

## SHORT COMMUNICATION

## Did Azara discover *Myotis simus* or *Myotis midastacus* (Mammalia: Chiroptera: Vespertilionidae) at least a century before their formal description?

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**ABSTRACT.** The true identity of the “Chauve-Souris Onzieme ou Chauve-Souris Cannelle” of Azara (1801) and the “LXXXII Murcielago Acanelado” of Azara (1802) has never been clarified. Though it has historically been associated with the Red Myotis, *Myotis ruber* (É. Geoffroy St.-Hilaire, 1806), there are clear inconsistencies with that species. Unusual features of the description such as the position of the attachment of the wing membrane to the limbs confirm that the species described by Azara belongs to the *Myotis simus* Thomas, 1901 group. Two members of that group occur in Paraguay, from where Azara described his specimen: *Myotis* cf. *simus* and the recently described *Myotis midastacus* Moratelli & Wilson, 2014. Measurements and collection locality slightly favour its identity as the former, but it is not possible to conclusively state which of these species Azara had in his possession.

**KEY WORDS.** Asunción, *Myotis ruber*, *Myotis* cf. *simus*, nomenclature, Paraguay.

Sent to delimit the borders of the Spanish and Portuguese crowns in South America, Félix de Azara (1742–1821) was a Spanish military engineer and a pioneer in natural history studies in the Southern Cone of the continent. When his Portuguese equivalent failed to show, he focused his attention on documenting the fauna, culture and geography of “Paraguay and La Plata,” a vast area incorporating modern day eastern Argentina, Paraguay, extreme southern Brazil and Uruguay. A detailed chronology of his movements, life and work is provided by Contreras (2010) and by Mones and Klappenbach (1997).

Azara wrote his original work in Spanish. Though the author lacked formal scientific training and did not use scientific binomials, the descriptions he provided are extraordinarily detailed. Much to the chagrin of the author, a French version (translated by L. E. Moreau-Saint-Méry) of an incomplete Spanish draft that he had sent to Europe for opinion, was published without his consent. This two volume translation “Essais sur l’histoire naturelle des Quadrupedes de la Province du Paraguay” (Azara 1801), thus became the first attempt to provide detailed descriptions of the mammal

fauna of the southern half of South America. However, the premature publication of the work prompted comments in the prologue of the later Spanish version of the text “Apuntamientos para la historia natural de los cuadrúpedos del Paraguay y Rio de la Plata” (Azara 1802) that it (and not the French volumes) should be considered as the finished item, and that it contained corrections to the errors and additional species that were not figured in Azara (1801). Nonetheless, many of the scientific names coined by European academics that were derived from Azara’s text were based on the French version (including É. Geoffroy Saint-Hilaire, Desmarest, Oken and Olfers amongst others), even though the specimens described (which pass for the types in the absence of surviving specimens) did not always correspond to those in the Spanish version.

Azara (1801) features twelve descriptions of bats (“chauve-souris”) and Azara (1802) descriptions of thirteen. The identities of some of these became clearer with the publication of an un-edited Azara manuscript by Azara (Agacino 1941), but others remain unresolved. One problematic description is that of “Chauve-Souris Onzieme ou

Chauve-Souris Cannelle” of Azara (1801: 292–293), which corresponds to the number 82 “Murcielago Acanelado” of Azara (1802: 308–309).

An English translation of Azara (1802) is provided below (the original Spanish and French texts are in Appendices 1 and 2). As noted in the “advertencias” (Azara 1802: xi) measurements are provided in inches and lines of the “pied du roi” (one inch = 2.707 cm and one line = 2.256 mm):

“LXXXII. Cinnamon bat

Length 3 1/12 inches: tail 1 1/12: wing span 9 1/6. Fur short, cinnamon above and the colour of rum<sup>1</sup> below. The wing membrane, and that which goes to the end of the tail originates from the tarsal joint. Ear very pointed, height 5 1/2 lines. And inside it is another, long and thin and pointed like an awl. Snout rather sharp, with upper half only slightly extended (over the lower). Above one incisor on each side, with a large space in the middle, and then come the canines. Below it seems there are two incisors on each side, and then the canines. The penis is free, the testicles external, with separation between one and the other, stuck to the sides of the tail and surrounded in the membrane there.”

