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# First record of Eastern Cloud Forest Rat *Nephelomys nimbosus* (Rodentia: Cricetidae) for Colombia

SEBASTIAN BAUTISTA PLAZAS<sup>1,2\*</sup>, ABELARDO RODRÍGUEZ BOLAÑOS<sup>2</sup> AND RONALD CASTELLANOS FLOREZ<sup>2</sup>

<sup>1</sup> Laboratorio Ecología de Bosques Tropicales y Primatología, Universidad de los Andes, Carrera 1 No 18A 12. Bogotá 111711, Colombia. Email: [sebastianbautista386@gmail.com](mailto:sebastianbautista386@gmail.com) (SB).

<sup>2</sup> Laboratorio Biodiversidad de Alta Montaña, Universidad Distrital Francisco José de Caldas, Carrera 4 No 26B 54. Bogotá 111611, Colombia. Email: [mountainresearch@gmail.com](mailto:mountainresearch@gmail.com) (AR), [kabuz2013@gmail.com](mailto:kabuz2013@gmail.com) (RC).

\*Corresponding author

Currently, four species of *Nephelomys* (*N. childi*, *N. maculiventer*, *N. meridiensis* and *N. pectoralis*) are known from Colombia. Here we present the first records of a fifth species, the rare Eastern Cloud Forest rat *N. nimbosus*, previously considered endemic to Ecuador and so far recorded only at five localities in the forests of the Eastern Cordillera. Four individuals of *N. nimbosus* were captured with Sherman traps at National Natural Park Cueva de los Guacharos in Huila Department, southern Colombia. Individuals were captured at two locations, a subandine primary forest at 2,000 m and at small cave 'Cueva de los Guacharos', at 1,900 m. Individuals were identified as *N. nimbosus* according to the following characteristics: ventral patch of self-colored white hairs in the gular region, ventral pelage ochraceous yellow with a golden tone, medium head-body size between 122 to 140 mm, incisive foramina between 4.6 and 5.1 mm with lateral margins rounded, posterolateral palatal pits small to big shallow and simple, hourglass shaped interorbital region, with supraorbital margins rounded or squared and a thin and delicate face. These new records increase the known species distribution by 760 kilometers to the north and present the first record of the species in Colombia. This first record of *N. nimbosus* for Colombia potentially extends the species distribution for northeastern Ecuadorian Cordillera and southern Colombian Cordillera. These results show the need to continue with the collection of specimens in poorly known species as *N. nimbosus* and in poorly known areas in Colombia, such as montane forests.

Actualmente, Colombia presenta cuatro especies del género *Nephelomys* (*N. childi*, *N. maculiventer*, *N. meridiensis* y *N. pectoralis*), aquí presentamos una quinta especie, la poco conocida rata de bosques nublados *Nephelomys nimbosus*, anteriormente considerada endémica de Ecuador y hasta ahora reportada para cinco localidades en bosques de la Cordillera Oriental. Cuatro individuos de *N. nimbosus* fueron capturados mediante trampas Sherman en el Parque Nacional Natural Cueva de los Guacharos, en el departamento de Huila, Colombia. Los individuos fueron encontrados en dos localidades, un bosque primario subandino a 2,000 m de altitud, y en una pequeña caverna "Cueva de los Guacharos", a 1,900 m de altitud. Los individuos pudieron ser identificados como *N. nimbosus* de acuerdo con las siguientes características: Parche ventral con pelos de color blanco en la región gular, pelaje ventral color amarillo ocre con un tono dorado, tamaño mediano, con una longitud entre la cabeza y el cuerpo de 122 to 140 mm; el foramen incisivo corto entre 4.6 y 5.1 mm con márgenes laterales redondeados, fosas palatales posterolaterales pequeñas a grandes, superficiales y simples; región interorbital en forma de reloj de arena, con márgenes supraorbitales redondeados o cuadrados, un rostro delgado y delicado. Estos nuevos ejemplares permiten aumentar la distribución de la especie por 760 kilómetros y presentar el primer registro de la especie para Colombia. Este primer registro de *N. nimbosus* para Colombia, extiende la distribución de la especie para el norte de la cordillera oriental de Ecuador y el sur de Colombia. Los resultados muestran la necesidad de continuar con la colecta de especímenes en los bosques montanos de áreas poco conocidas de Colombia.

