

Contribution to the bats knowledge of the Pacaya Samiria National Reserve, Loreto, Peru (Mammalia Chiroptera)

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ABSTRACT

Bats species richness (Mammalia Chiroptera) in Neotropical localities is generally higher than that of any other group of mammals. Surveys of local bat assemblages may provide useful data for conservation management plans. This paper presents bat records based on a chiropterological collection obtained during a preliminary multi-taxa survey (ECOMUSA Project) conducted by the Museo di Storia Naturale di Carmagnola (Torino, Italy) and the Universidad Nacional de la Amazonia Peruana, Iquitos (Loreto, Peru) in the Pacaya Samiria National Reserve (PSNR), where information on bats are scarce, with the aim of contributing a preliminary check of the bats listed between the Marañón, Ucayali, and Amazon rivers south of Iquitos. The survey was conducted from March 14 to March 24, 2002, in two sites of the PSNR. 74 bats of 19 species (18 Phyllostomidae, 1 Emballonuridae) were collected. The most collected species was *Sturnira lilium*, which makes up 28% of the captured bats, followed by *Carollia perspicillata*. In general, the composition of the bat community detected during this short survey in PSNR corresponds to the typical composition of neotropical rainforests. Despite the short duration of the survey, the collected data contributes to the knowledge of bats in PSNR and in the area between the Marañón, Ucayali, and Amazon rivers south of Iquitos, and represents the first record of *Rhynchonycteris naso* in this area.

KEY WORDS

Chiroptera; Neotropical bats; Peruvian Amazon Forest.

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INTRODUCTION

With more than 1,300 extant species, bats (Chiroptera) form the second largest mammalian order (Voigt & Kingston, 2016) and constitute the greatest diversity of mammals (Sosa et al., 2008). Within the neotropical region, Peru is one of the countries with the greatest bat diversity with its 165 species (Pacheco et al., 2009). Of these, 97 species are reported in the Loreto province (Fernández-Arellano & Torres-Vásquez, 2013), where the area around Iquitos, along the Marañón and

Ucayali rivers, is one of the most studied (Ascorra et al., 1993; Klingbeil & Willig, 2010; Mori et al., 2012; Fernández-Arellano & Torres-Vásquez, 2013).

The Pacaya-Samiria National Reserve (PSNR) is the largest protected area in the Peruvian Amazon, covering over 2 million hectares. It is located south of the Amazon/Marañón River, and east of the Ucayali, which are two important biogeographical barriers. Nevertheless, the information about bats in the PSNR is scarce and related mainly to museum specimens (Ruelas, 2017).

This paper presents bat records based on a chiropterological collection obtained during a preliminary multi-taxa survey (ECOMUSA Project) conducted by the Museo di Storia Naturale di Carmagnola (Torino, Italy) and the Universidad Nacional de la Amazonia Peruana, Iquitos (Loreto, Peru) in the Pacaya Samiria National Reserve (PSNR).

The purpose of this paper is to contribute to a preliminary check of the list of bats between the Marañón, Ucayali, and Amazon Rivers south of Iquitos.

MATERIAL AND METHODS

Study area

The survey was conducted from March 14 to March 24, 2002 in two sites (XX de Enero and Yarina) in the Pacaya Samiria National Reserve (Loreto, Peru), along the Rio Yanayacu-Pucate (Fig. 1).

XX de Enero (4°39'S, 73°49'W; 102 m a.s.l., March 14 and March 21–24). This is a small village on the right bank of the Rio Yanayacu-Pucate, about 1 km upstream from its confluence with the Marañón River. Habitats near the village where field work was conducted include orchards rather degraded varzea forest behind the village, flooded varzea forest (surveyed by canoe), and flooded *Cecropia* dominated second growth.

Yarina (4°45'S, 73°59'W; 110 m a.s.l., March 15–21). This is another small village on the right bank of the Yanayacu-Pucate, about 20 km upstream from XX de Enero. Human impact is much more limited here, and there are no other settlements on the Yanayacu-Pucate upstream from Yarina. Most of the field work here was concentrated in varzea and transitional forest, about 1 Km south of the village.

