

Notably range extension of *Sturnira aratathomasi* Peterson and Tamsitt 1969 in Perú

VÍCTOR PACHECO and PETER HOCKING

Departamento de Mastozoología, Museo de Historia Natural, Universidad Nacional Mayor de San Marcos, A.P. 14-0434, Lima-14, Perú; E-mail of VP: vpachecot@unmsm.edu.pe

Key words: *Sturnira aratathomasi*, distribution, Perú, Apurímac, the Andes, dry forests

INTRODUCTION

The genus *Sturnira* is one of the most speciose genus of Neotropical bats. Currently, no less than 15 species are recognized (Pacheco and Patterson, 1991, 1992; Koopman, 1993; Iudica, 2000; Sánchez-Hernández *et al.*, 2005; Simmons, 2005). Among them, the Aratathomas's yellow-shouldered bat *Sturnira aratathomasi* and the greater yellow-shouldered bat, *Sturnira magna*, are the two largest species of the genus; however, the former is one of the less known species in the genus. Most of the specimens of *S. aratathomasi* come from the Northern Andes, where as few as 18 specimens are known from Mérida state, Venezuela (Soriano and Molinari, 1984), the departments of Cauca, Caldas, Huila and Valle del Cauca, Colombia (Tamsitt *et al.*, 1986; Soriano and Molinari, 1987; Alberico 1987, Alberico *et al.*, 2000; Castaño *et al.*, 2003), and from Ecuador (Peterson and Tamsitt, 1968). The presence of *S. aratathomasi* in Ecuador is based on two specimens collected from an unknown locality before 1874; since then, no other specimen has been recorded for that country (Albuja, 1999; Tirira, 1999).

McCarthy *et al.* (1991) reported the first specimen of *S. aratathomasi* from Perú based on a juvenile male specimen (LSUMZ 21484) mist-netted on 29 August 1978, east of La Peca, at 3,165 m in the Cordillera Colán, Department of Amazonas. Later, the species was also reported from Río Abiseo, Department of San Martín (Solari *et al.*, 2001). The reported specimens of

S. aratathomasi indicate it inhabits the premontane and montane life zone from 1,650 to 3,165 m a.s.l. (Soriano and Molinari, 1987; McCarthy *et al.*, 1991; Alberico *et al.*, 2000).

Here, we provide information on the specimens from San Martín and report on three additional specimens from the Department of Apurímac, extending the southern range of the species more than 840 km.

MATERIALS AND METHODS

A distributional map of *S. aratathomasi* is presented, with all records mapped using ArcView 3.2 on an altitude map developed by WorldClim, version 1.4 (Hijmans *et al.*, 2004). Coordinates were taken from Tamsitt *et al.* (1986), Alberico (1987), Soriano and Molinari (1987), McCarthy *et al.* (1991), Paynter (1997), Castaño *et al.* (2003), and Lehr *et al.* (2004).

The report of Solari *et al.* (2001) was based on two specimens (MUSM 7305, 7306) captured at Las Palmas, ca. 32 km NE de Pataz, Department San Martín, at 2,000 and 2,100 m a.s.l. (ca. 07°34'12.65"S, 77°17'50.64"W). The specimen MUSM 7305 was captured on 19 July 1990 in montane forest, and it is a male with testes 4 × 3 mm; whereas the specimen MUSM 7306, sex undetermined, was captured on 21 August 1990 at riverine vegetation, near the river. Other species captured at the lower montane forest of Las Palmas were: *Anoura caudifer*, *A. geoffroyi*, *Carrollia brevicauda*, *Platyrrhinus ismaeli*, *P. nigellus*, *Sturnira bidens*, and *S. erythromos* (Velazco, 2005; M. Romo, personal comm.). The lower montane forest of Río Abiseo is characterized by the appearance of palms (*Chamaesorea poeppigiana* and *Prestoea acuminata*), cyclanths (*Asplundia moritziana*, and *Sphaeradenia steyermarkii*), other trees (e.g., *Casearia nigricolor*, *Cecropia* sp., *Cestrum* spp., *Clusia* spp., *Ficus* spp., *Oreopanax* spp.), and by the absence of tree ferns and the bamboo *Chusquea scandens* (Young and León, 1988, 1991).

