

**Noteworthy records of *Lionycteris spurrelli*
(Chiroptera: Phyllostomidae) (Thomas 1913) from British Guiana and Colombia**

**Registros notables de *Lionycteris spurrelli*
(Chiroptera: Phyllostomidae) (Thomas 1913) de la Guayana Británica y Colombia**

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Abstract

We introduce a new record of the nectarivorous bat *Lionycteris spurrelli* Thomas (1913), collected in Pacurita, 64 km south from the type locality of the species in Condoto, department of Chocó, Colombia. In addition, we describe a divergent morphotype of *L. spurrelli* from East Berbice-Corentyne, British Guiana characterized by an abnormality in the orientation of upper and lower dental pieces and finally comments on the significance of the herein presented records are included.

Keywords: New records; *Lionycteris spurrelli*; Pacurita; Chocó; East Berbice-Corentyne; British Guiana.

Resumen

Se presenta un nuevo registro del murciélago nectarívoro *Lionycteris spurrelli* (Thomas 1913) colectado en el corregimiento de Pacurita, departamento del Chocó a 64 km al sur de la localidad tipo de la especie en el municipio de Condoto, departamento del Chocó, Colombia. Adicionalmente, se describe un morfotipo divergente de *L. spurrelli* proveniente de East Berbice-Corentyne, Guayana Británica caracterizado por una malformación en la orientación de las piezas dentales superiores e inferiores y finalmente se incluyen comentarios sobre la importancia de los registros que aquí se presentan.

Palabras clave: Nuevos registros; *Lionycteris spurrelli*; Pacurita; Chocó; East Berbice-Corentyne; Guayana Británica.

Introduction

Lionycteris is recognized as a monotypic bat genus in the subfamily Lonchophyllinae (Baker *et al.* 2003, Griffiths and Gardner 2007) which also includes the genera *Lonchophylla*, *Platalina*, and the recently described genus *Xeronycteris* all of them having specializations for nectarivory. *Lionycteris spurrelli* was originally described by Thomas (1913) based on a single juvenile individual with milk dentition, BMNH 13.8.10.1 from Condoto (misspelled on tag of holotype as «Condota»), 70 masl; department of Chocó; Colombia. The biogeographic Chocó has been suggested as a *hot-spot* of diversity, as well as a center of diversification for the subfamily

Lonchophyllinae (Mantilla-Meluk 2007, Mantilla-Meluk *et al.* 2009). Seven lonchophylline bats, two of them endemic to the biogeographic Chocó (*) (*Lonchophylla cadenai**, *L. chocoana**, *L. handleyi*, *L. mordax*, *L. orcesi*, *L. thomasi*, and *Lionycteris spurrelli*) have been reported for the región (*Lonchophylla cadenai**, *L. chocoana**, *L. handleyi*, *L. mordax*, *L. orcesi*, *L. thomasi*, and *Lionycteris spurrelli*) (Mantilla-Meluk and Jiménez-Ortega 2006; Woodman and Timm 2006), representing 53% (7/13) of the known diversity in the subfamily. The central portion of the biogeographic Chocó, from where *L. spurrelli* was described (Thomas 1913), is characterized by hyper humid rainforests developed under precipitation regimens of more than

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12,000 mm/yr (Rangel 2004). This particular area of the biogeographic Chocó, as well as these unique hyperhumid environments are geographically isolated by the Western cordillera which runs parallel to the Pacific coast of these two countries. In addition, the hyper-humid environments at the central Chocó disrupt the continuity of the xerophytic forest typically found along the Pacific coasts of Central America and western Ecuador, posing the hypothesis of some level of biogeographic isolation of its fauna.

New Chocoan record of *Lionycteris spurrelli*.

