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First record of *Platyrrhinus albericoi* Velazco, 2005 (Chiroptera, Phyllostomidae) in the eastern slope of the Central Andes of Colombia

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Abstract
We report the first record of the bat *Platyrrhinus albericoi* Velazco, 2005 on the eastern slope of the Colombian Central Andes. Currently there are records of this species on the western slope of the Central Andes, eastern slope of the western Andes, and both slope of the eastern Andes in Colombia. We performed a morphological review of the specimens from several Colombian collections and analyzed their character variation, life zone, and distribution in Colombia. The geographic range of *P. albericoi* is increased and a new life zone, Premontane Wet Forest (bmh-PM in Spanish), is added to its distribution.

Key words
Range expansion, Neotropics, Tolima Department, bat.

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Introduction

Bats of the genus *Platyrrhinus* are frugivores that provide functional services to the environment because they disperse large amounts of seeds in Neotropical forests (Medellín 2003, Velazco and Gardner 2009, Estrada-Villegas et al. 2010). Bats of this genus are known to contribute to forest succession and ecological restoration because they consume many pioneer species and disperse them under isolated trees outside the forest or along forest edges (Medellín and Gaona 1999, Olea-Wagner et al. 2007, Estrada-Villegas et al. 2010).

Species of this genus differ from other stenodermatines by having the following combination of characters: a fringe of hairs on the outermost edge of the uropatagium, 2 accessory cusps on the posterior face of the second upper premolar (P4), and the presence of 3 upper molars. Other genera share one or two of these characteristics, but no other genera have all three characteristics (Lim 1993, Albuja 1999).

Platyrrhinus Saussure, 1860 (Phyllostomidae: Stenodermatinae) is one of the most diverse phyllostomid genera found in the Neotropics with 20 species (Velazco et al. 2018, Velazco and Patterson, 2008) and is surpassed only by the genus *Sturnira* with 22 species (Molinari et al. 2017) and *Artibeus* with 23 species (Hoofer et al. 2008, Redondo et al. 2008, Solari et al. 2009). In Colombia, *Platyrrhinus* is represented by 14 species (Ramírez-Chaves et al. 2016), but their geographic and altitudinal ranges vary widely (Velazco and Solari 2003, Gardner

2008, Velazco and Gardner 2009). One of the largest species in this genus is *Platyrrhinus albericoi* with a forearm length that range from 62 to 63 mm (Velazco 2005).

In Colombia, *P. albericoi* has been recorded in at least 21 localities, with 19 of these along the Andes, including 7 in the western Andes (departments of Risaralda and Valle del Cauca), 3 in the Central Andes (departments of Antioquia, Caldas and Quindío), and 9 in the eastern Andes (departments of Boyacá, Cundinamarca, Norte de Santander and Santander). Additionally, there are 3 records outside the Andes region in the Sierra Nevada of Santa Marta (Department of Magdalena) in northern Colombia (Mantilla-Meluk et al. 2009, Velazco and Gardner 2009). The records in Colombian collections are distributed along an altitudinal gradient ranging from 950 to 2650 m above sea level (a.s.l.) (Muñoz 2001, Tirira 2007, Mantilla-Meluk et al. 2009, Solari et al. 2013, Noguera-Urbano and Escalante 2015). Although, this species seems to prefer premontane and montane forests (Table 1), there are some records of *P. albericoi* along the coast and at the foothills of both versants of the Ecuadorian Andes, which suggests that it also inhabits humid tropical, subtropical and temperate forests (Muñoz 2001, Tirira 2007, Noguera-Urbano and Escalante 2015).

In this study, we report 3 new records that extend the geographic distribution of *P. albericoi* in Colombia into the eastern slope of the Central Andes, at the center of the Tolima department, confirming its presence in the Premontane Moist Forest and Premontane Wet Forest (bh-PM and bmh-PM in Spanish, Table 1) according classifying world life zones or plant formations reported by the Holdridge system (1987). Additionally, we provide cranial measurements and information on the life zones at the new localities (Tables 1, 2, Appendix), and we discuss the scenarios that might determine the distribution of this species in Colombia.

