

New records of bats from the northern region of the Peruvian Amazon

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Abstract: The northern Amazon Basin in Peru is one of the most diverse areas for small mammals in the world. In this work, I present information related to the diversity of bat species in the Amazonian region of Iquitos, Peru, where nearly 60% of the 152 bat species known to Peru recorded. Unlike in previous investigations in this area, bat surveys were designed to detect species living in urban and rural areas. The results have added a new bat species (*Eumops delticus*) to the Peruvian fauna, eight new species for the region around Iquitos (*Peropteryx macrotis*, *Peropteryx pallidoptera*, *Anoura caudifer*, *Lionycteris spurrelli*, *Vampyrum spectrum*, *Thyroptera lavalii*, *Cynomops planirostris*, and *Molossus coibensis*), and a new species for Northeast Peru (*Eumops maurus*).

Key words: Chiroptera; Iquitos; Amazon; Checklist

秘鲁亚马孙北部地区蝙蝠新记录

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摘要: 位于秘鲁的亚马孙盆地北部是世界小型哺乳动物多样性最高的地区之一。该文报道了亚马孙流域在秘鲁伊基托斯的蝙蝠物种多样性: 这里的蝙蝠物种数约占秘鲁已知 152 个蝙蝠物种的 60%。与在该地区之前开展的研究不同, 本次调查范围为城市和农村地区。结果发现 1 个秘鲁新记录(*Eumops delticus*)、8 个伊基托斯新记录(*Peropteryx macrotis*、*Peropteryx pallidoptera*、*Anoura caudifer*、*Lionycteris spurrelli*、*Vampyrum spectrum*、*Thyroptera lavalii*、*Cynomops planirostris* 和 *Molossus coibensis*)和 1 个秘鲁东北部新记录(*Eumops maurus*)。

关键词: 翼手目; 伊基托斯; 亚马孙; 记录

中图分类号: Q959.833; Q959.833.09 文献标志码: A 文章编号: 0254-5853-(2011)02-0168-11

The Amazon Basin covers millions of square kilometers and is characterized by a gradient of increasing diversity from east to west (Emmons, 1984; Voss & Emmons, 1996). The great species richness of the Peruvian Amazon is mainly due to the high heterogeneity that results from a combination of environmental factors, edaphic and ecological conditions, and historical processes (Gentry, 1986; Salo et al, 1986; Kalliola et al, 1993; Tuomisto et al, 1995; Alvarez Alonso, 2002).

Iquitos is a region known worldwide for its high diversity of wildlife species (Gentry, 1988; Rodríguez & Duellman, 1994; Lamar, 1997; Díaz & Willig, 2004), including a high diversity of small mammals (Hice, 2003;

Hice et al, 2004). Approximately 60% of the 152 species of bats in Peru can be found in this region around Iquitos (Pacheco, 2002). As a result of the intensive surveys conducted in this area, several new records of small mammal species have been added to the Iquitos region (Hice & Solari, 2002; Hice, 2003; Angulo & Díaz, 2004; Díaz & Willig, 2004; Hice et al, 2004). The studies of Hice et al (2004) carried out at the Reserva Nacional de Allpahuayo Mishana (25 km west of Iquitos) recorded 65 species of bats that made that area as the second richest area for bats species in Peru, after Parque Nacional de Manu. For other areas located in the Department of Loreto, 63 (Ascorra et al, 1993; Solari et al, 1999) and 57 species of bats (Fleck et al, 2002) were recorded.

Received date: 2010-08-12; Accepted date: 2011-02-28

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收稿日期: 2010-08-12; 接受日期: 2011-02-28

However, those surveys conducted in specific areas focused mainly on natural environments with variable degrees of human impact; they did not include suburban and urban areas. Thus, knowledge about bats of these urban environments was available only from specimens collected occasionally or found accidentally in towns (Avila-Flores & Fenton, 2005). Although the urbanization processes may have harmful effects on bats, leading to dramatic declines in diversity and abundance (Avila-Flores & Fenton, 2005; Oprea et al, 2009), it should be noted that they also provide shelter as well as food. Some species benefit from the concentrations of insects clustered around streetlights (Fenton, 1997; Everette et al, 2001). For these reasons, I decided to intensify collection efforts in urban and suburban areas, resulting in the inclusion of several species new to this area, as well as several new species for Peru.