Lionycteris spurrelli is widely distributed in the neotropics occurring in a variety of lowland forests in Central and South America from eastern Panamá to Brazil (Simmons 2005). Although no geographic variants have been described within this taxon, preliminary molecular analyses on *Lonchophylline* *cyt-b* gene variation (Dávalos and Jansa 2004), showed evidence of some

degree of genetic differentiation among populations of *L. spurrelli* in both sides of the Andean system from Panamá and Perú, suggesting the presence of more than one evolutionary lineage within the genus. Since the description of *L. spurrelli* was based on a juvenile individual, material representing adult specimens from its type locality is of great interest in order to properly evaluate, quantify and understand the taxonomic significance of *L. spurrelli* morphological variation across its geographic range and the potential existence of cryptic diversity within this taxon. Besides its holotype, Chocoan specimens of *L. spurrelli* are scarce in museum collections. In their revision of the Chocoan chiropterofauna, Mantilla-Meluk and Jiménez-Ortega (2006) mentioned only one Chocoan specimen of *L. spurrelli* collected in Terrón, central Chocó 79 km south west from the type locality of the species and deposited at the Colección Mastozoológica del Chocó (Figures 1, 2

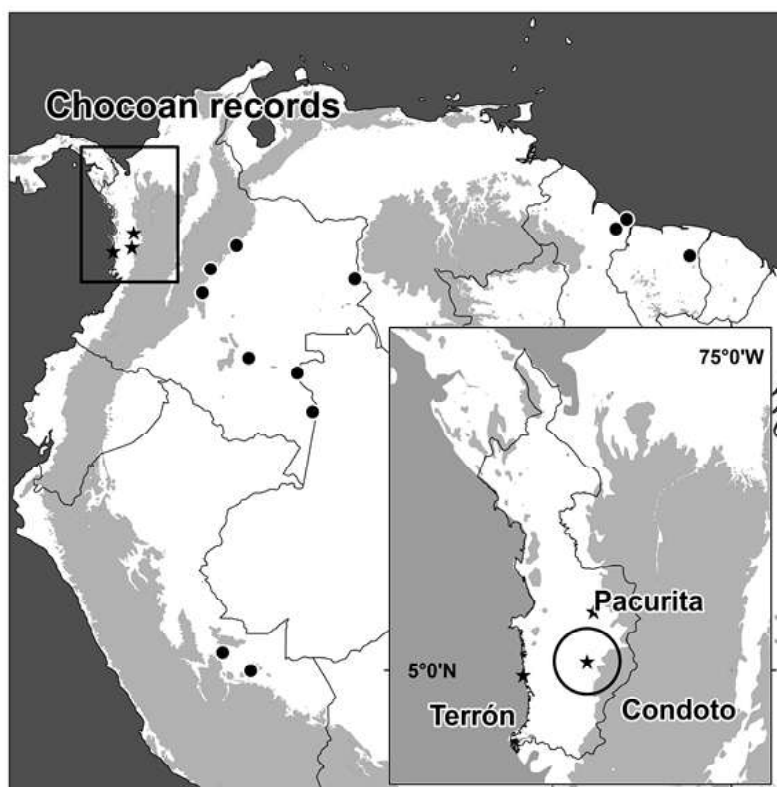


Figure 1. Sampling localities of directly analyzed records of *Lionycteris* (Appendix I) and chocoan localities including Pacurita (CMCH 758), Terrón (CMCH 058) and type locality of the species in Condoto (BMNH 13.8.10.1).



Figure 2. Skulls of chocoan *Lionycteris spurrelli* from a,c) Terrón, Bajo Baudó CMCH 58 and b,d) Pacurita, Quibdó CMCH708.

and Table 1). We introduced a new Chocoan record of *L. spurrelli* represented by an adult female specimen identified with field number CMCH825 (Figures 2, 3), collected at a stratified primary forest, located on the upper waters of quebrada La Honda, locality of Pacurita ($76^{\circ}34'34.08''\text{W}$; $5^{\circ}40'11.34''\text{N}$; 53 masl), 64 km north to the type locality of the species in Condoto, Chocó ($76^{\circ}38'35.71''\text{W}$; $5^{\circ}4'26.77''\text{N}$) (Thomas 1913) (Figure 1). Pacurita is located at the central rainforest on the Atrato valley, close to the city of Quibdó. The central part of the Colombian Chocó encloses the highest levels of precipitation of the Pacific corridor as well as one of the most diverse plant formations on the planet (Cuatrecasas 1958, Forero and Gentry 1989).