RESULTS

The three specimens reported here, were mist-netted at Cconoc (ca. 13°32'47"S, 72°38'39"W, elevation 1,925 m), Department of Apurímac, on 8 May 2002 by P.H., at the border of the Río Apurímac. This place is a forest dominated by trees of *Prosopis juliflora*, *Acacia macracantha*, *Schinus molle*, *Eriotheca discolor*, and other xerophytic elements such as columnar cacti and *Parkinsonia praecox*, which characterize a typical dry forest of interandean valleys (Fig. 1). This record appears to be the first time the species is captured in dry forest habitats. The capture effort was only six mistnet-night, and no other bat species were captured in the same place. The specimen MUSM 19153 is a female with developed teats suggesting a lactating condition; whereas the other two ones (MUSM 19151, 19152 — Fig. 2) are male adults but lack reproductive data.

DISCUSSION

Soriano and Molinari (1987) argue against Thomas and McMurray (1974) suggestion that *S. aratahomasi* might be a common species at higher elevations. A plot of all localities versus elevation supports Soriano and Molinari (1987) because all (22 specimens with elevation data), except four, were collected from 1,650 to 2,200 m, at the lowest limit of its altitudinal range. Capture data from mistnetting are not a reliable method for obtaining abundance, but we suggest that the range between 1,650 to 2,200 m appears to be the optimal range for the species.

The examined Peruvian specimens agree in external pelage coloration with the type description and other specimens collected so far. The San Martín specimens have a clear brownish tone whereas the Apurímac specimens are a composite: two specimens have the grayish tone (both males) and the



FIG. 1. Dry interandean forest in Cconoc, 1,925 m a.s.l., at the border of the Río Apurímac, Department Apurímac, Perú, where *S. aratahomasi* was collected



FIG. 2. A male individual of *S. aratathomasi* (MUSM 19152) collected from Cconoc

other the clear brownish one (female). The noseleaf, lips and orbicular ring are conspicuously dark in the Apurímac specimens. The epaulettes are absent in all specimens.

The external and cranial measurement of the San Martín and Apurímac specimens (Table 1) agree with the data reported elsewhere (Peterson and Tamsitt, 1968; Thomas and McMurray, 1974; Soriano and Molinari, 1987). The palates of all Peruvian specimens examined here present also several small cavities of irregular shape, size, and distribution (Soriano and Molinari, 1987), and appears to be distinctive for the species. Peterson and Tamsitt (1968) stated that the lower incisors of *S. aratathomasi* are bifid, but Pacheco and Patterson (1991) scored the middle lower incisors of the holotype as trilobed, similar to the score of McCarthy *et al.* (1991) based on a juvenile specimen (LSUMZ 21484). The Peruvian specimens examined here have also the middle lower incisors trilobed, and the outer lower incisors bilobed,

TABLE 1. Summary statistics for external and craniodental measurements (in mm) and body mass (in g) of *S. aratathomasi* from the departments of San Martín ($n = 2$) and Apurímac ($n = 3$), Perú, compared with the holotype specimen (USNM 395158)