1 Materials and Methods

The species reported here were collected from December 2002 to December 2006, at 14 collecting sites along the Iquitos-Nauta Highway (see Appendix I, Fig. 1), which passes through several districts of the Province of Maynas, Loreto Department. The overall study area is located in the “Iquitos region” (as referred to by Ortiz-S,

1997) and includes the northeastern Amazon Basin of Peru, and the adjacent part of southern Colombia. The region is dissected by several rivers and streams, and the elevation ranges from 100 to 220 m, with low-lying areas characterized by flooded forests (igapo) and higher areas supporting white sand forests (varillal) and upland forests (monte alto) (Ruokolainen & Tuomisto, 1993; Willig et al, 2007). The climate is relatively uniform, warm (average annual temperatures between 25 - 27°C), humid (annual mean humidity 85%), and rainy (annual mean precipitation 2700 mm) (Encarnación, 1985; Tafur Rengifo, 2001).

The study sites included primary and secondary forests, as well as rural, suburban, and urban areas. All bats were captured with mist nets placed at different heights, from the ground up to the sub-canopy and canopy levels. Nets were set from 18:00 h until 01:00 h and were checked every hour. Some specimens were collected by searching diurnal roosts in tree cavities, foliage, culverts, and buildings, among other places.

Total capture effort was 60,552 net-meter-hours, and the capture effort by habitat was 13,806 net-meter-hours for primary forest, 16,890 for secondary forest, 12,648 for urban areas, 12,900 for rural areas, 1,812 for suburban areas, 720 for primary-secondary forest ecotones and 1,776 for secondary forest-rural area ecotones. A total of 5,510 specimens were captured, from which 3,436 were collected and 2,089 released. Of the total, 5,270 were captured in mist nets and 255 were captured in roosts.

External measurements, body mass, sex, and reproductive condition were recorded in the field for all specimens, following Díaz et al (1998). Voucher specimens were prepared as skins and skeletons or stored in alcohol. The specimens are still being catalogued. A portion of the specimens will be deposited at the Museo de Historia Natural, Universidad Nacional Mayor de San Marcos (UNMSM), Lima, Peru, and another portion will be deposited at the Colección Mamíferos Lillo (CML), Tucumán, Argentina. The acronyms used in the text are MMD (personal catalogue of María Mónica Díaz) and CML (Colección Mamíferos Lillo).

The external measurements were taken from fresh specimens using a ruler, and forearm and cranial measurements were taken with a digital caliper to the nearest 0.05 mm. All measurements were taken as described by Barquez et al (1999), but I add the condyle-incisive length, measured as the distance from the

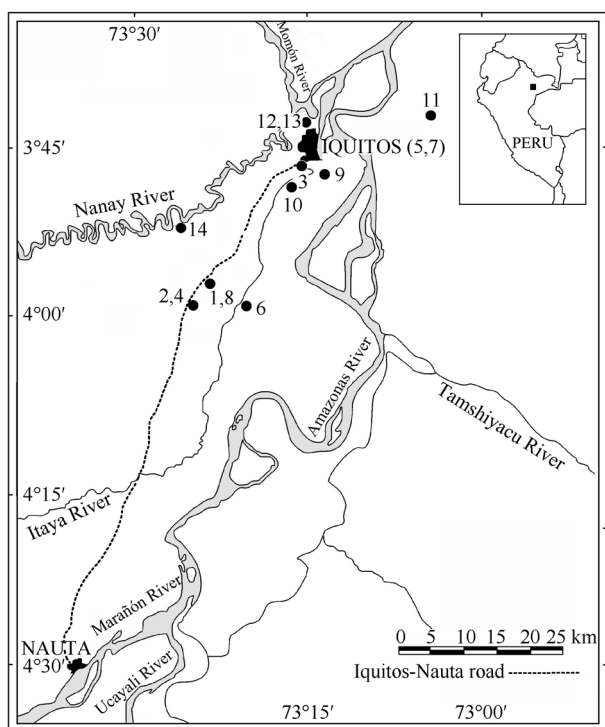


Fig. 1 Map of localities for collected bats (see details of localities in the Appendix I).

Map modified from Kalliola & Flores Paitán (1998).

anteriormost plane of the upper incisors back to the posteriormost projection of the occipital condyles. The measurements and their abbreviations are as follows: total length (ToL), tail length (TL), hindfoot length (HFL), ear length (EL), forearm length (FA), weight (W), body mass in grams, greatest length of skull (GLS), condyle-incisive length (CIL), breadth of braincase (BB), least interorbital breadth (LIB), postorbital constriction (PC), zygomatic breadth (ZB), mastoidal breadth (MB), palatal length (PL), length of maxillary tooththrow (LMxT), width across upper canines (C-C), width across upper molars (M-M), length of mandible (LM), and length of mandibular tooththrow (LMdT).

