, in the Sama River valley, and is the southernmost location on the Pacific coast. The location reported here is 287 km southwest of the town of Huatiapa, which is the nearest record site in the Department of Arequipa (Figure 2), corresponding to the study carried out by Málaga et al. (2020).

Málaga et al. (2020) reported one individual of this species captured in the town of Huatiapa, at an elevation of 726 m in the province of Castilla, and two individuals cap-

tured in the town of Chaucalla, at 860 m in the province of La Unión. Both locations are found to the north of the province of Arequipa, and share similar physical and environmental characteristics with the town of Sama (555 m), i.e., presence of terraces with crops, proximity to rivers, and hills with ravines. In addition, the local climate is characterized by narrow variations in temperature and low rainfall, and agricultural activities take place in both areas. Despite the few catches, it can be suggested that *L. arequipae* is associated with such conditions (González and Málaga 1997; Málaga et al. 2020).

Lasiurus arequipae is the only species reported for the Department of Tacna that has been recorded perching on a tree as a likely shelter. Tirira (2007) considers that the species in the genus *Lasiurus* are characterized by using branches and leaves of trees and shrubs as temporary shelters in agricultural land, open areas, and close to urban environments and water bodies. With this record, *L. arequipae* adds to the 10 bat species recorded in the Department of Tacna (Aragón and Aguirre 2014; Flores et al. 2015; Portugal-Zegarra et al. 2020): *Amorphochilus schnablii* Peters, 1877; *Desmodus rotundus* (É. Geoffroy, 1810); *Histiotus macrotus* (Poeppig, 1835); *Histiotus montanus* (Philippi and Landbeck, 1861); *Mormopterus kalinowskii* (Thomas, 1893); *Myotis atacamensis* (Lataste, 1892); *Platalina genovensium* Thomas, 1928; *Promops davisoni* Thomas, 1921; *Tadarida brasiliensis* (L. Geoffroy, 1824); and *Nyctinomops aurispinosus* (Peale, 1848).

Considering the distance from the localities of previous records in the Department of Arequipa, it is suggested that further research using supplementary sampling methods in intermediate and nearby sampling points sharing similar environmental conditions will provide additional valuable information about this species. The implementation of acoustic detection techniques to characterize echolocation pulses and their recognition in free flight, in addition to

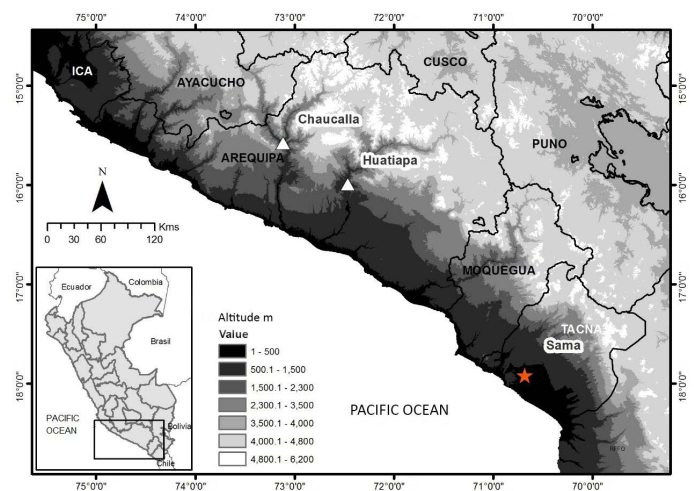


Figure 2. Records of *Lasiurus arequipae* in Perú. The towns of Chaucalla and Huatiapa are shown (white triangles; Málaga et al. 2020), as well as the location of the new record in the Department of Tacna, which is the southernmost region of Perú (orange star; CBT 529).

the use of mist nets, will improve further the knowledge of the distribution, natural history, and ecology of *L. arequipae* and will provide elements for the conservation strategies of this species.

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