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Un registro de hipertrofia del trago del murciélago frugívoro de gran tamaño *Artibeus lituratus* (Chiroptera: Phyllostomidae)

A record of hypertrophy of the tragus of great fruit-eating bat *Artibeus lituratus* (Chiroptera: Phyllostomidae)

Resumen

En este trabajo, reportamos y describimos evidencia de una anomalía en el trago de un individuo de *Artibeus lituratus*, capturado en los Andes Centrales de Colombia. En junio de 2019, durante un trabajo de campo en el Departamento de Caldas, municipio de Aranzazu, quedó atrapado un individuo de *A. lituratus* con inusual forma de trago. Este individuo tenía un trago de forma cilíndrica y asimetría. El individuo fue recogido y depositado en el Museo de Historia Natural de la Universidad de Caldas (MHN-UCa). Se realizó una revisión de la literatura para encontrar casos similares utilizando motores de búsqueda, pero no se encontraron informes previos de la anomalía. Además, revisamos el trago de los especímenes en el MHN-UCa y ninguno de ellos presentaba malformaciones similares. Concluimos que esta anomalía no se había registrado previamente en Chiroptera.

Abstract

In this work, we report and describe evidence of an anomaly in the tragus of an individual of *Artibeus lituratus*, captured in the Central Andes of Colombia. During field work in the Department of Caldas, municipality of Aranzazu, one individual of *A. lituratus* with unusual tragus form was trapped. This individual had a tragus with cylindrical shape and asymmetry. The individual was collected and deposited at the Museum of Natural History of the University of Caldas (MHN-UCa). A literature review was conducted to find similar cases using searching engines, but no previous reports of the anomaly were found. Furthermore, we reviewed the tragus of vouchers at the MHN-UCa and none of these had similar malformations. We concluded that this anomaly has not previously registered in Chiroptera.

Palabras clave:

Murciélago; Malformaciones; Oído externo.

Keywords:

Bat; Malformations; Outer ear.

Introduction

Among mammals, bats (Chiroptera) represent one of the most diverse groups with more than 1386 species (Burgin et al. 2018). Within this group there is an active and well-developed hearing system known as echolocation (Griffin 1958). This system allows to receive and process ambient sounds using high frequency sound signals, which are amplified and filtered by the outer ear and then oriented towards the middle ear (Moss 2019, Lawrence & Simmons 1982). The outer ear of most bat species consists of two main parts, the pinna and tragus. Tragus is a prominent skin vertical lobe inside the ear (Hutson et al. 2001). The shape and size of tragus vary among species to the extent that differences can be used in taxonomic differentiation of some species (Metzner 1991). According to studies aiming to understand the role of tragus (Müller 2004, Firzlafl & Schuller 2003, Wotton et al. 1995), it has been suggested that this structure can generate spe-

cific tracking signals for vertical sound localization to determinate the directionality of the rumbling echoes, although these vary according to the experiment and bat species (Chiu & Moss 2007, Metzner 1991). Alterations in the tragus can cause some degree of change in the transfer characteristics of sound and enough binaural differences to locate a target (Firzlauff & Schuller 2004, Chiu & Moss 2007). Therefore, an anomaly in the tragus can be a serious problem for individuals that develop it, threatening the survivability, but the latter can be influenced by their ecology. In an exceptional case for bats of the genus *Rhinolophus* that lack tragus, they can compensate the absence of this structure by using highly coordinated movements of the ears (Firzlauff & Schuller 2004).

Among Neotropical bat species, the family Phyllostomidae is characterized by the evolution of complex and differentiated structures for echolocation, and additional adaptation to frugivorous diets (Arias-Aguilar et al. 2016). In general members of the subfamily Stenodermatinae tend to be more colorful than other phyllostomids, and most of these bats are characterized by having white stripes on the face and some species have a white stripe in the middle of the back (Fleming 2003). The ears of Stenodermatinae bats are from small to medium size with rounded edges, often pale and having small tragus (Barquez et al. 1999).

Within Stenodermatinae, the common great fruit-eating bat *Artibeus lituratus* (Olfers 1818) is a large species (forearm = 71.7 mm, weight = 66 g) which is distributed from Central Mexico to southern Brazil, Trinidad and Tobago and the Lesser Antilles (Gardner 2008, Rui et al. 1999). *Artibeus lituratus* feeds mainly on seeds of the genus *Cecropia*, *Eriobothria*, *Ficus*, *Terminalia* and *Zyzygium* (Heithaus et al. 1975, Galetti & Morellato 1994, Fatima & Marjorie 2007, Saldana-Vázquez et al. 2013, Montoya-Bustamante et al. 2016). This species uses as shelters tree trunks, palm leaves, caves, and occasionally human constructions (Morrison 1980). In Colombia, *A. lituratus* is distributed throughout the country, from tropical forests to agriculture and livestock systems, between 0 and 2600 m (Solari et al. 2013, López-Aguirre & Pérez-Torres 2015).