The Specimens Examined indicates the amount of individuals collected per locality, their sex and their catalogue numbers. Additional Records are given for some species when they were registered in a nearby locality. Under Remarks, some general comments are added, mainly related to field, systematic, or distributional observations, as well as activity and habitat. The new records are explained in the species accounts.

2 Results

The intensive mist-netting and searching for bats in roosts, conducted over nearly five years, has allowed for the extension of the previously known distributions for ten species (families Emballonuridae, Phyllostomidae, and Molossidae), including nine species new to the region and one new species for Peru. For each species, the general distribution is mentioned.

SPECIES ACCOUNTS

ORDER CHIROPTERA

Family Emballonuridae Gervais, 1855

Peropteryx macrotis (Wagner, 1843)

Distribution This species has a wide distribution from southern Mexico south to Bolivia and Paraguay (Hood & Gardner, 2007).

Specimens Examined (1) QUITOS: Iquitos, Edificio EsSalud (calles Raymondi-Napo), 1 female (MMD 4875).

Additional Records Puerto Indiana, Amazon River (not examined), collected in 1926 by Olalla and sons, and deposited at the American Museum of Natural History (AMNH), New York.

Remarks The only specimen was collected in downtown Iquitos near dusk, at 6:00 pm on the 5th of July 2005, in a mist net placed in the 10th floor of a building. It was a pregnant female with a fetus of Crown Rump (CR) length of 12 mm. In the same building,

several specimens of *Myotis albescens* and *Molossus coibensis* were collected.

This species is distributed throughout the Peruvian Amazon. Although previously there were no specimens cited from the town of Iquitos, its presence was probable, as mentioned by Hice et al (2004) for the Reserva Nacional Allpahuayo-Mishana.

The measurements of the specimen from Iquitos (Tab. 1) are in the upper limits for the species, compared with the measurements given by Sanborn (1937), Goodwin & Greenhall (1961), and Willig (1983).

Peropteryx pallidoptera Lim et al, 2010

Distribution This species was recently described by Lim et al (2010) and was known only from three localities in Ecuador and Peru.

Specimens Examined (5) SAN JUAN: Camino a El Paujil, 1.8 km al W del km 35 de la carretera Iquitos-Nauta, 5 females (MMD 3530, 3531, 3532, 3533, 3534).

Remarks This species was found in primary lowland forests and all the specimens from Peru, cited by Lim et al (2010), were captured in their roosts. They were long ago deposited in collections; the one from Orosa was collected in 1926 by the Olalla brothers and was deposited at the AMNH. The 17 specimens from the second locality in Peru (Río Gálvez) were collected in 1998 and 1999, and later deposited at AMNH and at the MHNSM, Lima, Peru, evidencing the similarity of this species with the other “transparent wings *Peropteryx*” (*P. leucoptera*).

The specimens indicated here in “Specimens Examined” were also collected during the day in their roosts on the 13th of July 2004 in a primary forest (but close to a deforested area). This new record represents the third locality for the distribution of the species in Peru and is located about 160 km equidistant from the other two localities. All of the specimens were females and there were four adults and one juvenile. The adults had large mammae and two of them were pregnant, one with two fetuses (CR = 7 mm) and the other with a single embryo (CR = 7 mm). Females generally give birth to a single offspring (Yee, 2000).

The roost was a large cavity on the ground, transversed by many roots of several trees, and was probably excavated by the effects of water (e.g., erosion; Fig. 2). The roost was shared with a male specimen of *Carollia brevicauda*.

The most outstanding characters of *P. pallidoptera*

Tab. 1 External and cranial measurements (acronyms are explained in Materials and Methods). The measurements, or ranges for each measurement, are shown, and then the number of specimens examined (in parentheses) is indicated