Parameter	Holotype ¹	San Martín		Apurímac	
		$\bar{x} \pm SD$	Min–Max	$\bar{x} \pm SD$	Min–Max
Body mass ²	–	52.5 \pm 7.07	47.5–57.5	47.7 \pm 2.08	46.0–50.0
Head and body length	101.0	81.5 \pm 10.61	74–89.0	91.7 \pm 2.89	90–95.0
Hind foot length	21.0	18.3 \pm 0.35	18.0–18.5	18.7 \pm 0.29	18.5–19.0
Ear length	21.0	22.0 \pm 0.00	22.0–22.0	20 \pm 0.00	20.0–20.0
Forearm length	59.0	58.4 \pm 0.42	58.1–58.7	57.3 \pm 1.61	55.5–58.6
Metacarpal length of 3rd digit	57.0	54.1 \pm 1.06	53.3–54.8	54.7 \pm 0.20	54.5–54.9
Length of 1st phalanx of 3rd digit	21.0	20.9 \pm 0.85	20.3–21.5	21.6 \pm 1.13	20.7–22.8
Length of 2nd phalanx of 3rd digit	28.5	28.1 \pm 0.78	27.5–28.6	28.3 \pm 0.40	27.9–28.7
Greatest skull length	29.6	28.1 \pm 0.37	27.8–28.3	27.7 \pm 0.33	27.3–28.0
Condylobasal length	–	26.2 \pm 0.71	25.7–26.8	25.7 \pm 0.51	25.1–26.0
Condylocanine length	–	25.4 \pm 0.52	25.1–25.8	24.8 \pm 0.37	24.4–25.1
Palatal length	–	11.4 \pm 0.35	11.2–11.7	11.5 \pm 0.16	11.3–11.6
Maxillary tooththrow length	8.3	7.9 \pm 0.27	7.7–8.1	7.9 \pm 0.11	7.9–8.1
Zygomatic width	17.7	17.1 \pm 0.32	16.8–17.3	16.8 \pm 0.10	16.7–16.9
Braincase width	–	13 \pm 0.00	13.0–13.0	13.1 \pm 0.07	13.0–13.1
Lacrimal width	8.5	8.3 \pm 0.06	8.3–8.4	7.9 \pm 0.09	7.8–8.0
Postorbital width	8.2	7.3 \pm 0.00	7.3–7.3	7.5 \pm 0.10	7.4–7.6
Palatal width at second molar	–	9.6 \pm 0.00	9.6–9.6	9.7 \pm 0.08	9.6–9.8
Palatal width at canines	8.7	8.1 \pm 0.28	7.9–8.3	7.8 \pm 0.09	7.7–7.9
Dentary length	18.0	18.0 \pm 0.23	17.8–18.2	17.8 \pm 0.34	17.4–18.1
Mandibular tooththrow length	9.2	8.8 \pm 0.08	8.7–8.8	8.7 \pm 0.12	8.6–8.9
Coronoid height	–	7.2 \pm 0.00	7.2–7.2	7.1 \pm 0.10	7.0–7.2

¹ — Data from the holotype specimen was taken from Peterson and Tamsitt (1968)

² — Variables are described in Peterson and Tamsitt (1968), and Pacheco and Patterson (1992)

and that appears to be typical for the species.

Records of *S. aratathomasi* suggest that the species has a long, narrow and continuous distribution along the Andes from Venezuela to Central Perú (Fig. 3), in habitats of dry interandean, and lower and upper montane forests from 1,650 to 3,165 m a.s.l. In Colombia the species was recorded in the three Cordilleras, but in Perú it is reported only on the lower montane forests of the eastern slope of the Andes and the deep interandean valleys of the Río Apurímac. It is likely the

species range extends farther south to Bolivia.

Montenegro and Escobedo (2004) reported *S. aratathomasi* from a lowland neotropical forest, in Río Apayacu, at 35 km north of the Río Napo and Río Amazonas confluence, Department of Loreto, Perú ($3^{\circ}07'00''\text{S}$, $72^{\circ}42'45''\text{W}$; approximately 120–150 m a.s.l.), but the voucher was not retained impeding a proper re-identification. This record is the first from lowland tropical forest but disagrees with all previous ones from the Andean region (Fig. 3). *Sturnira magna* is also a large bat distributed from 200 m to 2,300 m a.s.l., from lowland neotropical forest to montane wet forests (Graham, 1983; Patterson *et al.*, 1996). It overlaps the range distribution of *S. aratathomasi* in its upper range, although no sympatry has been documented (Soriani and Molinari, 1987). We suggest the Montenegro and Escobedo's (2004) record might have been confused for *S. magna* because of its large size similar to *S. aratathomasi*. Nonetheless, additional efforts are required to confirm its distribution at lower elevations.