Figure 3. Skin of *Lionycteris spurrelli* voucher specimen CMCH708 from Pacurita, Quibdó, Colombia.



Table 1. Comparative morphometrics for *Lionycteris spurrelli*

Source	Sex	FA	GSL	CB	PL	PO	ZB	BB	MB	TR	M-M	ML	MTR	CH
Holotype BMNH 13.8.10.1														
juvenile, Carter and Dolan (1978)	Male	32.8(1)	18.9(1)	17.6(1)	8.8(1)	4.3(1)	-	8.0(1)	8.0(1)	7.3(1)	3.1(1)	12.1(1)	6.2(1)	-
CMCH58*	Female	-	19.69(1)	18.31(1)	9.45(1)	3.85(1)	8.24(1)	8.31(1)	8.38(1)	6.49(1)	5.30(1)	-	6.49(1)	-
CMCH708*	Female	-	19.24(1)	18.11(1)	9.22(1)	3.79(1)	7.93(1)	7.91(1)	7.70(1)	6.40(1)	5.11(1)	12.57(1)	6.68(1)	3.58(1)
FMNH48382*	Male	-	19.26(1)	18.01(1)	8.93(1)	4.14(1)	8.3(1)	8.11(1)	7.65(1)	6.09(1)	4.96(1)	-	6.06(1)	-
ICN, CMCH, FMNH*	Females													
	& Males	36.04(17)	20.83(17)	18.86(17)	9.41(17)	4.2(17)	8.48(17)	8.22(17)	8.07(17)	5.17(17)	6.57(17)	12.8(17)	6.63(17)	3.6(17)
MMD4560 - Diaz (2011)	Male	34.83(1)	19.82(1)	18.31(1)	8.86(1)	-	8.62(1)	8.81(1)	-	-	5.32(1)	13.21(1)	-	-
USNM-Woodman y Timm (2006)	Females													
	& Males	35.0±0.9	20.1±0.4	18.3±0.5	9.1±0.3	3.9±0.1	8.7±0.2	8.2±0.1	8.5±0.2	5.2±0.1	5.2±0.1	12.8±0.4	6.6±0.2	3.7±0.2
MZUSP-Gregorin and Ditchfield (2005)	Males	[33.4-37.5]	[19.0-20.7]	[17.1-19.2]	[8.3-9.7]	[3.7-4.1]	[8.4-9.2]	[8.0-8.5]	[8.0-8.7]	[4.9-5.5]	[4.9-5.5]	[12.0-13.4]	[6.2-6.9]	[3.4-4.1]
		35.44±0.76	20.28±0.21	19.02±0.39	10.23±0.24	-	8.17±0.15	-	-	4.98±0.20	4.98±0.20	13.65±0.37	-	-
Taddei et al. (1978) in Gregorin & Ditchfield (2005)	Females	[34.50-36.70](9)	[19.35-20.67](8)	[18.17-19.43](8)	[9.68-10.60](8)	-	-	[8.00-8.38](6)	-	-	[4.62-5.28](8)	[12.88-13.99](8)	-	-
		35.00±1.24	19.6(1)	18.00(1)	8.80(1)	-	-	8.20±0.28	-	-	5.05±0.21	13.05±0.21	-	-
		[33.60-36.00](3)						[8.00-8.40](2)			[4.90-5.20](2)	[12.90-13.2](2)		

Upper line is mean ± SD; lower line indicates range between [] with sample size in (); * indicates specimens examined. Measurements are given in millimeters. Acronyms: BMNH (British Museum of Natural History) CMCH (Colección Mastozoológica del Chocó) FMNH (Field Museum of Natural History), ICN (Instituto de Ciencias Naturales) MMD (personal catalogue of María Mónica Diaz) USNM (National Museum Smithsonian Institution), MZUSP (Museu de Zoologia da Universidade de São Paulo).