	<i>Peropteryx macrotis</i>	<i>Peropteryx pallidoptera</i>	<i>Anoura caudifer</i>	<i>Lionycteris spurrelli</i>	<i>Vampyrum spectrum</i>	<i>Thyroptera lavalii</i>	<i>Cynomops planirostris</i>	<i>Eumops delticus</i>	<i>Eumops maurus</i>	<i>Molossus coibensis</i>
ToL	67 (1)	60–65 (4)	65 (1)	70 (1)	147–148 (2)	75 (1)	81–83 (3)	110 (1)	122 (1)	90–109 (15)
TL	15 (1)	11–13 (4)	5 (1)	7 (1)	0 (2)	30 (1)	26–27 (3)	45 (1)	49 (1)	27–40 (15)
HFL	10 (1)	8–9 (4)	12 (1)	11 (1)	30–31 (2)	5 (1)	8–9 (3)	10 (1)	12 (1)	10–12 (15)
EL	17 (1)	14–15 (4)	14 (1)	13 (1)	42–45 (2)	14 (1)	14–15 (3)	22 (1)	22 (1)	12–14 (15)
W	6.75 (1)	4.75–6 (4)	9 (1)	7 (1)	158–182 (2)	5 (1)	9.00–10.25 (3)	14.75 (1)	24 (1)	11.50–21.00 (15)
FA	46.31 (1)	40.21–42.75 (4)	35.29 (1)	34.83 (1)	114.40–118.22 (2)	39 (1)	30.51–31.77 (3)	47.68 (1)	55.45 (1)	34.54–37.70 (15)
GLS	14.54 (1)	13.46–13.97 (2)	21.31 (1)	19.82 (1)	–	15.43 (1)	15.59 (1)	18.38 (1)	19.97 (1)	15.41–16.44 (3)
CIL	13.47 (1)	12.47–12.86 (2)	20.97 (1)	18.31 (1)	–	15.03 (1)	14.85 (1)	18.11 (1)	18.94 (1)	14.42–15.15 (3)
BB	6.79 (1)	6.46–6.76 (2)	8.80 (1)	8.81 (1)	–	7.16 (1)	8.40 (1)	8.78 (1)	10.52 (1)	8.40–9.62 (3)
LIB	4.63 (1)	4.75 (1)	4.62 (1)	3.7 (1)	–	4.42 (1)	–	6.25 (1)	–	–
PC	3.04 (1)	2.87–2.91 (2)	4.65 (1)	3.91 (1)	–	2.96 (1)	4.18 (1)	4.42 (1)	4.27 (1)	3.96–3.97 (3)
ZB	8.45 (1)	8.13–8.63 (2)	9.60 (1)	8.62 (1)	–	8.01 (1)	10.32 (1)	11.08 (1)	12.44 (1)	10.56–10.80 (3)
MB	7.47 (1)	7.14–7.45 (2)	9.32 (1)	8.04 (1)	–	6.99 (1)	9.16 (1)	10.17 (1)	10.99 (1)	9.45–10.26 (3)
PL	4.38 (1)	4.30–4.39 (2)	11.82 (1)	8.86 (1)	–	7.49 (1)	6.74 (1)	7.13 (1)	8.12 (1)	4.70–5.24 (3)
MXTL	5.53 (1)	5.08–5.22 (2)	8.23 (1)	6.57 (1)	–	6.47 (1)	5.78 (1)	6.93 (1)	7.63 (1)	5.69–6.00 (3)
M-M	6.18 (1)	5.93–6.59 (2)	5.77 (1)	5.32 (1)	–	5.72 (1)	6.84 (1)	7.67 (1)	8.32 (1)	7.56–7.96 (3)
C-C	3.86 (1)	3.61–3.71 (2)	3.71 (1)	3.22 (1)	–	3.01 (1)	4.21 (1)	4.42 (1)	5 (1)	4.23–4.39 (3)
LM	9.69 (1)	8.76–9.13 (1)	15.65 (1)	13.21 (1)	–	12.03 (1)	11.66 (1)	13.18 (1)	15.16 (1)	11.27–11.95 (3)
LMdT	5.54 (1)	5.04–5.38 (2)	8.71 (1)	7.02 (1)	–	6.60 (1)	6.27 (1)	7.79 (1)	8.26 (1)	6.33–6.72 (3)

are their pale wings (Fig. 3), separated ears, and the first small peg-like upper premolar; the species can be



Fig. 2 Roost of *Peropteryx pallidoptera*; the arrow points to one of the specimens



Fig. 3 Individual of *Peropteryx pallidoptera* collected at the locality “Camino a El Paujil, 1.8 km al W del km 35 de la carretera Iquitos-Nauta (San Juan)”. Photo M. M. Díaz.

distinguished from *P. leucoptera* by the ears connected by a band, from *P. macrotis* by the color of the wings, and from these two by the first upper molar, which is larger and with an accessory cusp.

Family Phyllostomidae Gray, 1825

Subfamily Glossophaginae Bonaparte, 1845

***Anoura caudifer* (É. Geoffroy Saint-Hilaire, 1818)**

Distribution *Anoura caudifer* is distributed throughout South America in Colombia, Venezuela, Guyana, Surinam, French Guiana, Brazil, Ecuador, Peru, Bolivia, Paraguay, and northern Argentina; its distribution forms a large arc surrounding the central Amazon Basin (Griffiths & Gardner, 2007a).

Specimens Examined (1) SAN JUAN: El Dorado, km 25 de la carretera Iquitos-Nauta, app. 1.5 km al E, 1 male (CML 7557).