Sturnira aratathomasi is reported from the biogeographical units of Chocó Magdalena and NorAndina areas in the category of Data Deficient (Rodríguez, 1998). In Perú it is not listed as a threatened species (D.S. 034-2004-AG, Ministerio de Agricultura, Perú). According to IUCN (2004) the species is listed as LR/nt (near threatened); however, because we lack appropriate data on abundance, distribution and habitat preferences, we suggest *S. aratathomasi* should be categorized as Data Deficient.

ACKNOWLEDGEMENTS

Collecting permits were issued by the Ministerio de Agricultura (INRENA), Lima. We thank Edgar Lehr for partly supporting, with Peter Hocking, the field expedition. Asunción Cano (MUSM) kindly

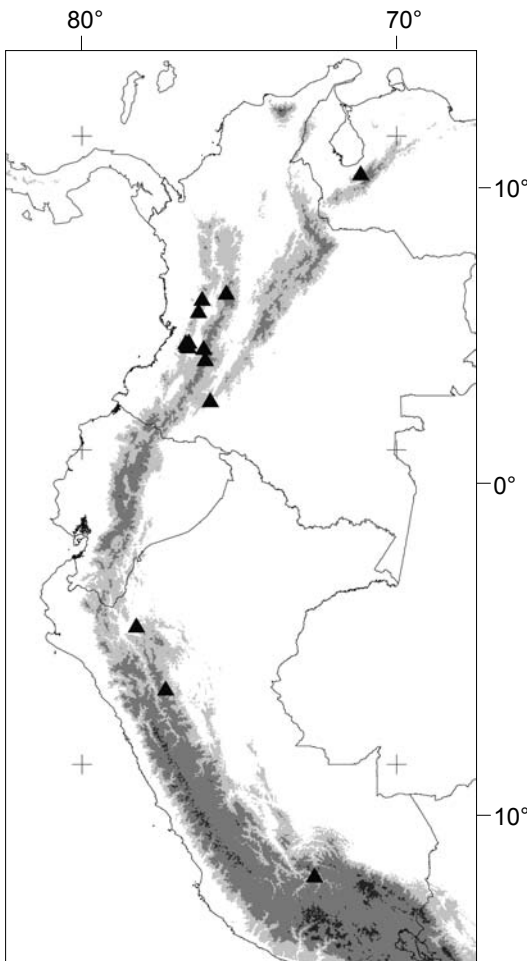


FIG. 3. Map of distribution of *S. aratathomasi* based on 22 specimens. The localities from Ecuador are unknown and were not included

provided botanical information of the Peruvian localities. Thanks are also extended to Heidi Quintana (MUSM) for masterly preparing the map in Fig. 3. Mariella Leo (APECO) help us to obtain the coordinates for Las Palmas, Department of San Martín.