**Key words:** Andes; montane forest; small non flying mammals; Thomasomyini.

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## Introduction

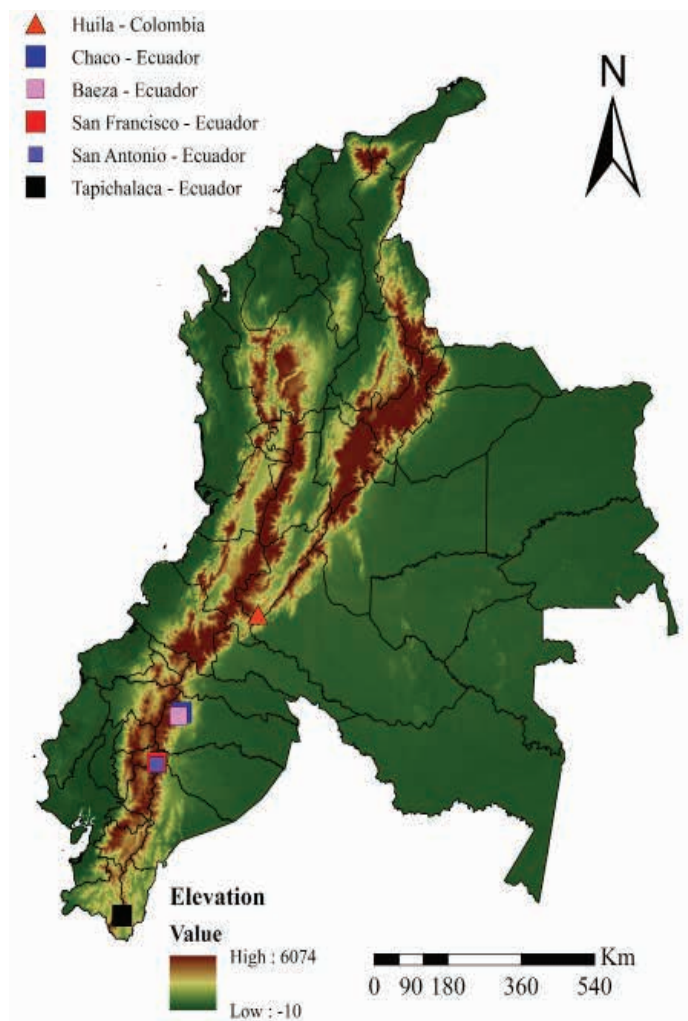
Cloud forest rats belonging to genus *Nephelomys* (Cricetidae: Sigmodontinae) distribute in the Andes (900 to 3000 m); they can be found in wooded paramo, montane cloud and elfin forest ecosystems (Percequillo 2003, 2015). Species of genus *Nephelomys* are present in South America from Colombia to Bolivia, including coastal Venezuela, extending to the Cordilleras of Panama and Costa Rica in Central America (Percequillo 2003, 2015; Prado and Percequillo 2013). Four of the thirteen species of the genus, *N. childi*, *N. maculiventer*, *N. pectoralis* and *N. meridiensis* are known from Colombia (Percequillo 2003, 2015; Solari et al. 2013; Ramirez-Chavez et al. 2016).

Historically the species *N. nimbosus* (Anthony 1926) was considered endemic to Ecuador. It was known from five

localities along the eastern slope of the Andes Cordillera, specifically two locations in the Napo Province (Baeza and Chaco Oyacachi River) and two in the Tungurahua Province (San Antonio, San Francisco; Percequillo 2003, 2015). Later, a new locality record at southeastern Ecuador (Tapichalaca, Zamora Chinchipe Province) was reported (Brito et al. 2015; Figure 1). Given the scarcity of records, the natural history of *N. nimbosus* is poorly known. Here we present the Colombian first record for *N. nimbosus*.

## Materials and methods

Individuals were captured between February and August of 2014 as part of the first inventory of small non flying mammals for the Natural National Park Cueva de los Guacharos (PNNCG) located in the department of Huila, Colombia



**Figure 1.** Recording localities of *Nephelomys nimbosus* in Ecuador and the new one in Colombia at Huila department.

(1° 36.14'N, -76° 8.13'W). Capture survey consist in linear transects of Sherman traps placed on the ground, a total of 100 traps were active for 150 days, totalizing a trapping effort of 1,5000 traps night (Bautista et al. 2014). *N. nimbosus* individuals were captured at two of the five sampling localities. The first one was a subandine primary forest at 2000 m; this location presents a high canopy with lianas and palms; some of the most abundant species were plants of the genus *Wettinia*, *Hyeronima*, *Alchornea*, *Miconia*, and *Inga* (Prada and Stevenson 2010). The second trapping locality was 'Cueva de los Guacharos' at 1900 m, a small cave with no vegetation where nocturnal frugivore birds known as oilbirds (*Steatornis caripensis*) build their nests and spend most of the daylight. The accumulation of Oilbird seed wastes on the bottom of the cave (e. g., *Prestoea acuminata*, *Geonoma* sp, *Dacryodes* sp, and *Oenocarpus bataua*) serves as a food resource for small non-flying mammals, like *N. nimbosus* and *N. childi* (Bautista et al. 2014).