Externally, the ears of *A. lituratus* is characterized by their rounded shape, shorter than the head, with a straight outer top margin and convex bottom margin. The tragus is well developed, leaf-shaped and having crenulation in the outer margin. The basal lobe is square. The tragus average size is between 5 and 7 mm, and in most specimens the tip of the tragus is yellow (Barquez et al. 1999, Tirira 2007, Reid 2009). In this work, we present evidence of an anomaly in the tragus of an individual of *Artibeus lituratus*, captured in the Central Andes of the department of Caldas, Colombia.

Material and methods

For the description of the anomaly, and to explore how common is the presence of anomalies in this structure we reviewed the tragus of 321 bat individuals of the families Phyllostomidae, Molossidae, and Vespertilionidae deposited at the Museum of Natural History at the University of Caldas (MHNU-Ca), Manizales, Colombia. In addition, we performed a literature search on the platforms Scopus, Web of Science and JSTOR using keywords such as anomalies, agrochemicals, bat, and malformation to locate publications that describe similar cases.

Results

During a field work in the vereda Alegrías, municipality Aranzazu, Caldas (5°18'21.28"N, 75°29'38.94"W; 1969 m) in June 2019, nine bats of the families Phyllostomidae, Vespertilionidae, and Molossidae were captured using mist nets. The sampling area is destined to agricultural activities, specifically with monocultures of tree tomato, passion fruit, lulo, beans, and avocados. The cultures are treated every two weeks with agrochemicals (fertilizers and pesticides) to improve agricultural production; this activity has been done for over 20 years.

Of the five bat species captured, two were individuals of *A. lituratus*, and one of them had an unusual tragus morphology. The tragus presented cylindrical shape and differed in size (right tragus 9.1 mm and left tragus 11.8 mm). The shape and size differed drastically from a normal tragus of conspecifics (Fig. 1), captured during the same sampling. The individual corresponds to an adult male.

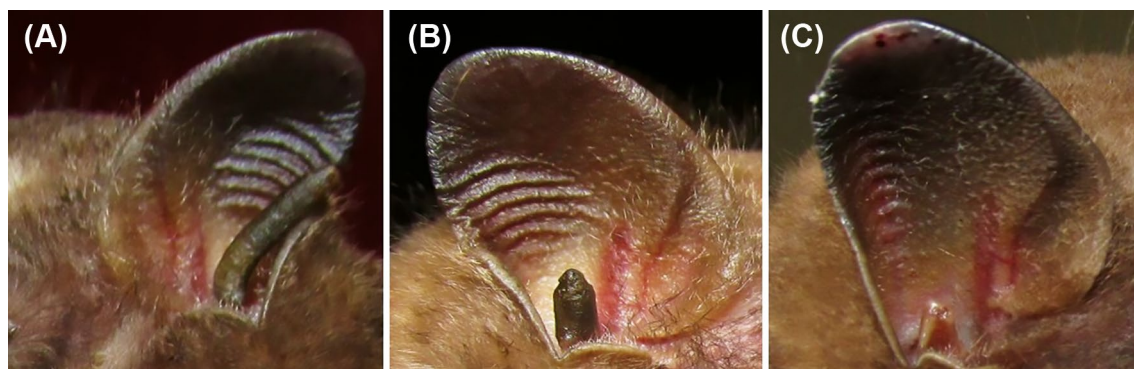


Figure 1. (A). Left side view of the tragus (11.8 mm) anomaly shape of *A. lituratus*. (B) Right side view of the tragus (9.1 mm) shape anomaly of *A. lituratus*. (C) Right side view with normal tragus shape (5.3 mm) of an individual of *A. lituratus* captured during the same sampling.

The specimen was preserved as skin and skull, with the body in 70% ETOH and deposited in the MHN-UCa (MHN-UCa 2726). The search for additional specimens with anomalies in the tragus was performed on 321 bat individuals. We could not find additional records of similar anomalies neither on the MHN-UCa collections nor during the literature search.

Discussion

Apparently, the anomaly reported here represents a new case for Chiroptera. Commonly morphological anomaly can be caused by congenital malformations, deformations or disruptions caused by environmental factors, genetic and unknown factors (Rojas & Walker 2012). In this case the main cause of the anomaly is unknown but could be associated to agrochemicals use, because is acknowledge declining bat populations due to pesticide usage (Frank 2017, Williams-Guillén et al. 2016), and furthermore, the exposure to insecticides may lead to hepatic and muscular toxicity with consequences in flight capacity, reproduction, and metabolism of the bats (Oliveira et al. 2018). However, new sampling efforts should be performed to test this hypothesis and to discard post-natal malformation of this structure.

Some of the most common anomalies described in bats are related to wing defects (Castillo-Figueroa & Perez-Torres 2018), unusual changes on the dental formula (Rui & Drehmer 2004), and the absence of pigmentation (Roncancio & Ramirez-Chaves 2008, Marin-Vasquez et al. 2010, Velandia-Perilla et al. 2013). Another type of anomalies less known as the conjoined twins (Nogueira et al. 2017), and skeletal deformities (Kunz & Chase 1983, Romero & Pedersen 2017). We recommend continuing documenting and reporting anomalies in bats to understand the potential negative effects that can generate in individuals that present this unusual condition, and the causes of these morphological alterations (Benítez-Leite et al. 2007, Hoy et al. 2015).

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