Previous studies on plant composition conducted at the sampling locality showed that up to 634 plant elements of more than 10 cm of diameter could be found in a Ha (unpublished data). Average temperature in the region is 20°C, with 84% of relative humidity and 8.558 mm/yr of precipitation (Rangel and Lowy 1993, Eslava 1994). The sampling site is characterized by woody elements, palms and lianas primarily in the families: Sapotaceae, Annonaceae, Moraceae, Melastomataceae, Arecaceae, Clusiaceae, Myristicaceae, Bombacaceae y Lauraceae. At the collecting locality of the newly introduced record CMCH825 of *L. spurrelli*, 24 other bat species were documented. Bat species collected at Pacurita and number of captures is presented in Table 2. Based on its frequency of capture we consider *L. spurrelli* as a rare species in the area. Only one *L. spurrelli* was obtained out of 255 bat specimens collected at the sampling site. At the collecting site, two other Lonchophylline bats were found also in low frequencies including *Lonchophylla thomasi* (N=3) and *L. robusta* (N=1). Two other non-lonchophylline nectarivorous bat species were also documented in our sample: *Choeroniscus periosus* and *Lichonycteris obscura*, represented by only one capture (Table 2).

Description of *Lionycteris spurrelli* specimen CMCH825. Specimen preserved as skin and skull and associated tissues in alcohol 90% (liver). Measurements of specimen CMCH825 are presented in Table 1. Although *L. spurrelli* specimen CMCH825 falls within the morphometric ranges previously reported for the species (Carter and Dolan 1978, Gregorin and Ditchfield 2005, Woodman and Timm 2006, Diaz 2011) it has an overall small size among records included in this work (directly analyzed specimens, Appendix I and records reported in the cited literature).

Specimen CMCH825 is characterized by a laterally compressed skull with the smallest values reported for zygomatic breadth (ZB), braincase breadth (BB), and mastoid breadth (MB) (Table 1).

Divergent morphotype in *L. spurrelli* from British Guiana. As part of our interest in documenting Chocoan material deposited in museums out of the country, as well as determining the level of morphological variation of Chocoan specimens deposited in the Colección Mastozoológica del Chocó, we directly analyzed material of *L. spurrelli* deposited at the Field Museum of Natural History (FMNH). The corresponding author had the opportunity to analyze a specimen from East Berbice-Corentyne, British Guiana which represents a distinct morphotype of *L. spurrelli* characterized by an abnormality in the orientation (angle) of growth of the frontal dental pieces (upper inner and lateral incisors and lower canines) we consider this specimen worth of a note. The specimen is an adult male identified with catalogue number FMNH 48382 preserved as skull with body in fluid. Skull in good condition, but mandible incomplete (Figure 4). *Lionycteris spurrelli* specimen FMNH 48382 was collected in East Berbice-Corentyne, British Guiana (05°50'25.93" N, 57°28'20.03" W) (Figure 1). In *norma frontalis* skull of specimen FMNH 48382 shows a short and strongly inflated rostrum specially above M1 (Figure 4); lateral outlines of the rostrum strongly convex; postorbital region slightly inflated; lacking of lateral projections; posterior margin of infraorbital foramen not projecting beyond the lateral outline of the rostrum, anterior edge of the upper canine convexly rounded; in *Norma lateralis* the specimen has its inner and lateral incisors oriented perpendicularly with respect to the palatal axis (Figure 5); posterior margin of the orbital foramen above posterior root of P4; short canines; high and subequal P3 and P4; in *Norma*

Table 2. Bat species collected at quebrada La Honda, locality of Pacurita, Quibdó, Chocó, Colombia*