The *N. nimbosus* specimens were deposited in the mammal collection of the Universidad Distrital Francisco Jose de Caldas (MUD) in Bogota, Colombia. Analyzed specimens (MUD 877; MUD 883; MUD 884; MUD 893) were compared with the holotype of *N. nimbosus* (American Museum of

Natural History, AMNH 67337; Anthony 1926; Percequillo 2003), and a specimen of this species from south eastern Ecuador deposited in the Ecuadorian Museum of Natural Sciences (DMMECN 1083; Brito et al. 2015). Also, specimens were compared with individuals of *N. childi* (MUD 876; MUD 876; MUD 880; MUD 887; MUD 889). Body and cranial measures were taken with a gauge  $\pm 0.1$  following the definitions of Voss (1988) and Patton et al. (2000).

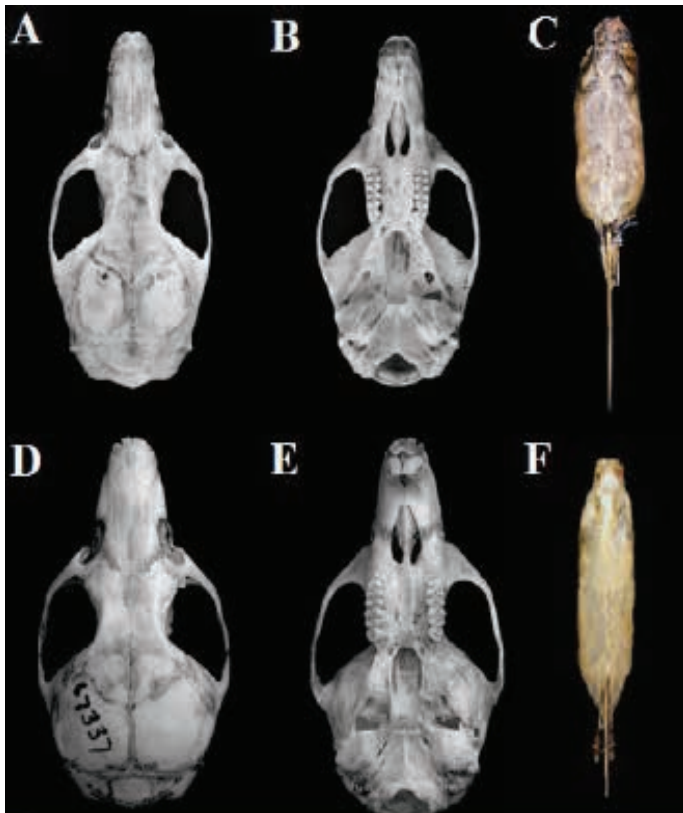
## Results

Four individuals from a total of 198 of the first inventory of small non flying mammals of PNNCG were identified as belonging to *N. nimbosus* using the description and key provided in Anthony (1926) and Percequillo (2003, 2015). Some co-occurring species were *Marmosops parvidens*, *Marmosops caucae*, *Heteromys anomalus*, *Melanomys caliginosus*, *Chilomys instans*, *Neacomys tenuipes*, *Rhipidomys latimanus*, *Microryzomys minutus*, *Tramandinomys talamancae* and *Nephelomys childi*, most of them typical of montane forest.

Captured individuals present the following characteristics that separates them from those of *N. auriventer* and *N. childi* (Figure 2). Ventral patch of self-colored white hairs in the gular region (not present in *N. auriventer*), ventral pelage ochraceous yellow with a golden tone (*N. childi* presents ventral pelage grayish or whitish washed with gray), medium body size between 122 and 140 mm (*N. auriventer* is larger, measuring between 140 and 173 mm), incisive foramina short range: 4.6 to 5.1 mm with lateral margins rounded (*N. auriventer* has long incisive foramina range: 5.6 to 6.7 mm with teardrop shape), posterolateral palatal pits small to big shallow and simple (*N. childi* presents posterolateral palatal pits complex small numerous and deep), interorbital region hourglass shaped, with supra-orbital margins rounded or squared (*N. auriventer* has an interorbital region with strongly beaded supraorbital margins, which diverge posteriorly) and a thin and delicate face (*N. nimbosus* has a robust and strong face; Anthony 1926; Percequillo 2003, 2015). No comparison were made with *N. pectoralis* because of its distinctive large and wide white ventral patches and its numerous and deep posterolateral pits placed in deep palatal fossae (Allen 1912; Weksler et al. 2006). Most of cranial and body measures of the four individuals are within the known range for the species (Percequillo 2003, 2015; Weksler et al. 2006; Brito et al. 2015; Table 1). This new record of *N. nimbosus* expands the known distribution of the species 760 km towards north, and constitutes the first record of the species for Colombia.

