



First record of *Promops nasutus* (Spix, 1823) (Chiroptera: Molossidae) from Colombia

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Abstract: Specimens of the genus *Promops* (Chiroptera, Molossidae) are rare in Colombian scientific collections. Only one species, *P. centralis*, has been documented from the country. We report the first record of *P. nasutus* for Colombia, collected on the Eastern Cordillera of the Andes. External and cranial measurements, as well as morphological features in our specimen match those of *P. nasutus*. Our record of *P. nasutus* also represents a geographic extension in the distribution of the species of more than 755 km west from the closest known location in the Venezuelan Amazon.

Key words: bats; geographic distribution; Andes; Norte de Santander

Molossid bats have a highly sophisticated biosonar system and usually fly above the canopy or in open areas (Norberg and Rayner 1987; Fenton et al. 1998), making it difficult to catch them using mist nets (Simmons and Voss 1998). Therefore, they are usually underrepresented in scientific collections, and this has consequently prevented our understanding of the evolutionary, biogeographic and ecological relationships among molossid bats (Ammerman et al. 2012). Gregorin and Chiquito (2010) recognized three species in the genus *Promops*: *P. centralis* Thomas, 1915; *P. davisoni* Thomas, 1921, and *P. nasutus* (Spix, 1823). *Promops centralis* is distributed from Mexico throughout Central America, and in South America, it is found in Colombia, Venezuela, Trinidad and Tobago, Brazil, Guyana, Surinam, French Guiana, Ecuador, Bolivia, Peru, Paraguay, and Argentina (Simmons 2005; Eger 2008; Gregorin and Chiquito 2010). *Promops davisoni* is restricted to Ecuador and Peru on the western slope of the Andes, whereas *P. nasutus* occurs in Argentina,

Paraguay, Bolivia, Brazil, Surinam, Guyana, Venezuela, and Trinidad and Tobago (Eger 2008; Flores-Quispe et al. 2015). In Colombia, *P. centralis*, has been reported for the Andean, Caribbean and Pacific regions between 0–1,800 m above sea level (a.s.l.) (Solari et al. 2013). Several authors have also suggested the presence of *P. nasutus* in Colombia, based on its presence in neighbouring countries such as Venezuela and Brazil, but there are no confirmed records of the species in Colombia (Cuervo et al. 1986; Eisenberg 1989; Alberico et al. 2000). Herein, we report the first record of *P. nasutus* from Colombia representing both a geographic and ecological extension of the species.

Our specimen (field number MFP 124) is an adult female collected on the northeastern portion of the Colombian Eastern Cordillera in the department of Norte de Santander (Figure 1). Since the skin was badly damaged, the specimen was first preserved in alcohol and then transported to the laboratory for preparation. The skull and skeleton were preserved and deposited at the scientific collection of the Instituto Alexander von Humboldt (IAvH-M-9683).

The specimen was found dead on the floor of a carpentry workshop at the Villa Marina Experimental Farm of the Universidad de Pamplona. The Farm is located at 49 km on the Cúcuta-Pamplona road, east bank of Pamplonita River, Pamplonita municipality, corregimiento El Diamante, Vereda Matajira (07°32' 08.7" N, 072°38' 06.8" W), ca. 1,150 m a.s.l. (Figure 2). The Farm (ca. 440 ha) used to be covered with sub-Andean forests (IAvH 2001), but currently is in a rural landscape and is used for recreational and educational activities for professional careers such as veterinary medicine, zootechnics, and agronomy. On the Farm, there are plantations of coffee, citrus plants, ornamental flowers, and pastures, as well as livestock production activities.

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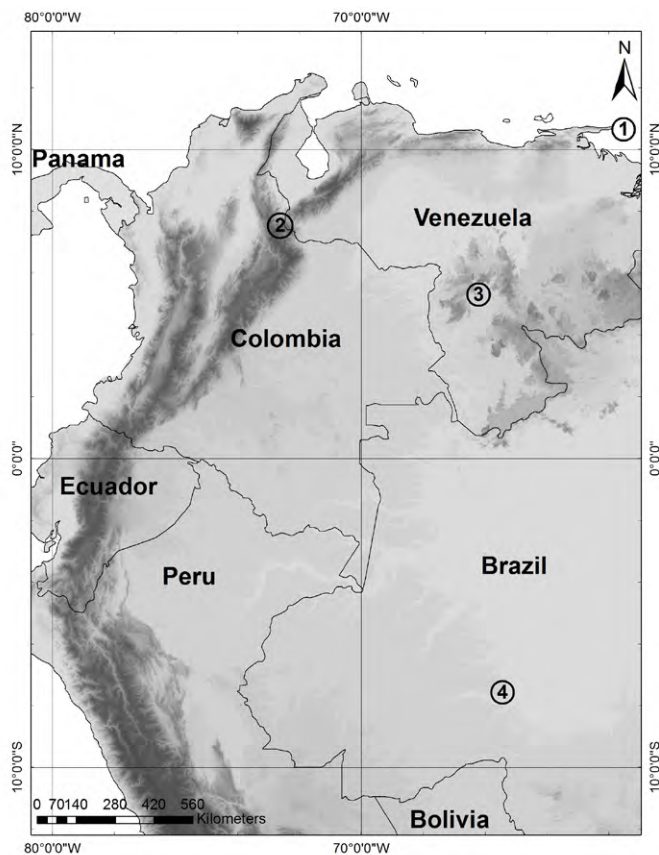