Species	Abundance
<i>Artibeus lituratus</i>	45
<i>Artibeus obscurus</i>	13
<i>Carollia benkeithi</i>	5
<i>Carollia brevicauda</i>	14
<i>Carollia castanea</i>	33
<i>Carollia monohernandezi</i>	3
<i>Carollia perspicillata</i>	27
<i>Chiroderma trinitratum</i>	8
<i>Choeroniscus periosus</i>	1
<i>Dermanura anderseni</i>	1
<i>Dermanura cinerea</i>	1
<i>Dermanura glauca</i>	10
<i>Dermanura phaeotis</i>	15
<i>Dermanura watsoni</i>	44
<i>Lichonycteris obscura</i>	1
<i>Lionycteris spurrelli</i>	1
<i>Lonchophylla robusta</i>	1
<i>Lonchophylla thomasi</i>	3
<i>Lophostoma silvicolum</i>	1
<i>Messophylla macconnelli</i>	3
<i>Mimon crenulatum</i>	1
<i>Phyllostomus discolor</i>	1
<i>Platyrrhinus chocoensis</i>	2
<i>Platyrrhinus helleri</i>	2
<i>Rhinophylla alethina</i>	9
<i>Uroderma bilobatum</i>	1
<i>Vampyressa thylene</i>	3
<i>Vampyriscus nymphaea</i>	6
Total	255

*76°34'34.08"W; 5°40'11.34"N; 53 masl

ventralis the specimen has an obvious gap between I1 and I2; P3 and P4 short and triangular rather than elongate and laterally compressed; upper molars large and subquadrate with anterior and lateral borders nearly straight, forming a ca. 90° angle; posteromedial edge of palate anterior to the optic foramen, mesopterygoid fossa long, open, and W-shaped anteriorly; me-