Additional records Six specimens from Quebrada Orán, ca. 5 km N Río Amazonas, 85 km NE Iquitos, collected in 1984, are deposited in the Louisiana Museum of Natural History, United States of America. The specimen from San Juan represents the nearest locality to the town of Iquitos, where the species was collected.

Remarks After three years of intensive surveys, only one specimen was captured (in an ecotone between secondary forest and a deforested area) indicating that the abundance of this species is very low in the region. The specimen was an adult male, captured on July 14th 2003 at 10:00 PM during a full moon. At the same mist net, but early in the evening (before moonrise), *Saccopteryx leptura* and *Artibeus (Dermanura) gnomus* were also captured. The specimen of *Anoura caudifer* from San Juan is compared here with the recently described species *A. cadenoi*, and *A. aequatoris* because of the similarity between them. The presence of a tail, and the upper canines without longitudinal sulcus, separate *A. caudifer* from *A. cadenoi*. If compared with *A. aequatoris*, the uropatagium is less furred (see fig. 4b in Mantilla-Meluk & Baker, 2006). The measurements of this specimen (Tab. 1) match perfectly with those recorded by Mantilla-Meluk & Baker (2006) for *A. caudifer*, except for the foot, perhaps reflecting different ways to take the measure.

Subfamily Lonchophyllinae Griffiths, 1982

***Lionycteris spurrelli* Thomas, 1913**

Distribution This species is known from eastern Panama into central Peru and northern Brazil (Griffiths & Gardner, 2007b).

Specimens Examined (1) SAN JUAN: app. 500 m E km 28.8 de la carretera Iquitos-Nauta, 1 male (MMD 4560).

Remarks This species was previously known



Fig. 4 Individual of *Eumops maurus* collected at the locality “Asociación de Viviendas 15 de Mayo (San Juan)”. Photo M. M. Díaz.

from central and southeastern Peru, in Huanuco, Pasco and Cusco departments (Griffiths & Gardner, 2007b). It is here added to the Loreto Department in northeastern Peru. This species is similar to the sympatric *Lonchophylla thomasi*, but *Lionycteris* has a shorter rostrum than any species of *Lonchophylla*; it is even shorter than the braincase. In *Lionycteris*, the upper third and fourth premolars are short and triangular, while the lower third and fourth premolars are trident with the main cusp high and robust (Woodman & Timm, 2006; Griffiths & Gardner, 2007b). The measurements of this specimen coincide with those given by Woodman & Timm (2006).

The only specimen was collected on April 13th 2005 at 10:00 pm, in a mist net set at ground level in primary forest. Other species collected in the same locality were *Artibeus obscurus*, *Carollia brevicauda*, *C. perspicillata*, *Carollia* sp. (“castanea group”), *Mesophylla macconnelli*, *Rhynophylla fisherae*, *R. pumilio*, *Sturnira lilium*, *S. tildae*, *Vampyressa thylene*, and *Myotis riparius*.

Subfamily Phyllostominae Gray, 1825

***Vampyrum spectrum* (Linnaeus, 1758)**

Distribution This species is distributed from Mexico to South America, where it is found in Colombia, Venezuela, Trinidad, Surinam, French Guiana, Ecuador, Brazil, Peru, and Bolivia (Williams & Genoways, 2007).

Specimens Examined (2) SAN JUAN: 1 km E km 25.3 de la carretera Iquitos-Nauta (Fundo San Martín), 1 female (CML 7558); km 25 de la carretera Iquitos-Nauta (Fundo San Martín), 1 female (MMD 5137).

Remarks The two specimens were collected in secondary forest habitat, on May 25th and December 11th 2006; both were adult females with closed vaginas. Twenty-six other species of bats (Emballonuridae, Phyllostomidae, and Vespertilionidae) were collected in the same area. The nearest locality where this species has been previously collected (with voucher specimens) is at Yarinacocha (Ucayali), more than 500 km SW of Iquitos, as cited by Sanborn (1949). Recently Klingbeil & Willig (2009) have mentioned the presence of this species in their study area in southwestern Iquitos, but no voucher specimens, nor a specific locality, were indicated by the authors.

Family Thyropteridae Miller, 1907

***Thyroptera lavalii* Pine, 1993**

Distribution This species has been recorded in Peru, Brazil, Ecuador, and Venezuela (Wilson, 2007).

Specimens Examined (1) SAN JUAN: Zungarococha, 5.4 km al W del km 6 de la carretera Iquitos-Nauta, 1 female (MMD 716).