Data collection and analysis

Bats were captured in mist nets set from ground level to 2.5 meters high, similarly to those used mainly for ornithological research (Janni et al., 2008). Mist-net lines of 10–20 nets (using 12-meter nets) spaced about 50 meters each, were open at dawn, closed rapidly after sunset, and were used for a total of 570 net-hours at Yarina and 300 net-hours at XX de Enero. Field work was carried out under a specific permit from the “Instituto Nacional de Recursos Naturales, Ministerio de Agricultura, Re-

publica del Perú” n° 01 C/C-2002- INRENA-DGANP of the 12/3/02. The zoological specimens are held in the Museo Civico di Storia Naturale of Carmagnola, Italy (MCCI) and at the Universidad de la Amazonia Peruana, Peru (UNAP).

This work is based only on voucher specimens preserved in MCCI for which a clear identification was possible, while the bats captured and subsequently released were excluded, because identification was uncertain in the field.

Specimens preserved were sexed and identified using mainly Lopez-Baucells et al. (2016) integrated with Aguirre et al. (2009) and Diaz et al. (2011). For the species of the genus *Carollia* Gray, 1838 the indication provided by Ruelas (2017) was used. For each bat, the following biometric measurements used for identification were taken: forearm, fifth finger, and tibia. For the specimens of the *Carollia* genera, given the difficulty of identification, the upper molar canine length was also measured.

When possible, the reproductive status of the captured females was assessed through observation of the nipples (Racey, 2009).

The data of this work has been integrated with similar research conducted within a radius of 100 km from the investigated locations (Klingbeil & Willig, 2010; Díaz, 2011; Mori et al., 2012; Linares-Palomino et al., 2013; Fernández-Arellano & Torres-Vásquez, 2013), in order to provide a preliminary bat checklist of the Marañón, Ucayali, and Amazon River areas south of Iquitos.

RESULTS

The examined specimens represent 19 species of bats (18 Phyllostomidae, 1 Emballonuridae), 34 males and 40 females (Table 1). Phyllostomidae are represented by five subfamilies: Carollinae, Glossophaginae, Lonchophyllinae, Phyllostominae, and Stenodermatinae. In Yarina, 17 species were detected, while at XX de Enero, only 7 were detected (Table 1). This difference is possibly due to the lower sampling effort carried out in the last locality. The most captured species has been *Sturnira lilium*, which makes up 28% of the captured bats, followed by *Carollia perspicillata*. Of the other species, only single individuals have been captured.

Of the 40 females captured, 17 were evidently lactating (42%) and presented nipples highlighting an active reproductive status. This is particularly

evident for *Sturnira lilium* captured in Yarina, highlighting the presence of a reproductive site in the immediate vicinity of the place of capture.

Most of the species caught have a frugivorous diet (Table 1), while four have an insectivorous diet (gleaning animalivore) and two nectar-based (*Glossophaga soricina*, *Lonchophylla thomasi*).

DISCUSSION

The relatively brief duration of the survey allowed us only a preliminary assessment of the bats of the area, and the list compiled is very incomplete. The 19 species detected correspond to 27% of the species known in the Marañón, Ucayali area (Klingbeil & Willig, 2010; Díaz, 2011; Mori et al., 2012; Linares-Palomino et al., 2013; Fernández-Arellano & Torres-Vásquez 2013) and 29% of the species detected in similar habitats near Iquitos (Hice et al., 2004).

In general, the composition of the bat community detected during this short survey in PSNR corresponds to the typical composition of neotropical rainforests, where *Carollia perspicillata*, *Carollia brevicauda*, and *Sturnira lilium* are the most abundant species (Hice et al., 2004). In particular, *C. perspicillata* is the most captured bat along Río Ucayali (Mori et al., 2012).

Species richness and the abundance of frugivorous and insectivorous bats were clearly in favour of the former. The low abundance of insectivores could be attributed partially to a sampling bias, as some insectivorous species are particularly difficult to capture in mist nets because of their characteristic high and fast flight or their ability to avoid mist nets (Hice et al., 2004). This fact, together with flight behaviour at a high altitude, could also explain the almost total absence of captures of individuals of the families Vespertilionidae and in particular Molossi-