Methods

We reviewed specimens of *Platyrrhinus albericoi* from the following Colombian collections: Colección Zoologica de la Universidad del Tolima (CZUT-M, Ibagué); Instituto de Investigación Recursos Biológicos Alexander von Humboldt (IAvH-M, Villa de Leyva); Instituto de Ciencias Naturales, Universidad Nacional de Colombia (ICN, http://www.biovirtual.unal.edu.co, Bogotá); Colección de Mastozoología del Instituto de Biología de la Universidad de Antioquia (MUA, Medellín); Museo Javeriano de Historia Natural "Lorenzo Uribe, S.J.", Pontifica Universidad Javeriana (MPUJ, Bogotá); and Universidad del Valle (UV, Cali). Additionally, we gathered, information regarding specimens that were available in the online database of the National Museum of Natural History, Smithsonian Institution (NMNH,

Table 1. Records of *Platyrrhinus albericoi* in Colombia. Premontane moist forest (bh-PM), Tropical moist forest (bh-T), Lower montane moist forest (bh-MB) and very humid montane forest (bmh-PM).

Sex	Voucher no.	Latitude	Longitude	Elevation (m)	Municipality	Department	Region	Life zone
Male	MUA11141	05.7867	–075.1396	1272	Sansón	Antioquia	Cordillera Central	bh-PM
Male	ICN 16329	04.8811	–073.2486	950	Santa María	Boyaca	Cordillera Oriental	bh-T
	MHN-UC 160, 582-583, 705	05.0583	–075.3841	2200	Cuenca del río Chinchiná	Caldas	Cordillera Central	bh-MB
Male	MPUJ 0315	04.6289	–074.3136	2650	San Antonio del Tequendama	Cundinamarca	Cordillera Oriental	bh-MB
Male	MPUJ 1480	05.0641	–074.2353	1734	Supatá	Cundinamarca	Cordillera Oriental	bh-PM
Female	MPUJ 1470-1478	05.0641	–074.2353	1734	Supatá	Cundinamarca	Cordillera Oriental	bh-PM
Male	ICN 5541	04.6895	–074.3868	2100	Tena	Cundinamarca	Cordillera Oriental	bh-MB
Male	ICN 5392	11.1098	–074.0744	2000	Santa Marta	Magdalena	SNSM	bh-PM
	Sánchez-Palomino et al. 1993	03.3000	–073.9500	700	Município de San Juan de Arama	Meta	Cordillera Oriental	bh-T
Male	IAvH-M 6740	07.2585	–072.2260	1608	Toledo	Norte de Santander	Cordillera Oriental	bh-PM
Male	IAvH-M 7046	04.5090	–075.6860	1325	Armenia	Quindio	Cordillera Central	bh-PM
Male	ICN 11788	05.4570	–076.0653	980	Mistrató	Risaralda	Cordillera Oriental	bh-T
Female	MPUJ 1147	04.7424	–075.5668	2266	Pereira	Risaralda	Cordillera Occid.	bh-MB
Male	ICN 11941	05.2451	–076.0071	1600	Pueblo Rico	Risaralda	Cordillera Occid.	bh-T
Male	ICN 8151	06.0749	–073.2166	1600	Charalá	Santander	Cordillera Oriental	bh-T
Male	ICN 17590-17591	07.2613	–073.0404	1600	Encino	Santander	Cordillera Oriental	bh-T
Female	CZUT-M 98	04.3886	–075.5139	2159	Cajamarca	Tolima	Cordillera Central	bh-MB
Male	CZUT-M 188, 327	04.5000	–075.3000	1777	Ibagué	Tolima	Cordillera Central	bmh-PM
Male	USNM 483654, 483656	03.3480	–076.4763	1658	Calí	Valle del Cauca	Cordillera Occid.	bh-PM
Male	UV 3413	03.8833	–076.5833	1650	Darién	Valle del Cauca	Cordillera Occid.	bh-PM
Female	USNM 483646, 483648, 483650, 483652	03.7708	–076.5155	1365	Restrepo	Valle del Cauca	Cordillera Occid.	bh-PM
Female	USNM 483647, 483649, 483651, 483653, 483579	3.7708	–076.5155	1365	Restrepo	Valle del Cauca	Cordillera Occid.	bh-PM

USA; VertNet, http://portal.vertnet.org) and from specimens that were reported in regional checklists that were backed by vouchers specimens (e.g. Escobar-Lasso et al. 2013, Sánchez-Palomino et al. 1993). We made 22 external and cranial measurements with digital calipers with an accuracy of 0.1 mm (Table 2). Total length (TL) and weight (W) were taken from the specimen labels.