Remarks The only captured specimen represents the first report of the species for Iquitos, and the northernmost record for Peru. The closest known records are the type locality (Quebrada Esperanza, near the Brazilian border) (Pine, 1993) and Jenaro Herrera (Ascorra et al, 1993) (but cited as *T. discifera* and later re-identified as *T. lavalii* by Solari et al, 2004). Both the characters and the measurements of this specimen correspond with the original description of the species (see Pine, 1993), except for the ear length, which is given as 8 mm in Pine (1993) but is 14 mm in this study. However, Reid et al (2000) indicates a range of 11–13 mm for *T. lavalii*. The specimen from Iquitos was an adult female with a closed vagina. It was collected on December 18th 2002, at 7:00 pm, on a clear and cloudless night with a full moon, in a ground level mist net placed in secondary forest, together with *Carollia perspicillata*, *Lophostoma silvicolum*, and *Artibeus (Dermanura) anderseni*.

Family Molossidae Gervais, 1856

***Cynomops planirostris* (Peters, 1866)**

Distribution This species is found east of the Andes in South America, from Colombia, Venezuela, and the Guianas, south through Peru and Bolivia, and into Paraguay and Argentina (Eger, 2007).

Specimens Examined (3) PUNCHANA: Villa del Ejército (entre Av. 28 Julio-Freyre y calle Piura), 3 females (2 MMD 5010, 5011, 1 CML 7561).

Remarks Although this species has a widespread distribution, there were previously no records for northeastern Peru. The species of *Cynomops* recorded for the area were *Cynomops abrasus*, *C. milleri*, and *C. paranus* (Eger, 2007).

The three specimens examined were collected in an urban area on September 20th, 2005, at 6:30 pm, during a warm and misty night with a full moon. The specimens were trapped in mist nets elevated 2 m above the ground. All were females with developed mammae; one was pregnant with a single fetus of CR=16 mm.

***Eumops delticus* Thomas, 1923**

Distribution The distribution of this species was known from southeastern Colombia and along the Amazon River in Brazil (Eger, 2007). It is here included in Peru.

Specimens Examined (1) SAN JUAN: Piscina Olímpica del Instituto Peruano de Deportes, km 1.5 al W de la carretera Iquitos-Nauta, 1 female (CML 7560).

Remarks *Eumops delticus* was treated as a subspecies of *E. bonariensis* (see Eger, 1977; Simmons, 2005). However Eger (2007), later decided to revalidate its specific level and restrict the distribution of *E. bonariensis* to southern South America, in Brazil, Uruguay, and Argentina. During this study, only one specimen was collected in five years of surveys; this specimen represents the first record of this species for the country. The specimen was a pregnant female, with a fetus of CR=20 mm, collected at 6:30 pm on 9th October 2003. The collecting locality is close to the town of Iquitos in a recreational area. The specimen was captured in an elevated net set between a few palm trees and a swimming pool. *Molossus molossus* was the only other species collected at this location.

***Eumops maurus* (Thomas, 1901)**

Distribution This rare species is known from only a few specimens and localities (see Eger 2007) from Guyana, Surinam, Venezuela, Ecuador (Tirira, 2006; Eger, 2007), and Peru (Luna et al, 2002).

Specimens Examined (1) SAN JUAN: Asociación de Viviendas 15 de Mayo (E Av. Quiñones), 1 female (CML 7559).

Remarks This record widely extends the distribution of this species in Peru and represents the second locality in the country. It was previously known from the Pampas del Heath, Madre de Dios (Pacheco et al, 2009), about 1000 km south of the present record. The specimen was a pregnant female with a CR=27 mm fetus,

captured at 7:30 pm on July 4th, 2005, on a hot day with a clear sky, in a net elevated about 2 m above the ground. The habitat was a suburban area, with a few houses, grasses, flooded grasslands (“gramalotal”), and some yucca plants (manioc), all surrounded by secondary forests. The characters of this specimen are the typical for the species, including a band of white hairs on the ventral surface of the mesopatagium, next to body (Fig. 4). However, the forearm (55.45 mm) is slightly larger than the average for the few known specimens of this species. Other species captured at the same locality were *Carollia perspicillata*, *Platyrrhinus brachycephalus*, and *Uroderma magnirostrum*.

***Molossus coibensis* J. A. Allen, 1904**

Distribution In South America, this species is known from eastern Colombia, Peru, Ecuador, Venezuela, Guyana, French Guiana, and west-central Brazil (Eger, 2007).

Specimens Examined (15) BELEN: Moena Caño, 3 females (MMD 2602, 2604, 2611) and 2 males (MMD 2603, 2625). IQUITOS Colegio Primario Secundario “RADM” (Rosa Agustina Donayre de Morey), calle Putumayo, 3 females (MMD 4336, 4337, 4341) and 1 male (CML 7562); Iquitos, Edificio EsSalud (calles Raymondi-Napo), 4 females (MMD 4864, 4873, 4876, 4878). PUNCHANA: Punchana, Calle Amazonas 1086 (casa de Dr. Gendrau), 1 female (CML 7563) and 1 male (MMD 3124).