LITERATURE CITED

- ALBERICO, M. S. 1987. Notes on distribution of some bats from Southwestern Colombia. *Fieldiana: Zoology (N.S.)*, 39: 133–135.
- ALBERICO, M., A. CADENA, J. HERNÁNDEZ-CAMACHO, and Y. MUÑOZ-SABA. 2000. Mamíferos (Synapsida: Theria) de Colombia. *Biota Colombiana*, 1: 43–75.
- ALBUJA, L. 1999. Murciélagos del Ecuador, 2nd edition. Cicetrónica Cia. Ltda, Quito, 288 pp.
- CASTAÑO, J. H., Y. MUÑOZ-SABA, J. E. BOTERO, and J. H. VÉLEZ. 2003. Mamíferos del Departamento de Caldas-Colombia. *Biota Colombiana*, 4: 247–259.
- GRAHAM, G. L. 1983. Changes in bat species diversity along an elevational gradient up the Peruvian Andes. *Journal of Mammalogy*, 64: 559–571.
- HIJMANS, R. J., S. CAMERON, and J. PARRA. 2004. WorldClim, Version 1.4 (release 3). A square kilometer resolution database of global terrestrial surface climate. [<http://www.worldclim.org>]. Downloaded on 06 January 2006.
- IUCN. 2004. 2004 IUCN Red List of Threatened Species. [<http://www.iucnredlist.org>]. Downloaded on 29 January 2006.
- IUDICA, C. A. 2000. Systematic revision of the neotropical fruit bats of the genus *Sturnira*: a molecular and morphological approach. Ph.D. Thesis, University of Florida, Miami, xii + 284 pp.
- KOOPMAN, K. F. 1993. Order Chiroptera. Pp. 137–241, in *Mammal species of the world: a taxonomic and geographic reference*, 2nd edition (D. E. WILSON and D. M. REEDER, eds.). Smithsonian Institution Press, Washington D.C., 1207 pp.
- LEHR, E., N. CARRILLO, and P. HOCKING. 2004. New species of *Drymoluber* (Reptilia: Squamata: Colubridae) from Southeastern Peru. *Copeia*, 2004: 46–52.
- MCCARTHY, T. J., L. J. BARKLEY, and L. ALBUJA V. 1991. Significant range extension of the giant Andean fruit bat, *Sturnira aratathomasi*. *Texas Journal of Science*, 43: 437–438.
- MONTENEGRO, O., and M. ESCOBEDO. 2004. Mamíferos. Pp. 80–87, in *Perú: Ampiyacu, Apayacu, Yaguas, Medio Putumayo* (N. PITMAN, R. C. SMITH, C. VRIESENDORP, D. MOSKOVITS, R. PIANA, G. KNELL, and T. WACHTER, eds.). Rapid Biological Inventories Report 12, The Field Museum, Chicago, 273 pp.
- PACHECO, V., and B. D. PATTERSON. 1991. Phylogenetic relationships of the New World bat genus *Sturnira* (Chiroptera: Phyllostomidae). *Bulletin of the American Museum of Natural History*, 206: 101–121.
- PACHECO, V., and B. D. PATTERSON. 1992. Systematics and biogeographic analysis of four species of *Sturnira* (Chiroptera: Phyllostomidae) with emphasis on Peruvian forms. *Memorias del Museo de Historia Natural, UNMSM (Lima)*, 21: 57–81.
- PATTERSON, B. D., V. PACHECO, and S. SOLARI. 1996. Distributions of bats along an elevational gradient in the Andes of south-eastern Peru. *Journal of Zoology (London)*, 240: 637–658.
- PAYNTER, R. A., JR. 1997. Ornithological gazetteer of Colombia, 2nd edition. Museum of Comparative Zoology, Harvard University, Cambridge, 539 pp.
- PETERSON, R. L., and J. R. TAMSITT. 1968. A new species of bat of the genus *Sturnira* (family Phyllostomatidae) from northwestern South America. *Royal Ontario Museum, Life Sciences Occasional Papers*, 12: 1–8.
- RODRIGUEZ, J. V. 1998. Listas preliminares de mamíferos colombianos con algún riesgo a la extinción. Informe final presentado al Instituto de Investigación de Recursos Biológicos Alexander von Humboldt. [on-line URL: http://www.humboldt.org.co/conservacion/Listas_Preliminares.htm].
- SÁNCHEZ-HERNÁNDEZ, C., M. L. ROMERO-ALMARAZ, and G. D. SCHNELL. 2005. New species of *Sturnira* (Chiroptera: Phyllostomidae) from Northern South America. *Journal of Mammalogy*, 86: 866–872.
- SIMMONS, N. B. 2005. Order Chiroptera. Pp. 312–529, in *Mammal species of the world: a taxonomic and geographic reference*, 3rd edition (D. E. WILSON and D. M. REEDER, eds.). The Johns Hopkins University Press, Baltimore, xxxv + 2142 pp.
- SOLARI, S., E. VIVAR, P. VELAZCO, and J. J. RODRÍGUEZ. 2001. Small mammal diversity from several montane forest localities (1300–2800 m) on the eastern slope of the Peruvian Andes. Pp. 262–264, in *Biological and social assessments of the Cordillera de Vilcabamba, Peru* (L. ALONSO, A. ALONSO, T. SCHULENBERG, and F. DALLMEIER, eds.). RAP Working Papers 12 & SI/MAB Series 6. Conservation International, Washington D.C., 296 pp.
- SORIANO, P. J., and J. MOLINARI. 1984. Hallazgo de *Sturnira aratathomasi* (Mammalia: Chiroptera) en Venezuela y descripción de su cariotipo. *Acta Científica Venezolana*, 35: 316–317.