Figure 1. Known records from the edges of the distribution of *Promops nasutus* in northern South America: Trinidad and Tobago (1), Venezuela (3), and Brazil (4), and the new record from the north-east of Colombia, Pamplonita, Norte de Santander (2).



Figure 2. View of the Villa Marina Experimental Farm in Pamplonita, Norte de Santander, Colombia (A) and the carpentry shop where the specimen of *P. nasutus* was found (B).

Measurements were recorded using callipers to the nearest 0.1 mm. We made measurements as described by Barquez (1999) and Gregorin and Taddei (2002). Total length (TL), tail length (T), ear length (E), forearm length (FA), greatest length of skull excluding incisors (GLS), condylobasal length (CBL), least interorbital breadth (LIB), zygomatic breadth (ZB), postorbital constriction (PC), breadth of braincase (BB), maxillary tooththrow length (MTRL), palatal length (PL), mastoidal breadth (M-B), length of mandible (LM), mandibular tooththrow length (LMdT), width across canines (C-C), and width across molars (M-M). The specimen's features are consistent with a small species of *Promops* (e.g., FA=48.38; GLS=18.42; Table 1).

The specimen conforms with all diagnostic characters of the genus *Promops*, having two pairs of lower incisors (Figure 3). The anterior upper premolars are reduced to spicules, and the first molars are very small. The palate is highly domed, the sagittal crest is low but well developed, and the zygomatic arches are complete (Gregorin and Chiquito 2010; Díaz et al. 2011).

We used the Sistema de Información sobre Biodiversidad de Colombia (SIB) to search for specimens of *Promops* in collections of mammals in Colombia. We found one specimen of *P. centralis* at the Universidad del Cauca that we could not examine. Additionally we found two specimens of *Promops* at the Instituto de Ciencias Naturales, Universidad Nacional de Colombia (ICN) and four specimens at the *Instituto de Investigación de Recursos Biológicos Alexander von Humboldt* (IAvH). The specimens at the IAvH were previously identified as *P. centralis*, but our examination revealed they were *Molossus rufus* É. Geoffroy, 1805 (IAvH-M- 5861, IAvH-M- 5867–5869). One of the specimens at the ICN showed the diagnostic characteristics of *Promops*, but it still had hook-shaped incisors indicating that was a juvenile individual (ICN 16721) and the second specimen was an adult without skull (ICN 4719), preventing identification to the specific level.

Our specimen had a uniform dark coloration contrasting the characteristic pale coloration of *Promops davisoni* (Gregorin and Chiquito 2010). Discrete cranial or dental characters are not suitable to differentiate within *Promops* species, but all the measurements from our specimen fall within the range of size variation reported for specimens from *P. nasutus* from Argentina, Guyana, and Brazil (Barquez et al. 1999; Gregorin and Chiquito 2010).

The possible presence of *P. nasutus* in Colombia was first mentioned by Cuervo et al. (1986), and was also suggested by Eisenberg (1989), and Alberico et al. (2000). These authors suggested the species to be distributed along the Amazonian and/or the Orinoco regions of Colombia, based on its presence in these two biogeographic regions in Venezuela and Brazil

Table 1. Selected measurements of the new record from Colombia of *Promops nasutus* (this study) and specimens from Argentina, Brazil, and Guyana reported in previous studies (Barquez et al. 1999^a; Gregorin and Chiquito 2010^b). All measurements are in millimeters. The sample mean plus or minus one standard deviation, the observe range (in parentheses), and sample size.