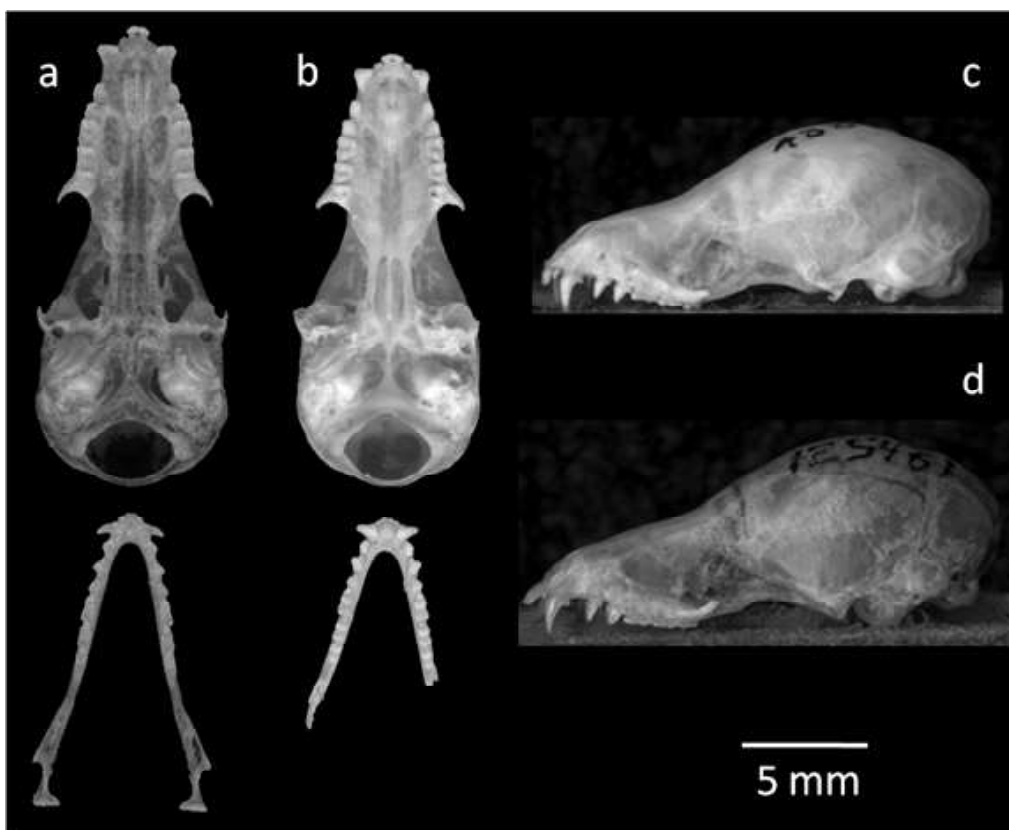


Figure 4. *Lionycteris spurrelli* from Peru. FMNH 125461(a, d), and *L. spurrelli* divergent morphotype of East Berbice-Corentyne, British Guiana FMNH 48382 (b, c).

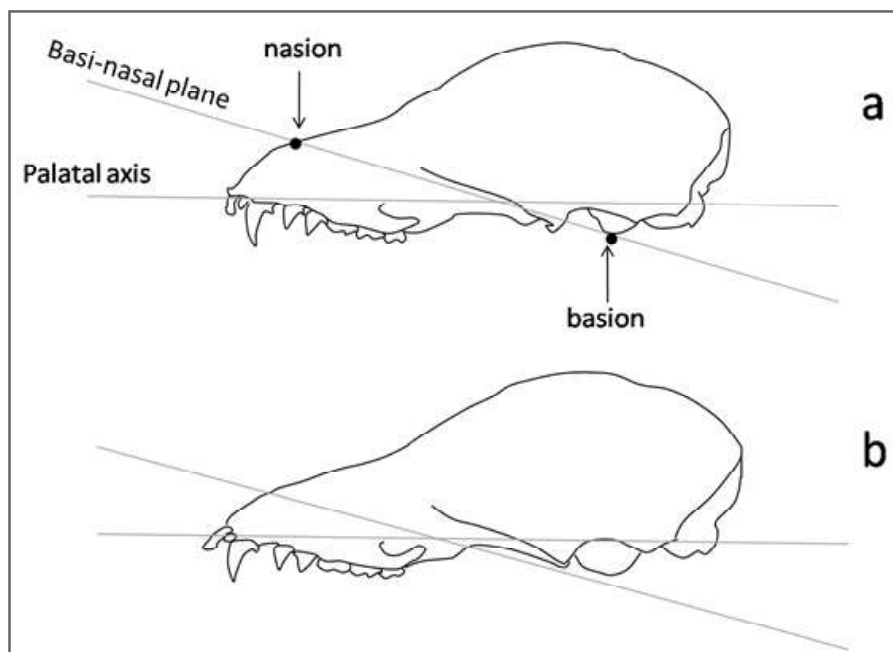


Figure 5. Lateral profiles of: a) *L. spurrelli* divergent morphotype of East Berbice-Corentyne, British Guiana and b) *L. spurrelli* typical morphology, showing differences in the amplitude of the angle formed by the basi-nasal plane and the palatal axis.

dian or peninsular projection of the palate extended posteriorly into the mesopterygoid fossa; posterolateral borders of the dental palate smooth; posterygoid process straight, narrow, and uninflated; basisphenoid pits shallow and broad; coronoid process high; p2 and p3 projected anteriorly; well defined posterior cusps on p2 and p3; lower canines straight and projected laterally. In *Norma ventralis*, the lower canines appear to be projected forward, opposing the typical orientation backwards of lower canines in all analyzed specimens (including other genera in the subfamily: *Lonchophylla*, *Platalina* and *Xeronycteris*) (Figure 4). Specimen FMNH 48382 is among the smaller analyzed specimens in all measurements, closer in size to specimens CMCH825 and CMCH58 from the department of Chocó (Table 1). Specimen FMNH 48382 has a short rostrum, greater basi-nasal angle; enlarged postorbital region without projections; the inner and lateral incisors not projected anteriorly, an obvious gap between I1 and I2; and lower canines straight and projected anterior-laterally.