Remarks *M. coibensis* was previously considered as a synonym of *M. molossus* by Koopman (1993), but recently several authors (e.g., Reid et al, 2000; Simmons, 2005; Eger, 2007), following Dolan (1989), began to treat it as a valid species. Both species are similar, but *M. coibensis* is smaller and the dorsal pelage is shorter and practically unicolored, with a shorter white basal band of hairs and shorter and spatulated upper incisors.

Certainly, many of the specimens from Peru that are identified in the literature as *Molossus molossus* may belong to this species. It is therefore essential to review these specimens to more accurately determine the distribution of this species in the country. However, there was a previous record of this species from Huanuco Department, in central Peru, south of the region of Iquitos (Eger, 2007). In Iquitos, most of the specimens were netted in urban areas. In a downtown building (Edificio EsSalud), the specimens were captured in a net placed in the 10th floor, where specimens of *Myotis albescens* and *P. macrotis* were also captured. Two other

specimens were collected in the roof of a house where they were roosting with several specimens of *M. molossus*. All other specimens were captured in a school, along with *M. molossus*, *M. rufus* and *Phyllostomus hastatus*. Only the specimens from Moena Caño were captured in a natural habitat, a secondary forest area, with elevated mist nets during the evening. At least 15 other species belonging to four families (Emballonuridae, Molossidae, Phyllostomidae, and Vespertilionidae) were also collected in this locality. Pregnant females were recorded on 24th November 2003, 24th March 2004, 3rd March 2005, and 5th July 2005, and a male with scrotal testicles was registered on 25th November 2003.

3 Discussion

The small mammals of the Amazon Basin of Peru have been the subject of numerous studies, but the attention has mainly focused on the southern and central parts of the country, particularly the Manu area (Terborgh et al, 1984; Janson & Emmons, 1990; Ascorra et al, 1991, 1996; Patterson et al, 1992, 1996, 1998, 2006; Pacheco et al, 1993, 1994; Pacheco & Vivar, 1996; Wilson & Sandoval, 1996; Zeballos-Patrón et al, 2001; Leite-Pitman et al, 2003; Bravo et al, 2008). Only a few studies have been conducted in the northeastern area (Sandborn, 1949; Thomas, 1924, 1927, 1928a, b; Ascorra et al, 1993), and specifically in Iquitos, including by members of our research group and colleagues (Davis & Dixon, 1976; Hice, 2003; Angulo & Díaz, 2004; Díaz & Willig, 2004; Hice et al, 2004; Willig et al, 2007). However, none of these investigations has included sampling in urban and suburban areas. As a consequence, my decision to include these areas in our surveys has resulted in the collection of several species recorded for the first time, as well as species newly added to the region and to the country.

Despite intensive sampling over several years, all of these new distributional records were obtained by capturing just a few specimens. Only single specimens were captured for *A. caudifer*, *L. spurrelli*, *P. macrotis*, *E. delticus*, and *E. maurus*. Two specimens of *V. spectrum* and three of *C. planirostris* were obtained, and five specimens of *Peropteryx pallidoptera* were captured from the roost at one locality. This reflects the low abundance of these species and indicates their rarity. *Molossus coibensis*, a widely distributed and very abundant species, was the only of the new species

collected in this study that has been recorded by several specimens. *Lionycteris spurelli* and *Peropteryx pallidoptera* were the only specimens collected in primary forest, a habitat where both species are frequently related (Handley, 1976; Lim et al, 2010). All other species were collected in somewhat modified environments, such as rural areas (*Eumops delticus*), suburban areas (*Eumops maurus*), secondary forest-deforested ecotones (*Anoura caudifer*), secondary forests (*Molossus coibensis*, *Thyroptera lavalii* and *Vampyrus spectrum*), and urban areas (*Peropteryx microtis*, *Cynomops planirostris* and *Molossus coibensis*).