The name *Vespertilio ruber* É. Geoffroy St.-Hilaire, 1806, is based on the “Chauve-Souris Onzieme ou Chauve-Souris Cannelle” of Azara (1801), the French version of this same text (Appendix 2). The description has generally been associated with the species known today as the Red Myotis *M. ruber* (É. Geoffroy St.-Hilaire, 1806) and Miller and Allen (1928) later restricted the type locality for this species to “Paraguay, probably near Asunción,” based on the premise that this is where Azara was stationed. *Myotis ruber* is a rare bat in Paraguay where it is known only from Paraguari and Itapúa departments, and has never been confirmed to occur in Asunción or Central department (López-González 2005).

Recognizing inconsistencies between Azara’s (1801, 1802) description and its supposed identity as *M. ruber*, LaVal (1973: 46) observed that:

*In describing his Chauve-souris onzieme ou Chauve-souris cannelle Azara (1801) stated “Le poi lest court, cannelle en-hout, et de la couleur du Roseau en-bas”. This is the only portion of his (or Geoffroy’s) description that best applies to Myotis ruber. Because this name has been generally applied to bats of a single species fitting this description, I think it best to retain the name ruber.*

LaVal (1973) thus conserved current usage by designating a neotype (USNM 115097) from nearby Sapucaí, collected by William Foster on 22 May, 1901. Of note is that this locality is in Paraguari department, not in “Neembucú” [sic] as stated in the specimens examined section by LaVal (1973).

Hershkovitz (1976) criticized this designation of the neotype, noting that *Noctilio ruber* Rengger was an “arbitrary reclassification of *Vespertilio ruber* É. Geoffroy based solely on Azara” and in reference to Azara that “the original description is equivocal”. He argued that “it would have been more appropriate (for LaVal) to describe the species under a new name and refer *Vespertilio ruber* É. Geoffroy to the taxonomic limbo of incertae sedis”. However, LaVal’s (1973) neotype designation remains valid for *M. ruber*, regardless of the identity of Azara’s description.

Azara’s (1802) description is short, clearly does not apply to the Red Myotis as LaVal (1973) correctly noted and until recently its identity has been understandably confusing. However, it contains two key details in the first lines of the description that in combination identify the species group to which the species belongs, confidently setting it apart from all other Neotropical *Myotis* species. “Fur short, cinnamon above and the color of rum below. The wing membrane, and that which goes to the end of the tail originates from the tarsal joint”.

*Myotis midastacus* Moratelli & Wilson, 2014 is a recently-described Vespertilionid bat long confused with the similar *Myotis simus* Thomas, 1901 (and contributing to the variation observed in that species by López-González et al. 2001). According to the original description of *M. midastacus*, the species is distinguished from all other New World congeners by the following characters: plagiopatagium attached to the foot by a narrow band of membrane (< 1.5 mm; as per figure 1B in López-González et al. 2001: 141) and its extremely short, woolly, golden-yellow fur (Moratelli and Wilson 2014). *Myotis* cf. *simus*, a very similar species also occurs in Argentina and Paraguay, this being marginally smaller than *M. midastacus*, having the narrow band of membrane ca. 1.5 mm wide (as in figure 1C in López-González et al. 2001: 141), and slightly darker and duller dorsal and ventral coloration.

In addition to the presence of these diagnostic elements in Azara’s description, the illustrations of *M. midastacus* and *M. cf. simus* in the original description (Moratelli and Wilson 2014: E19; figures 2, 3) show dorsal colorations that might justifiably be called “cinnamon above and the color of rum below” (Azara), a slightly protruding snout and

<sup>1</sup>The French translation of the Spanish word caña (sugar cane or rum) uses the term roseau. In English this would be equivalent to reed or bull-rush, but it is not the meaning intended by Azara.

**Table 1.** Comparative measurements for Murciélago Acanelado of Azara (1802: 308–309) (converted into mm), *Myotis midastacus* and *Myotis cf. simus* (taken from Moratelli et al. 2015) and *Myotis ruber* (taken from López-González 2005).