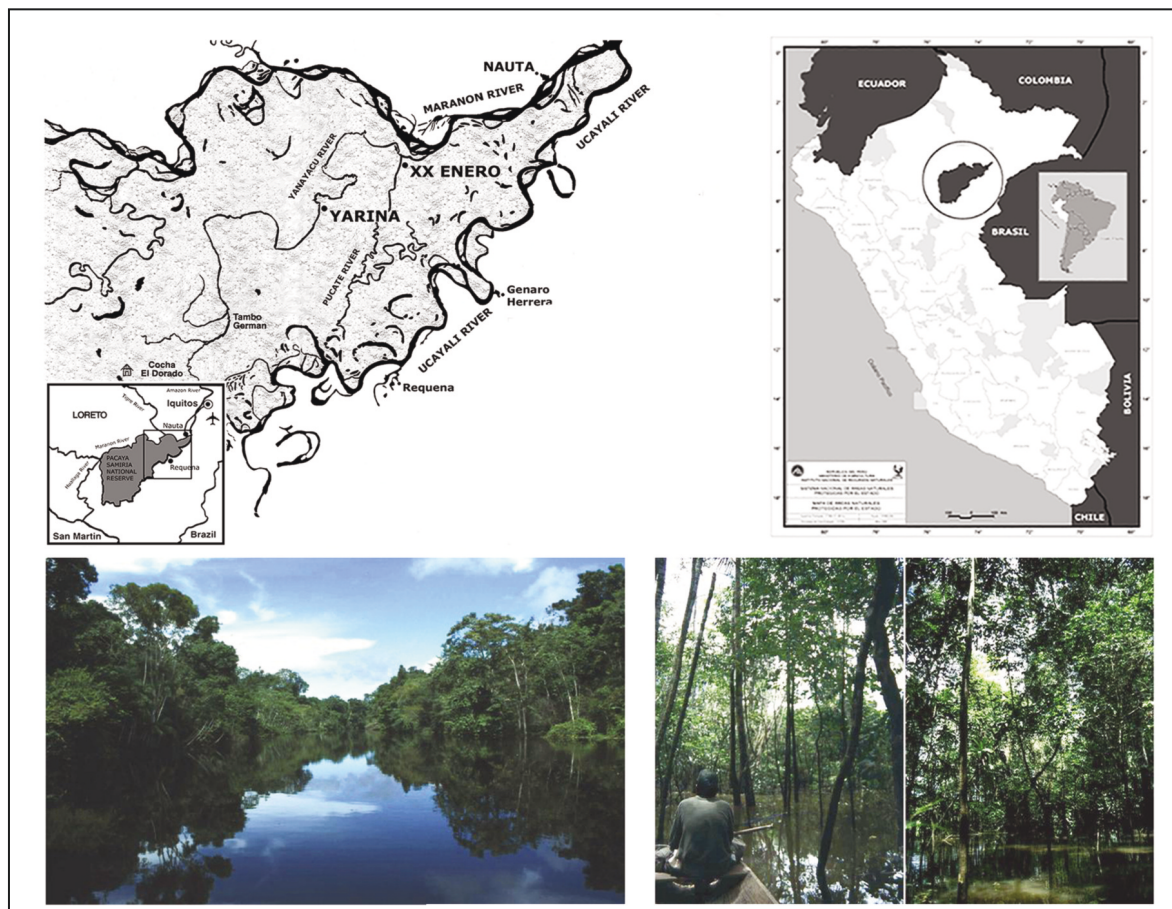


Figure 1. Map of the Rio Yanayacu-Pucate with the localization of Yarina and XX de Enero and view of the Rio Yanayacu-Pucate and flooded varzea forest close to XX de Enero.

Species	XX de Enero			Yarina			Guild
	Male	Female	Total	Male	Female	Total	
Emballonuridae - Emballonurinae							
<i>Rhynchonycteris naso</i>				1	1	2	GA
Phyllostomidae – Phyllostominae							
<i>Phyllostomus elongatus</i>				1	1	2	GA
<i>Tonatia saurophila</i>					1	1	GA
<i>Trachops cirrhosus</i>					1	1	GA
Phyllostomidae – Glossophaginae							
<i>Glossophaga soricina</i>					1	1	N
Phyllostomidae – Lonchophyllinae							
<i>Lonchophylla thomasi</i>				2		2	N
Phyllostomidae – Carolliinae							
<i>Carollia brevicauda</i>	1		1	1	1	2	F
<i>Carollia castanea</i>				3	1	4	F
<i>Carollia perspicillata</i>		3	3	1	5	6	F
Phyllostomidae – Stenodermatinae							
<i>Artibeus anderseni</i>	1		1				F
<i>Artibeus obscurus</i>	1		1	4		4	F
<i>Artibeus planirostris</i>	1		1	2	3	5	F
<i>Dermanura glauca</i>				1		1	F
<i>Mesophylla macconnelli</i>				2	1	3	F
<i>Platyrrhinus brachycephalus</i>	1		1	1	3	4	F
<i>Sturnira lilium</i>				6	15	21	F
<i>Sturnira tildae</i>				4	1	5	F
<i>Uroderma bilobatum</i>		1	1				F
<i>Uroderma magnirostrum</i>					1	1	F
<i>Specimens collected</i>			9			65	
<i>Species</i>			7			17	