Measurement	This study	Argentina ^a	Argentina ^b	Brazil ^b	Guyana ^b
TL	115	117.6 ± 4.61 (109.0–126.0) 13	—	—	—
T	50	50.5 ± 2.63 (47.0–58.0) 13	—	—	—
E	11.8	13.6 ± 1.07 (12.0–15.7) 13	—	—	—
FA	48.4	47.4 ± 1.16 (45.0–49.3) 13	48.2 ± 1.5 (45.5–51.8) 55	47.7 ± 0.3 (45.6–49.0) 16	47.4 ± 1.2 (43.5–48.7) 16
GLS	18.4	17.0 ± 0.55 (15.6–17.8) 12	18.7 ± 0.5 (17.6–19.7) 60	18.5 ± 0.4 (18.1–19.4) 17	18.7 ± 0.2 (18.5–1.0) 14
CBL	16.7	15.8 ± 0.29 (15.5–16.4) 13	—	—	—
LIB	5.7	5.7 ± 0.12 (5.6–6.0) 12	—	—	—
ZB	11.6	10.7 ± 0.19 (10.4–11.2) 12	11.2 ± 0.3 (10.4–11.8) 58	11.1 ± 0.2 (10.5–11.5) 14	11.0 ± 0.2 (10.7–11.7) 14
PC	3.9	3.9 ± 0.11 (3.7–4.1) 12	4.1 ± 0.2 (3.4–4.4) 61	4.1 ± 0.4 (3.9–4.3) 16	3.8 ± 0.1 (3.6–4.0) 14
BB	9.5	9.4 ± 0.18 (9.1–9.7) 12	9.6 ± 0.2 (9.1–10.1) 60	9.4 ± 0.2 (9.2–10.0) 17	9.6 ± 0.1 (9.4–9.8) 14
MTRL	6.6	6.3 ± 0.17 (6.1–6.6) 12	6.8 ± 0.3 (6.1–7.2) 62	6.7 ± 0.3 (6.3–7.4) 16	6.7 ± 0.2 (6.4–7.1) 14
PL	6.2	5.7 ± 0.17 (5.5–6.1) 12	—	—	—
M-B	11.1	10.3 ± 0.48 (8.8–10.6) 12	10.8 ± 0.3 (9.7–11.3) 51	10.8 ± 0.2 (10.5–11.2) 15	10.7 ± 0.1 (10.5–11.0) 14
LM	12.5	11.7 ± 0.22 (11.4–12.0) 11	12.5 ± 0.5 (11.2–13.5) 59	12.3 ± 0.3 (11.6–12.8)	12.6 ± 0.1 (12.0–13.3) 14
C-C	4.7	4.1 ± 0.17 (3.9–4.5) 12	4.5 ± 0.3 (3.9–4.9) 62	4.7 ± 0.2 (4.4–5.0) 16	4.3 ± 0.1 (4.2–4.5) 13
M-M	7.8	7.7 ± 0.39 (7.0–8.1) 12	8.1 ± 0.3 (7.4–8.8) 62	8.2 ± 0.19 (7.8–8.4) 17	8.0 ± 0.1 (7.9–8.2) 14
LMdT	7.7	7.0 ± 0.20 (6.7–7.3) 11	7.5 ± 0.2 (7.0–7.7) 14	7.5 ± 0.3 (6.9–7.9) 16	7.5 ± 0.2 (7.0–7.7) 14

(Goodwin and Greenhall 1962; Handley 1976). However, our specimen of *P. nasutus* was found in the Colombian Andean region more than 755 km west to the closest known record in the Venezuelan Amazon. *Promops nasutus* apparently is a resilient and versatile species inhabiting contrasting ecosystems that include forests, savannas, and scrublands (Sazima and Uieda 1977; Siles et al. 2005; Copaverde-Júnior et al. 2014). It has also been found in an elevational range up to 2,560 m (Siles et al. 2005). The species is known for using human constructions as roosts (Sazima and Uieda 1977). These probably explain the presence of the species in a farm, which is part of a rural area where most of native sub-Andean forests have disappeared (IAvH 2001).

Pamplonita is on the Colombian Eastern Cordillera, west of the Tamá massif, which reaches up to 3,400 m a.s.l. and has the Orinoco basin to the east (Vásquez and Serrano 2009). Because *P. nasutus* has not being found above 3,000 m a.s.l. (Eger 2008; Gregorin and Chiquito 2010), a probable connection between the populations of *P. nasutus* in the Colombian Andes and those in Venezuela occurs through the Táchira depression south to the Merida Cordillera or north of this Cordillera

through the arid regions of the north of Venezuela. Our proposed distribution is based on the adjacency of the mentioned regions to the collecting locality, but it needs to be tested in future research.