Furthermore, we reviewed and reidentified three specimens published by Galindo-Espinosa et al. (2010) identified as *Chiroderma salvini* (CZUT-M 98) and *Platyrrhinus vittatus* (CZUT-M 188 and CZUT-M 327) to assess the accuracy of their identifications. We compared each specimen housed in the various collections with the characters provided by Velazco (2005) and Velazco and Gardner (2009), and described the morphological characters, external and craniodental measurements of *P. albericoi* distributed in Colombia to facilitate the future identification under field and laboratory conditions.

We gathered specimen data from the different biological collections including: coordinates, elevation, locality, geographical region, and life zone according to the classification of Holdridge (1987) (Table 1). We created a distribution map of *P. albericoi* in Colombia, including the localities of the specimens deposited in the ICN, MPUJ, IAvH-M, UV, and MUA collections, as well as records available in the literature (e.g. Velazco and Gardner 2009). We analyzed the presence or absence of each species among the different geographic regions and provinces of Colombia (Table 1, Appendix), as proposed by Hernández-Camacho et al. (1992). Finally, we report on some ecological observations that were obtained from the information associated with the reviewed specimens.

Results

The reexamination of 3 specimens reported by Galindo-Espinosa et al. (2010; CZUT 98, 188, 327), resulted in their reidentification as *P. albericoi*. These records broaden the known geographic distribution of *P. albericoi* and constitute the first records of the species in the eastern slopes of the Central Andes of Colombia.

***Platyrrhinus albericoi* Velazco, 2005**

Figure 2

New records. Colombia: Department of Tolima, municipality of Ibagué, Vereda Pastales, La Plata creek (04°30′ N, 075°18′ W, 1777 m a.s.l) (Fig. 1), collected by Emma Galindo and Karina Gutierrez on January 30, 2003. Two males with scrotal testes (CZUT-M 188, 327). Colombia: Department of Tolima: municipality of Cajamarca, Vereda La Leona (04°23′19″ N, 075°30′50″ W, 2159 m a.s.l), on July 29 of 2003, a nonreproductive male with a TL of 94.5 mm (CZUT-M 98).

These collection localities belong to the bh-PM and bmh-PM life zones, which are characterized by steep slopes and a vegetation that includes species like *Alchornea polyantha*, *Pseudobombax septenatum*, *Calophyllum lucidum*, *Maclura tinctoria*, *Dussia lehmannii*, *Jacaranda copaia*, *Luehea seemannii*, *Poulsenia armata* and *Virola sebifera* (Guzman 1996). The dominant landscape ranges from plains to low mountainous areas with sandy

Table 2. Selected external and craniodental measurements of *P. albericoi* collected in the eastern slope of the Central Andes, Colombia. Measurements of the holotype and paratype of *P. albericoi* were taken from Velazco (2005).

Characteristics	This study: MUSM 19149		Holotype: FMNH 170145	Paratype
Sex	Female	Male	Female	Female
Weight	52	52	55	68
Total length	99.5	94.59	100	100
Hindfoot length	15.5	16.08	16	15
Ear length	24.08	22.08	25	24
Forearm length	62.58	63.08	63	62
Tibia length	23.73	22.7	23.93	23.71
Greatest length of skull	32.2	50.82	32.84	32.51
Condyloincisive length	31.12	47.07	32.63	31.63
Condylocanine length	30.55	45.835	31.89	30.82
Postorbital breadth	7.12	11.755	7.65	7.39
Zygomatic breadth	20.15	30.3	20.85	20.68
Braincase breadth	13.13	20.17	13.38	13.58
Mastoid breadth	15.43	22.79	15.85	16.12
Palatal length	17.77	27.94	—	—
Maxillary tooth row length	13.24	19.79	13.89	13.44
Breadth across maxilla	8.82	14.24	—	—
Molariform tooth row length	11.06	17.19	—	—
Width across first upper molars	14.39	22.75	—	—
Width across second upper molars	14.89	22.94	—	—
Dentary length	23.06	37.47	—	—
Length of mandible toothrow	15.06	22.07	—	—
Coronoid height	8.43	13.8	—	—
Width at mandible condyles	9.89	14.65	—	—
Breadth across molars	15.05	23.07	15.23	15.57