## Discussion and conclusions

Colombian sigmodontines have recently suffered taxonomic changes, as well as improvements in their know distribution. Hence, the species number from Colombia has increased from 66 in 2013 (Solari et al. 2013) to 75 in 2016 (Ramirez-Chavez et al. 2016). The new records of *N. nimbosus* of the present study and of *N. meridiensis* mentioned by Percequillo (2015); previously identified as *Nephelomys*



**Figure 2.** Dorsal (A) and ventral view (B) of the skull and (C) skin of an adult Colombian female of *Nephelomys nimbosus* (MUD 883). Dorsal (D) and ventral view (E) of the skull and (F) skin of the holotype of *Nephelomys nimbosus* (AMNH 67337).

**Table 1.** External and cranial measures (in millimeters) of four specimens of *Nephelomys nimbosus* from Colombia (MUD 877, MUD 884, MUD 893, MUD 883), *Nephelomys nimbosus* of Zamora Chinchipe province (DMMECN 1083; Brito et al. 2015), and the holotype of *Nephelomys nimbosus* (AMNH 1083) from Tungurahua province, Ecuador taken from Percequillo (2003).

Measures (mm)	Colombia				Ecuador	
	MUD 877	MUD 884	MUD 893	MUD 883	AMNH 67337 (Holotype)	DMMECN 1083
Total length	284	292	302	242	300	289
Tail length	129	149	153	116	160	147
Head and Body length	155	143	149	126	140	142
Hindfoot length	30.8	32.0	31.6	30.7	34.0	33.0
Ear length	20.9	18.2	17.7	16.6	-	19.0
Weight (grams)	74.9	73.7	57.4	42.3	-	84.0
Condyle incisive length	33.02	30.73	30.37	27.86	32.04	30.50
Superior molar series length	6.46	5.54	5.38	5.61	5.57	5.50
Diastema length	10.35	8.69	9.30	7.77	9.48	9.10
Incisive foramina length	5.80	5.41	4.83	4.36	5.12	4.30
Occipitonasal length	36.61	34.25	33.65	30.81	35.33	34.10
Molar 1 width	1.78	1.72	1.62	1.78	1.64	-
Nasal length	14.32	12.38	13.91	12.69	13.13	-
Incisive foramina width	3.35	2.33	2.39	1.96	2.82	-
Zygomatic plate width	3.57	2.94	3.09	2.65	3.81	3.80
Palatal bridge width	3.48	3.16	3.98	3.05	-	-
Inter orbital lesser width	4.94	5.11	5.85	4.85	5.79	5.40
Zygomatic width	18.59	17.49	16.52	-	17.75	18.40
Rostral length	8.00	9.12	9.92	7.38	-	11.50
Cranial width	14.39	14.29	13.77	13.32	15.30	14.30
Cranial height	10.21	9.60	9.93	9.73	10.80	10.20

sp. by [Solari et al. 2013](#) and [Percequillo 2003](#)), increase the number of species of genus from three to five for Colombia and contributes to the constant changes of the Colombian sigmodontines species list.

The discovery of *N. nimbosus* in Colombia is important due to the apparently restricted distribution of the species that was previously known only from five localities in Ecuador ([Percequillo 2003, 2015](#); [Prado and Pecrequillo 2013](#); [Brito et al. 2015](#)). The potential presence of the species extends to the northern Ecuadorian Cordillera, the Colombian Cordillera massif, and to the southern part of the Colombian eastern Cordillera. Although the Andes montane forests have been catalogued as hotspots of mammalian diversity and endemism ([Myers et al. 2000](#); [Ceballos and Ehrlich 2006](#)), it is important to increase the sampling effort for small non-flying mammals in this poorly known region where deforestation rate is increasing alarmingly ([Armenteras et al. 2011](#)). The limited number of known individuals of *N. nimbosus* makes of it a rare species with a poorly known distribution ([Percequillo 2003, 2015](#); [Prado and Pecrequillo 2013](#)). For instance, in the present study the species had an abundance of four out of a total 198 small mammals captured, with a 15,000 traps night sampling effort, during a five months continuous sampling period ([Bautista et al. 2014](#)). We suggest increasing the amount of studies in the montane forest near the borderline between Colombia and Ecuador, where the species potentially could



be found. Due to these facts it is essential to increase studies of the genus *Nephelomys*, with the purpose of gathering information about species geographical distribution and ecology, which in turn would contribute useful material to clarify species limits and their phylogenetic relationships.

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