Measurements	“Murciélago Acanelado”	<i>Myotis midastacus</i> (N = 13 from Bolivia and Paraguay)	<i>Myotis cf. simus</i> (N = 4 from Argentina)	<i>Myotis ruber</i> (N = 6 from Paraguay)
Length	83.5 mm	86–100 mm	83–93 mm	91–95 mm
Tail	29.3 mm	36–41 mm	30–40 mm	41–42 mm
Wing span	248.1 mm	NA	NA	NA
Ear	12.4 mm	12–15 mm	12–13 mm	14–17 mm

a long, pointed tragus shaped like an awl. Whilst it may be argued that strictly the plagiopatagium of these species is attached to the foot and not the tarsal joint, the membrane which attaches it (<1.5 mm wide) is unlikely to have been obvious using late 18<sup>th</sup> or early 19<sup>th</sup> century observation equipment, and the general impression of this species is that the membrane joins the limbs at the tarsal joint (figure 1B, C in López-González et al. 2001: 141).

Azara’s description of the skull provides discrepancies with *Myotis*, stating that there is a single pair of incisors in the upper mandible and two pairs of incisors in the lower mandible. This is clearly an error (as no members of the genus have this dental formula) and is probably rooted in the extremely small size of these incisors resulting in undercounting. Uncertainty on the part of the author is in fact suggested in the text “Below **it seems** there are two incisors on each side, and then the canines” [emphasis mine]. Comparative measurements are provided in Table 1. Whilst these are a close match for both *M. midastacus* and *M. cf. simus* (arguably marginally favoring the latter) they are purely external and thus should be considered non diagnostic.

*Myotis midastacus* was confirmed to occur in Paraguay by Moratelli et al. (2015) and in the context of the Paraguayan bat fauna, is a highly distinctive species confusable only with *M. cf. simus* (see López-González et al. 2001, Moratelli and Wilson 2014, Moratelli et al. 2015). Known Paraguayan specimens of *M. midastacus* are from Presidente Hayes department, in the Humid Chaco, west of the Paraguay River. Known Paraguayan specimens of *M. cf. simus* are from Cordillera and Misiones departments in the Humid Chaco east of the Paraguay River. Which of these two species Azara had in his possession can probably be never conclusively determined, but it seems that there is little doubt that the “Murciélago Acanelado” refers to one of these two species. However, in the absence of the discovery of Azara’s type specimen (which is apparently lost) the identity of the description of the “Murciélago Acanelado” has no bearing on nomenclature. LaVal’s (1973) neotype designation fixes the name *M. ruber* to the species to which it currently applies.

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#### Competing Interests

The author have declared that no competing interests exist.

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Appendix 1. Reproduction (including original grammar) of the original Spanish text of the “Murciélago Acanelado” of Azara (1802: 308–309).

LXXXII

#### DEL ACANELADO

Longitud 3 1/12 pulgadas: cola 1 1/12: braza 9 1/6. Pelo corto, acanelado arriba y color de caña debaxo. La membrana del ala, y la que va al fin de la cola nacen de la coyuntura del tarso. Oreja muy aguda, alta 5 1/2 líneas. Y dentro otra larguita estrecha, aguda como punzon. Hocico algo agudo, con la mitad superior poco avanzada. Arriba un incisivo en cada lado, quedando un portillo en medio, y despues están los colmillos. Abaxo parece hay dos incisivos juntos, y luego los colmillos. El miembro suelto, y los testículos fuera del cuerpo, con separacion uno de otro, pegados á los lados de la cola, y envueltos en la membrana que está.

Appendix 2. Reproduction (including original grammar) of the original French text of the “Chauve-souris onzieme” or “Chauve-souris canella” (1801: 292–293).

Longueur, 3 pouces 1 ligne (8 centimètres 1 cinquième).

Queue, 13 lignes (près de 3 centimètres).

Envergure, 9 pouces 2 lignes (près de 25 centimètres).

Le poil est court, cannelle en-haut, et de la couleur du roseau en-bas.

Les membranes de l'aile et celle que va à l'extrémité de la queue, naissent à l'articulation du tarse.

L'oreille est très-aiguë, haute de 5 lignes et demie (12 millimètres), et en – dedans en este une autre *longuette*, étroite et aiguë comme un poinçon.

Les narines sont comme dans les Chauve-Souris précédentes. Le museau est un peu aigu, et la moitié supérieure est un peu avancée.

Dans la mâchoire d'en-haut, est une incisive de chaque côté, laissant un espace au milieu; ensuite vient une canine.

En-bas, il paroît y avoir deux incisives réunies, et tout de suite deux canines.

Le membre est pendant, et les testicules sont hors du corp, séparés l'un de l'autre, collés sur les côtés de la queue, et enveloppés dans la membrane de celle-ci.