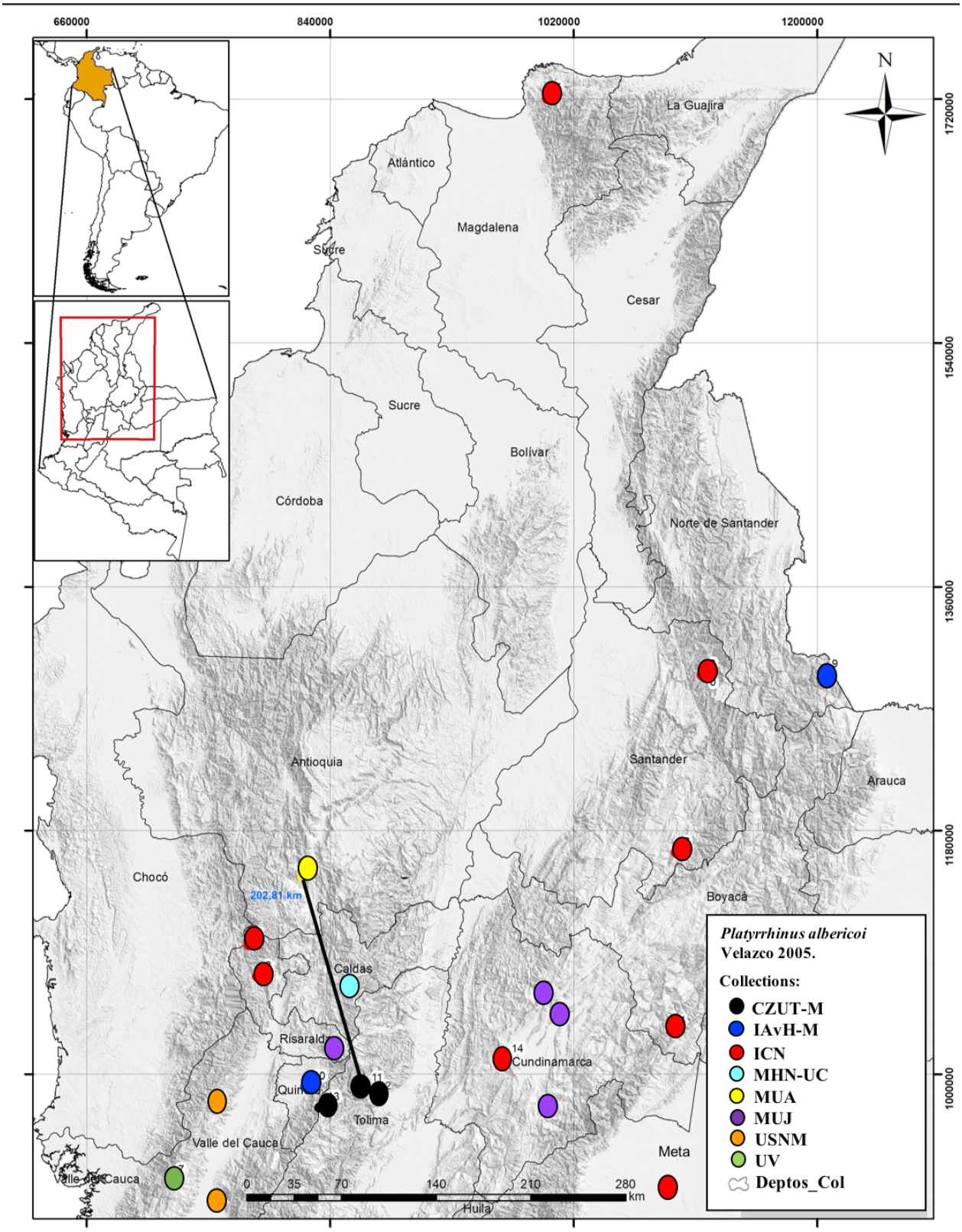

Figure 1. Records of *Platyrrhinus albericoi* in Colombia. See Methods for acronyms.

soils (Vargas et al. 2007). These 2 life zones (bh-PM and bmh-PM) are mostly located in areas with excessive agricultural and urban development, where the natural vegetation has been replaced with coffee, banana and other crops. The collections are from a patch of natural vegetation (bh-PM and bmh-PM) surrounded by crops and near streams and creeks, where riparian vegetation remnants are still found.

Identification. The 3 specimens were identified by comparing their external and cranial characters with the original description of *P. albericoi* (Velazco 2005). The key characteristics, that led us to recognize our specimens as *P. albericoi* were the combination of large size and dorsal fur with 3 bands and bicolored ventral fur, a

Figure 2. Dorsal, ventral and occlusal views of the skull and mandible of a male *Platyrrhinus albericoi* (CZUT-M 98) captured at Vereda La Leona, Tolima department, in July 2003.

well-marked but a narrow dorsal line, dense long hairs on the dorsum of the feet, a forearm greater than 55 mm, metacarpal III subequal to V, accessory cuspulids lacking on pm4 and the measurements of the skull (Table 2).