A revision of Colombian specimens of *Promops*, showed that they are not only rare in scientific collections, but also revealed that further revisions of the material of representatives of the family Molossidae from Colombia are necessary to correct misidentifications and may also provide additional records of *Promops*. Indeed, the misidentified specimens we found reflect the poor understanding of Colombian molossid bats and can also be explained by the morphological similarities between *Promops* and *Molossus* (Ammerman et al. 2012; Gregorin and Cirranello 2016). It is important to mention, that the implementation of other documenting methodologies, rather than ground mist nets are necessary in inventories (i.e., echolocation detectors, canopy mist nets, and manual captures in roosting sites) (Simmons and Voss 1998).

The bat fauna of Norte de Santander has been poorly studied (CORPONOR 1998; Suárez-Payares and Lizcano 2011; Gallardo and Lizcano 2014), and further efforts



Figure 3. Dorsal, ventral and lateral views of the skull, and dorsal view of the mandible of *Promops nasutus* (IAvH-M-9683) from Pamplonita, Norte de Santander, Colombia. Scale bar: 10 mm.

may provide additional examples of species that have not been reported for this region, which is biogeographically important given the branching of the Andes north of Pamplonita in Colombia and Venezuela. Also, more about 90% of natural ecosystems in Norte de Santander have disappeared (IAvH, 2001) and information on its biodiversity is critical to propose strategies for its management and conservation.