- SORIANO, P. J., and J. MOLINARI. 1987. *Sturnira aratathomasi*. Mammalian Species, 284: 1–4.
- TAMSITT, J. R., A. CADENA G., and E. VILLARRAGA. 1986. Records of bats (*Sturnira magna* and *Sturnira aratathomasi*) from Colombia. Journal of Mammalogy, 67: 754–757.
- THOMAS, M. E., and D. N. McMURRAY. 1974. Observations on *Sturnira aratathomasi* from Colombia. Journal of Mammalogy, 55: 834–836.
- TIRIRA, S. D. 1999. Mamíferos del Ecuador. Publicación Especial, Museo de Zoología, Centro de Biodiversidad y Ambiente, Pontificia Universidad Católica del Ecuador, 2: 1–392.
- VELAZCO, P. M. 2005. Morphological phylogeny of the bat genus *Platyrrhinus* Saussure, 1860 (Chiroptera: Phyllostomidae) with the description of four new species. Fieldiana: Zoology (N.S.), 105: 1–53.
- YOUNG, K. R., and B. LEÓN. 1988. Vegetación de la zona alta del Parque Nacional Río Abiseo, San Martín. Revista Forestal del Perú, 15: 3–20.
- YOUNG, K. R., and B. LEÓN. 1991. Diversity, ecology, and distribution of high-elevation pteridophytes within Rio Abiseo National Park, north-central Peru. Fern Gazette, 16: 25–39.

Received 04 February 2006, accepted 05 June 2006

Aggressive behaviour of greater mouse-eared bat (*Myotis myotis*) towards lesser horseshoe bats (*Rhinolophus hipposideros*) in a hibernaculum

KRZYSZTOF PIKSA

Institute of Biology, Cracow Pedagogical University, Podbrzezie 3, 31-054 Kraków, Poland
E-mail: krzychu@ap.krakow.pl

Key words: Myotis myotis, Rhinolophus hipposideros, aggressive behaviour, hibernation

INTRODUCTION

Aggression occurs in many forms and can be an important adaptive behaviour (Rarmirez, 1998). Also among bats, aggressive behaviour is observed in different situations, and can take on different forms, as occurs in other mammals. Aggression in bats has been observed during feeding. This behaviour is expressed through chasing and pursuing fight patterns as well as through scaring away a newcomer of the same or different species from the feeding area (Ransome, 1990). Many times this type of behaviour is accompanied by agonistic and aggressive calls generated and emitted by the aggressive bat (Racey and Swift, 1985; Ransome, 1990; Barlow and Jones, 1997).

Aggressive behaviour is also often observed during the mating season (McCracken and Wilkinson, 2000). In this case, it concerns the males, which defend their roost sites (Davidson and Wilkinson, 2004) or female groups (McCracken and Bradbury, 1981; Gerell-Lundberg and Gerell, 1994). Such behaviour is also observed in mating colonies and consists of utilizing and defending the traditional roosting and foraging sites by females (McCracken and Bradbury, 1981; Rydell 1989; Kerth *et al.*, 2002). In most cases, the aggression is usually reduced to agonistic behaviour, that is, to confrontational behaviour without fighting. However, there are rare incidents of direct fights (physical contact) between bats (Rydell, 1986), which very rarely lead to the