Discussion

Our results update and increase the distribution of *P. albericoi* in Colombia (Table 1). To date, there were no records of this species in the eastern slope of the Central Andes of Colombia. The existing records of the species correspond to life zones bh-PM, bh-T and bh-MB. Escobar-Lasso et al. (2013) reported the presence of *P. albericoi* in the basin of the río Chinchiná in the department of Caldas (MHN-UC 160, 582, 583, 705). However, after reviewing the geographical information provided by Escobar-Lasso et al. (2013) we find that the Chinchiná river basin is not on the eastern slope of the Central Cordillera but on the western slope of the Colombia›s Central Cordillera of the Andes (Franco 2001).

The records reported here not only represent the first records of the species in the eastern slope of the Central Andes of Colombia, but also represents an extension of the ecological range of the species. The life zone Premontane Wet Forest (bmh-PM) has environmental and climatic characteristics that differ from others previously reported for the species, presenting a precipitation that ranges between 2000–4000 mm and a temperature between 18–24 °C. Natural forests in this area were characterized by their large extent, with several arboreal strata, many epiphytes, and fertile soils; however, currently most of the forest has been transformed to coffee, plantain crops, and grasslands (Guzman 1996).

The existence of only few records of *P. albericoi* in Colombia may be associated with the paucity of local and regional studies (Hutson et al. 2001). Additionally, the current levels of deforestation and transformation to coffee plantations and vegetable crops of some life zones are important for *P. albericoi* (Vargas et al. 2007, García et al. 2015).

We conclude that the remnants the bh-MB and bmh-PM in the department of Tolima harbor important species of bats. The expansion here of the geographic distribution of *P. albericoi* reinforces the need for additional bat samplings in the department of Tolima, which still has poorly studied areas (García et al. 2015, 2018).

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Authors' Contributions

LARF and LVGH examined and identified the specimens and analyzed the data from the collections; LARF, LVGH and GRF wrote the manuscript, with significant contributions from all the coauthors; LARF and LVGH photographed the skulls; and LARF edited the photographs for the figures.

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Appendix

Analyzed specimens. For each specimen the collection acronym and museum number are provided, and the localities are listed by country, department, and specific locality.

Platyrrhinus albericoi*—Colombia**. ***Antioquia: Sonsón, La Soledad (MUA 11141). ***Boyacá*:** Santa María, Vereda La Calichana, Sitio La Almenara (ICN 16329). ***Caldas***: Cuenca del Río Chinchina (MHN-UC 160, 582, 583, 705). ***Cundinamarca:*** Supáta, Vereda Las Lajas, finca los Recuerdo (MPUJ 1470, 1478, 1480); Tena, Laguna de Pedro Palo (ICN 5541); San Antonio del Tequendama, San Cayetano (MPUJ 0315). ***Magdalena:*** Santa Marta, Serranía San Lorenzo, Hacienda La Victoria (ICN 5392). ***Meta:*** Município de San Juan de Arama, Subcuenca hidrográfica del Río Güejar, cuenca del Río Guayabero (Sánchez-Palomino and Rivas-Pava 1993). ***Norte de Santander:*** Municipio Toledo, Vereda el Diamante, Cerro San Agustín, Parque Natural Nacional Tama (IAvH-M 6740). ***Quindío:*** Municipio Armenia, Vereda San Juan de Carolina, Finca La Irlanda, Bosque San Pedro (IAvH-M 7046). ***Risaralda:*** Mistrato, Puerto de Oro (ICN 11788); Pereira, Vereda la Suiza, corregimiento la Florida, Santuario de Fauna y Flora Otún Quimbaya (MPUJ 1147) Pueblo Rico, Vereda San José, Quebrada San José (ICN 11941). ***Santander:*** Charala, Inspección de Policía Virolin, Margen Derecha Río Guillermo (ICN 8151); Encino, Vereda Los Pericos, Finca Vegaleón (ICN 17590, 17591). ***Tolima:*** Cajamarca, Vereda La Leona (CZUT-M0098); Ibagué, Vereda Pastales, Quebrada La Plata (CZUT-M0188, 0327). ***Valle del Cauca:*** Cali (USNM 483654, 483656); Darién, Finca La Guayacana, 2 km W del muro (UV 3413); Restrepo (USNM 483646–483653, 483579).