Table 1. List of sampled bats by sex and diet guild: F frugivore, GA gleaning animalivore, N nectarivore.

dae. The ratio of the captures of the different guilds corresponds to their detectability by catching with mist nets on the ground (Meyer et al., 2011).

The number of lactating females corresponds to that observed in other areas of neotropical rainforests (Hice et al., 2004), and a similar pattern is commonly observed in neotropical phyllostomid frugivorous bats (Willig, 1985a; 1985b).

Despite the short duration of the survey and the lack of other sampling techniques that could have increased species richness (e.g., canopy nets, acoustic sampling, etc.) as indicated by Meyer et al. (2011), the collected data contribute to the knowledge of bats in PSNR and in the area between the Marañón, Ucayali, and Amazon rivers south of Iquitos. These, integrated with the bibliographic information available (Klingbeil & Willig, 2010; Díaz, 2011; Mori et al., 2012; Fernández-Arellano & Torres-Vásquez 2013; Linares-Palomino et al.,

2013) within a buffer of 100 km from the sampled sites, provide a checklist of 72 species of bats (Table 2). Although the species detected during this brief survey are already known in the bibliography for the area, the data collected in this survey added a species, not previously reported (*Rhynchonycteris naso*), to the checklist of the buffer area. The presence of this species has recently been confirmed in the buffer area by an observation in February 2016 (<https://www.inaturalist.org/observations/3350987>).

Finally, more detailed investigations are still desirable using different sampling techniques (Meyer et al., 2011) to better define the status of data deficient species (e.g. *Peropteryx pallidoptera*, *Carollia benkeithi*, *Myotis simus*), but above all to better define the biodiversity of bats in the area, considering the recent description of new bat species in Loreto Departement (Simmons et al., 2002).