Significance of the reported *L. spurrelli*. *Lionycteris spurrelli*, was described based on a single juvenile individual with presence of milk dentition (Thomas 1913). Although the International Commission on Zoological Nomenclature (ICZN) (1999) does not prevent in any of its articles and/or recommendation descriptions of new taxa based on a single specimen, and the article 17.3 in the ICZN approves the use of specimens at different stages of development in their life cycles as holotypes, the lack of a type series including adult specimens imposes limitations to evaluate the evolutionary meaning of the existing morphological variation across *Lionycteris* distributional range and makes difficult to validate taxonomic hypothesis such as the assignation of proper names to recently documented diversity within the genus such as the divergent clades from Panamá and Perú obtained in the molecular work of Dávalos and Jansa (2004)

which differ in more than 4% in their sequences of cyt-b gen. In general, most of the descriptions published by Thomas correspond to short documents; some of them not longer than half of a page and the description of *L. spurrelli* is not the exception. Although the species is widely distributed in Central and South America, museum records of *L. spurrelli* from Colombia, and particularly from the department of Chocó are rare. Records of *L. spurrelli* from el Chocó only consist of the holotype from Condoto (Thomas 1913), a record from Terrón (Mantilla-Meluk and Jiménez-Ortega 2006), and the herein presented record from Pacurita. Although the herein reported record was not collected at the type locality of the species it belongs to the same biogeographic district, Atrato-San Juan, as defined by Hernández-Camacho *et al.* (1992) and we consider it useful for future comparisons.

Within the analyzed material major changes in morphology were observed in specimen FMNH 48382, from East Berbice-Corentyne related with the orientation of its dental pieces. Thomas (1913) pointed on the highly specialized morphology of the incisors and premolars of *Lionycteris* in comparison with the primitive nature of their molars. The projected orientation of the incisors parallel to the palatal axis is one of the diagnostic features of the subfamily (*Lionycteris*, *Lonchophylla*, *Platalina*, and *Xeronycteris*). The conservative nature of the protrusion of the incisors in all members of the subfamily Lonchophyllinae points on the evolutionary implications of this characteristic and its potential relationship with a specialized type of nectarivory. Specimen FMNH 48382 has a perpendicular orientation of the inner and lateral incisors with respect to the palatal axis, as well as an atypical orientation of the canines forward. Based on the degree of ossification of phalangeal epiphyses and the completeness of ossification of the basisphenoid suture we identified specimen FMNH 48382 as an adult and do not consider the observed changes

as a product of precarious development of the dentition in specimen. However this is not a common malformation; Phillips (1971) studied in detailed the dental abnormalities of nectar-feeding bats within the family Phyllostomidae. In his revision Phillips (1971) included 25 specimens of *L. spurrelli* from Panamá, Venezuela, Guiana, and Brazil, and only reported four cases of hyperdontia for the genus *Lionycteris* in specimen from Brazil, AMNH 97265, 97267, USNM 239477, and Venezuela, USNM 385709. In humans, problems in the orientation of dental pieces have been associated with some cases of achondroplasia caused by punctual mutations that affect early stages of development of the dentition. With the advent of genomics, information like the one presented herein is becoming more important every day because it provides clues to understand the effect of gene expression in an evolutionary context.

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Appendix I

Lionycteris spurrelli.- COLOMBIA: Caqueta, Río Mesay, Puerto Abeja (Tepuy), SE Serranía de Chiribiquete (ICN 14572-82); Casanare, Aguazul, Retén Guadalcanal (ICN 8323); Chocó, Terrón, Bajo Baudó (CMCH 58), Pacurita, Quibdó (CMCH708); Meta, Restrepo, Mina de Upín (ICN 16208); San Juan de Arama, N Serranía de la Macarena, Caño La Curia (ICN 10277); Vaupés, Mitú. Finca Urania (ICN 16956). PERU: Madre de Dios (FMNH 5461). BRITISH GUIANA: East Berbice-Corentyne (FMNH48382).