The presence of *T. lavalii* in secondary forests was not known, and some authors (Reid et al, 2000; Solari et al, 2004) have indicated that “it seems to prefer primary forest near swamps”. In this study, the species was collected in a secondary forest patch surrounded by agricultural fields and flooded areas. *A. caudifer* and *V. spectrum* were captured in secondary forests but these localities were surrounded by very large patches of well-preserved forests. For example, *V. spectrum* was captured in a locality close to the wildlife reserve of Allpahuayo Mishana. The presence of molossid bats in urban and suburban areas is well known; moreover, the presence of emballonurids in these environments is apparently more common than supposed. Several distributional range extensions and inclusions of new species in some countries were consequences of specimens collected in urban areas (Handley, 1976; Furlonger et al, 1987; Sodr e & Uiedam, 2006; Dalponte & Aguiar, 2009; Mantilla-Meluk et al, 2009). It is possible that those specimens were attracted by roosting opportunities in buildings, or by the insects flying around the nearby street lamps (Dalponte & Aguiar, 2009).

It is well known that habitat modification for agricultural purposes (Arambur , 1984; Hice, 2003;

Willig et al, 2007) is one of the greatest threats to nature. This process has a negative effect on biodiversity, mainly because of the isolation imposed on environments and the resulting decrease in species richness and modification of population dynamics (Luque et al, 1994; Iida & Nakashizuka, 1995; Luque, 2000).

Habitat destruction, deforestation due to population pressure, the use of wood, and the exploitation of land for agricultural purposes were all observed during this study. In this context, it is necessary to state that bats are one of the groups of mammals most affected by habitat destruction and fragmentation (Cosson et al, 1999; Gorresen & Willig, 2004). The Iquitos region in particular, is a very distressed and fragmented area (Willig et al, 2007) and is included in the Peruvian Amazon forest, where approximately 0.4% (271,000 ha) is being converted to cropland or pasture each year (World Resources Institute, 1990).

Acknowledgements: My sincere gratitude to Victor Linares, Sixto Mananita, Harold Portocarrero, Cesar Ahuanari, Rubi Angulo, and to the students of the Universidad Nacional de San Marcos for their help with lab and fieldwork. Special gratitude goes to Rub n Barquez and William Lamar for their constant support, for help with the English corrections, and for his suggestion that improved this manuscript. Fieldwork was supported by the United States Public Health Service National Institute of Allergy and Infectious Diseases, USA (grants R01TW005860, D43TW007120, and K24AI068903). I especially thank Joseph Vintz, the principal investigator on the grants that supported the fieldwork. I also thanks the Instituto Nacional de Recursos Naturales (INRENA) and the Ministerio de Agricultura of Peru for the permits to capture and collect specimens.

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Appendix I

List of localities, district and province in brackets, geographic coordinates, and type of habitat.

1. 1 km E km 25.3 de la carretera Iquitos-Nauta (Fundo San Martín) (San Juan) 3° 57.954' S 73° 24.259' W—Tropical humid forest.
2. app. 500 m E km 28.8 de la carretera Iquitos-Nauta (San Juan) 3° 59.227' S 73° 24.920' W—Tropical humid forest.
3. Asociación de Viviendas 15 de Mayo (E Av. Quiñones) (San Juan) 3° 45.903' S 73° 17.725' W—Suburban area.
4. Camino a El Paujil, 1,8 km al W del km 35 de la carretera Iquitos-Nauta (San Juan) 4° 01.217' S 73° 26.787' W—Tropical humid forest.
5. Colegio Primario Secundario “RADM” (Rosa Agustina Donayre de Morey), calle Putumayo (Iquitos) 3° 44.997' S 73° 15.137' W—Urban area.
6. El Dorado, km 25 de la carretera Iquitos-Nauta, app. 1.5 km al E (San Juan) 3° 58.010' S 73° 23.620' W—Ecotone deforested area and secondary forest.
7. Iquitos, Edificio EsSalud (calles Raymondini-Napo) (Iquitos) 3° 44.942' S 73° 14.613' W—Urban area.
8. km 25 de la carretera Iquitos-Nauta (Fundo San Martín) (San Juan) 3° 57.954' S 73° 24.259' W—Secondary forest.
9. Moena Caño (Belén) 3° 46.728' S 73° 13.495' W—Secondary forest.
10. Piscina Olímpica del Instituto Peruano de Deportes, km 1.5 al W de la carretera Iquitos-Nauta (San Juan) 3° 47.696' S 73° 18.231' W—Rural area.
11. Puerto Indiana, Amazon River (Indiana) 03° 43.05' S 73° 04.32' W.
12. Punchana, Calle Amazonas 1086 (casa de Dr. Gendrau) (Punchana) 3° 43.506' S 73° 15.113' W—Urban area.
13. Villa del Ejército (entre Av. 28 de Julio-Freyre y calle Piura) (Punchana) 3° 43.658' S 73° 14.608' W—Urban area.
14. Zungarococha, 5.4 km al W del km 6 de la carretera Iquitos-Nauta (San Juan) 3° 49.825' S 73° 22.288' W—Secondary forest.