<i>species</i>	IUCN	<i>species</i>	IUCN
EMBALLONURIDAE - EMBALLONURINAE		<i>Rhinophylla pumilio</i> Peters, 1865	LC
<i>Cormura brevirostris</i> (Wagner, 1843)	LC	PHYLLOSTOMIDAE - STENODERMATINAE	
<i>Diclidurus albus</i> (Wied-Neuwied, 1820)	LC	<i>Artibeus anderseni</i> (Osgood, 1916)	LC
<i>Peropteryx macrotis</i> (Wagner, 1843)	LC	<i>Artibeus bogotensis</i> K. Andersen, 1906	NE
<i>Peropteryx pallidoptera</i> Lim, Engstrom, Reid, Simmons, Voss et Fleck, 2010	DD	<i>Artibeus cinereus</i> (Gervais, 1856)	LC
<i>Rhynchonycteris naso</i> (Wied-Neuwied, 1820)	LC	<i>Artibeus concolor</i> Peters, 1865	LC
<i>Saccopteryx leptura</i> (Schreber, 1774)	LC	<i>Artibeus gnomus</i> (Handley, 1987)	LC
PHYLLOSTOMIDAE - MICRONYCTERINAE		<i>Artibeus lituratus</i> (Olfers, 1818)	LC
<i>Micronycteris matses</i> (Simmons, Voss et Fleck, 2002)	DD	<i>Artibeus obscurus</i> (Schinz, 1821)	LC
<i>Micronycteris megalotis</i> (Gray, 1842)	LC	<i>Artibeus planirostris</i> (Spix, 1823)	LC
<i>Micronycteris minuta</i> (Gervais, 1856)	LC	<i>Artibeus watsoni</i> (Thomas, 1901)	LC
PHYLLOSTOMIDAE - DESMODONTINAE		<i>Chiroderma trinitatum</i> Goodwin, 1958	LC
<i>Desmodus rotundus</i> (É. Geoffroy, 1810)	LC	<i>Chiroderma villosus</i> Peters, 1860	LC
PHYLLOSTOMIDAE - PHYLLOSTOMINAE		<i>Dermanura glaucus</i> (Thomas, 1893)	LC
<i>Chrotopterus auritus</i> (Peters, 1856)	LC	<i>Dermanura gnomus</i> (Handley, 1987)	LC
<i>Lophostoma brasiliense</i> Peters, 1866	LC	<i>Mesophylla macconelli</i> Thomas, 1901	LC
<i>Lophostoma carrikeri</i> (Allen, 1910)	LC	<i>Platyrrhinus brachycephalus</i> (Rouk et Carter, 1972)	LC
<i>Lophostoma silvicolum</i> D'Orbigny, 1836	LC	<i>Platyrrhinus helleri</i> (Peters, 1866)	LC
<i>Mimon crenulatum</i> (É. Geoffroy, 1803)	LC	<i>Platyrrhinus infuscus</i> (Peters, 1880)	LC
<i>Phylloderma stenops</i> (Peters, 1856)	LC	<i>Sturnira lilium</i> (É. Geoffroy, 1810)	LC
<i>Phyllostomus elongatus</i> (É. Geoffroy, 1810)	LC	<i>Sturnira magna</i> de la Torre, 1966	LC
<i>Phyllostomus hastatus</i> (Pallas, 1767)	LC	<i>Sturnira tildae</i> de la Torre, 1959	LC
<i>Tonatia saurophila</i> Koopman et Williams, 1951	LC	<i>Uroderma bilobatum</i> Peters, 1866	LC
<i>Trachops cirrhosus</i> (Spix, 1823)	LC	<i>Uroderma magnirostrum</i> Davis, 1968	LC
<i>Vampyrus spectrum</i> (Linnaeus, 1758)	LC	<i>Vampyressa bidens</i> (Dobson, 1878)	LC
PHYLLOSTOMIDAE - GLOSSOPHAGINAE		<i>Vampyressa brocki</i> (Peterson, 1968)	LC
<i>Anoura caudifer</i> (É. Geoffroy, 1818)	LC	<i>Vampyressa thyone</i> Thomas 1909	LC
<i>Choeroniscus minor</i> (Peters, 1868)	LC	<i>Vampyriscus bidens</i> (Dobson, 1878)	LC
<i>Glossophaga soricina</i> (Pallas, 1766)	LC	<i>Vampyroides caraccioli</i> (Thomas, 1889)	LC
PHYLLOSTOMIDAE - LONCHOPHYLLINAE		NOCTILIONIDAE	
<i>Lionycteris spurrelli</i> Thomas, 1913	LC	<i>Noctilio albiventris</i> Desmarest, 1818	LC
<i>Lonchophylla thomasi</i> J.A. Allen, 1904	LC	MOLOSSIDAE - MOLOSSINAE	
PHYLLOSTOMIDAE - CAROLLINAE		<i>Cynomops planirostris</i> (Peters, 1866)	LC
<i>Carollia benkeithi</i> Solari et Baker, 2006	DD	<i>Eumops maurus</i> (Thomas, 1901)	DD
<i>Carollia brevicauda</i> (Schinz, 1821)	LC	<i>Molossus coibensis</i> Allen, 1904	DD
<i>Carollia castanea</i> (H. Allen, 1890)	LC	<i>Molossus molossus</i> (Pallas, 1766)	LC
<i>Carollia perspicillata</i> (Linnaeus, 1758)	LC	<i>Molossus rufus</i> E. Geoffroy, 1805	LC
PHYLLOSTOMIDAE - "GLYPHONYCTERINAE"		VESPERTILIONIDAE - MYOTINAE	
<i>Glyphonycteris daviesi</i> (Hill, 1964)	LC	<i>Myotis nigricans</i> (Schinz, 1821)	LC
<i>Glyphonycteris sylvestris</i> Thomas, 1896	LC	<i>Myotis riparius</i> Handley, 1960	LC
<i>Trinycteris nicefori</i> (Sanborn, 1949)	LC	<i>Myotis simus</i> Thomas, 1901	DD
PHYLLOSTOMIDAE - "RHINOPHYLLINAE"		THYROPTERIDAE	
<i>Rhinophylla fischerae</i> Carter, 1966	LC	<i>Thyroptera lavalii</i> (Pine, 1993)	DD

Table 2. Checklist of the bats of the Marañón, Ucayali, and Amazon rivers south of Iquitos and their IUCN status: LC = Least Concern, NE = Not Evaluated, DD = Data Deficient.

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