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LITERATURE CITED

- Alberico, M., A. Cadena, J. Hernández-Camacho and Y. Muñoz-Saba. 2000. Mamíferos (Synapsida: Theria) de Colombia. Biota Colombiana 1: 43–75. <http://www.redalyc.org/pdf/491/49110103.pdf>
- Ammerman, L.K., D.N. Lee and T.M. Tipps. 2012. First molecular phylogenetic insights into the evolution of free-tailed bats in the subfamily Molossinae (Molossidae, Chiroptera). Journal of Mammalogy 93(1): 12–28. doi: [10.1644/11-MAMM-A-103.1](https://doi.org/10.1644/11-MAMM-A-103.1)
- Barquez, R.M., M.A. Mares and J.K. Braun. 1999. The bats of Argentina. Museum of Texas Tech University 42: 1–275.
- Copaverde-Júnior, U.D., S.M. Pacheco and M.E. Duarte. 2014. Murciélagos (Mammalia: Chiroptera) del área urbana del municipio de Boa Vista, Roraima, Brasil. Barbastella 7 (1): 1–6. http://www.secemu.org/media/uploads/ubirajara_et_al_2014.pdf
- Cuervo, A., J. Hernández-Camacho and A. Cadena. 1986. Lista actualizada de los mamíferos de Colombia: anotaciones sobre su distribución. Caldasia 15: 471–501. <http://revistas.unal.edu.co/index.php/cal/article/view/35095>
- Díaz, M.M., L.F. Aguirre and R.M. Barquez, 2011. Clave de identificación de los murciélagos del cono sur de Sudamérica. Cochabamba, Bolivia: Centro de Estudios en Biología Teórica y Aplicada. 94 pp.
- Eger, J.L. 2008. Family Molossidae P. Gervais, 1856; p. 669, in: A. L. Gardner (ed.). Mammals of South America. Volume 1. Marsupials, xenarthrans, shrews, and bats. Chicago: The University Chicago Press.
- Eisenberg, J.F. 1989. Mammals of the Neotropics: The northern Neotropics. Chicago: The University of Chicago Press. 449 pp.
- Fenton, M.B., C.V. Portfors, I.L. Rautenbach and J.M. Waterman. 1998. Compromises: sound frequencies used in echolocation by aerial-feeding bats. Canadian Journal of Zoology 76(6): 1174–1182. doi: [10.1139/z98-043](https://doi.org/10.1139/z98-043)
- Flores-Quispe, M., M.G. Calizaya, V. Pacheco and A.G. Aragón. 2015. Distribution of *Promops davisoni* Thomas, 1921 (Chiroptera: Molossidae) in Peru with a new record and southward range extension. Check List 11(2): 1573. doi: [10.15560/11.2.1573](https://doi.org/10.15560/11.2.1573)
- Gallardo, A.O. and D.J. Lizcano. 2014. Organización social de una colonia del murciélago *Carollia brevicauda* en un refugio artificial, Bochalema, Norte de Santander, Colombia. Acta Biológica Colombiana 19: 241–250. doi: [10.15446/abc.v19n2.30207](https://doi.org/10.15446/abc.v19n2.30207)
- Gregorin, R. and A. Cirranello. 2016. Phylogeny of Molossidae Gervais (Mammalia: Chiroptera) inferred by morphological data. Cladistics 32(1): 2–35. doi: [10.1111/cl.12117](https://doi.org/10.1111/cl.12117)
- Gregorin, R. and E.A. Chiquito. 2010. Revalidation of *Promops davisoni* Thomas (Molossidae). Chiroptera Neotropical 16(1): 648–660. <https://chiroptera.unb.br/index.php/cn/article/view/54>
- Gregorin, R. and V.A. Taddei. 2002. Chave artificial para a identificação de molossídeos brasileiros (Mammalia, Chiroptera). Mastozoología Neotropical 9: 13–32. http://www.sarem.org.ar/wp-content/uploads/2012/11/SAREM_MastNeotrop_9-1_03-Gregorin.pdf
- Goodwin, G.G. and A.M. Greenhall. 1961. Two new bats from Trinidad, with comments on the status of genus *Mesophylla*. American Museum Novitates 2080: 1–18. <http://hdl.handle.net/2246/4024>
- Handley, C.O., Jr. 1976. Mammals of the Smithsonian Venezuelan Project. Brigham Young University Science Bulletin 20(5): 1–89; 2 maps.
- IaVH (Instituto de Investigación de Recursos Biológicos Alexander von Humboldt). 2001. Plan de acción regional en biodiversidad para Norte de Santander. Cucúta, Colombia: Corporación Autónoma Regional de la Frontera Nororiental-CORPONOR, Instituto de Investigación de Recursos Biológicos Alexander von Humboldt. 200 pp.
- Linares, O.J. 1998. Mamíferos de Venezuela. Caracas, Venezuela: Sociedad Conservacionista Audubon de Venezuela. 691 pp.
- Norberg, U.M. and J.M.V. Rayner. 1987. Ecological morphology and flight in bats (Mammalia; Chiroptera): wing adaptations, flight performance, foraging strategy and echolocation. Philosophical Transactions of the Royal Society, London B 316: 335–427. doi: [10.1098/rstb.1987.0030](https://doi.org/10.1098/rstb.1987.0030)
- Reis, N.R., A.L. Peracchi, W.A. Pedro and I.P. De Lima. 2007. Morcegos do Brasil. Londrina, Brasil: Divisão de Processos Técnicos da Biblioteca Central da Universidade Estadual de Londrina. 253 pp.
- Sazima, I. and W. Uieda. 1977. O morcego *Promosp nasutus* no sudeste brasileiro (Chiroptera, Molossidae). Ciencia e Cultura 29(3): 312–314.
- Siles, L., D. Peñaranda, J. Pérez-Zubieta and K. Barboza. 2005. Los murciélagos de la ciudad de Cochabamba. Revista Boliviana de Ecología y Conservación Ambiental 18: 181–164. <http://www.cepsip.org/rebeca/index.php/rebeca/article/view/75>
- Simmons, N.B. 2005. Order Chiroptera; pp. 312–529, in: D.E. Wilson and D.M. Reeder (eds.). Mammal species of the world: a taxonomic and geographic reference. Baltimore City: Johns Hopkins University Press.
- Simmons, N.B. and R.S. Voss. 1998. The mammals of Paracou, French Guiana: a Neotropical lowland rainforest fauna. Part I. Bats. Bulletin of the American Museum of Natural History 237: 1–219. <http://digitallibrary.amnh.org/handle/2246/1634>
- Solari, S., Y. Muñoz-Saba, J.V. Rodríguez-Mahecha, T.R. Defler, H.E. Ramírez-Chaves and F. Trujillo. 2013. Riqueza, endemismo y conservación de los mamíferos de Colombia. Mastozoología Neotropical 20(2): 301–365. http://www.sarem.org.ar/wp-content/uploads/2013/12/SAREM_MastNeotrop_20-2_08_Solari.pdf
- Suárez-Payares, L.M. and D.J. Lizcano. 2011. Uso de refugios por tres especies de murciélagos filostómidos (Chiroptera: Phyllostomidae) en el Área Natural Única Los Estoraques, Norte de Santander, Colombia. Mastozoología Neotropical 18: 259–270. http://www.scielo.org.ar/scielo.php?script=sci_arttext&pid=S0327-93832011000200008&nrm=iso
- Vásquez, V.V.H. and G.M.A. Serrano. 2009. Las Áreas Naturales Protegidas de Colombia. Bogotá: Conservación Internacional/ Colombia Fundación Biocolombia. xv + 696 pp.

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