

First record of *Thomasomys cinereus* Thomas, 1882 (Rodentia, Cricetidae, Sigmodontinae) in Ecuador

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The Andean forests of southwestern Ecuador and northern Peru, hold a unique assemblage of species, given the existence of high habitat diversity. Our aim is to characterize the small mammal diversity at Yacuri National Park in southern Ecuador. We collected small non-volant mammals, using Sherman, Pitfall, and Tomahawk traps, in wet and dry habitats in the Yacuri National Park; and obtained some specimens of rodents and marsupials in the pluviseasonal forest in southern Ecuador. We registered several non-volant small mammal species, including the first Ecuadorian record of the olive-gray mouse (*Thomasomys cinereus*). This record expands the known species distribution, 10 km from the northernmost location in Peru within the same ecosystems.

Los bosques de los Andes del suroccidente de Ecuador y norte de Perú, comparten una diversidad única en especies de mamíferos, debido a la amplia diversidad de hábitats. Este estudio tuvo el objeto de conocer más acerca de los pequeños mamíferos del Parque Nacional Yacuri, para lo que se aplicaron métodos de captura de pequeños roedores y marsupiales en los bosques pluviestacionales del sur del Ecuador. Se registraron algunas especies de marsupiales, ratones marsupiales y roedores, entre los cuales una especie de roedor que resultó ser un nuevo registro del ratón gris oliváceo (*Thomasomys cinereus*) para Ecuador, el cual representa una extensión de 10 kilómetros de su distribución al norte de Perú, habitando los mismos ecosistemas peruanos en Ecuador.

Keywords: Andes; Sigmodontinae; Thomasomyini; Tumbes; Yacuri National Park.

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Introduction

The genus *Thomasomys* currently includes 44 living species, and is one of the most diverse genera of sigmodontine rodents. This genus is distributed from northern Venezuela to southern Bolivia, occupying the subtropical forest, the cloud forest, upper montane forests, and moors “paramos”. The Andes of Ecuador have been considered the center of diversification for this genus (Voss 2003).

Species of *Thomasomys* Coues 1884 are characterized by having elongated rostrums, relatively small zygomatic plates, a narrow interorbital region that appears to be hour-glass shaped, round or square supraorbital margins and a rounded braincase (Pacheco 2015). Ecuador have 13 species of *Thomasomys*: *T. aureus*, *T. auricularis*, *T. baeops*, *T. caudivarius*, *T. cinnameus*, *T. erro*, *T. fumeus*, *T. hudsoni*, *T. paramorum*, *T. silvestris*, *T. taczanowskii*, *T. ucucha*, and *T. vulcani*. Five of which inhabit the western slopes and three of which inhabit the eastern slopes in the Ecuadorian Andes (Albuja 2011; Pacheco 2015; Tirira 2017). Ecuadorian species of *Thomasomys* distribute across the Andes from 1,220 to 4,500 masl (Pacheco 2015). Moreno and Albuja (2012) mention the species *Thomasomys onkiro* from the eastern foothills of the eastern Andes in the Ecuadorian province of Zamora Chinchipe. However, according to Pacheco (2015), the specimens that are the base of this mention would represent a new species more allied to *Thomasomys caudivarius*.

The composition of the non-volant mammal assemblage of the grasslands and montane forests of the southern Ecuadorian Andes has been the subject of few studies (but see Barnett 1999), while in the north and center Andes of Ecuador has been studied more extensively (Voss 2003; Lee et al. 2006; Lee et al. 2008; Boada 2008; Lee et al. 2010; MECN 2010; Lee et al. 2011; Ojala et al. 2013). Few studies have been carried out in the eastern Andes of the province of Zamora Chinchipe (Moreno and Albuja 2012), and most of them are focused along the Cordillera del Condor. This region has recently been the site of important discoveries of flora (Ulloa et al. 2012) and fauna (Albuja and Luna 1997; Boada 2011; Almendáriz et al. 2014). Here, we report results of small non-volant mammal survey conducted at Yacuri National Park including a species of *Thomasomys*, previously unknown from Ecuador.

Materials and methods

Yacuri National Park is located between the Ecuadorian provinces of Loja and Zamora Chinchipe, at the border with Peru. We sampled at an area located at 2,900 masl in the western foothills of the Eastern Cordillera in the province of Loja, which belongs to the evergreen high montane forest of the biogeographical section “Catamayo-Alamor.” At this site, the canopy reaches up to 20 meters, and the ground is covered with forest litter (MAE 2013).

Data was collected between 2 and 13 July 2014. To capture small non-volant mammals, we used 100 Sherman traps, 50 Pitfall traps, and 50 Tomahawk traps. Sherman and Tomahawk traps were baited with a mixture of peanut butter, oatmeal and cod liver oil, sometimes alternating with tuna and salami. Traps were arranged in linear transects intercalating between two Sherman, one Pitfall trap (without fences) and one Tomahawk trap, covering different microhabitats such as ravines, freshwater streams and bush remnants in the grasslands. Sampling effort was 400 nights for Sherman trap, 200 for Pitfall traps and 200 for Tomahawk traps in the evergreen high montane forest of the biogeographical section “Catamayo-Alamor”.

We captured only one specimen of *Thomasomys* in the montane forests of the western flank of the Andes, in the province of Loja. We preserved the specimen as skin, skull, skeleton, and samples of muscle and liver tissues stored in 98 % ethanol. It was deposited in the section of Mammalogy at the Departamento de Ciencias Biológicas de la Escuela Politécnica Nacional del Ecuador (MEPN).

The specimen of *Thomasomys* was identified at the species level using original descriptions of species of *Thomasomys* and other publications (Voss 1993; Pacheco 2003, 2015). Victor Pacheco of the Departamento de Mastozoología, Museo de Historia Natural, Universidad Mayor de San Marcos (Lima, Perú), a specialist on Thomasomyini, was also consulted about the identity of the collected specimen. The determination of the other species of small mammals was by revision of original descriptions and revision of specimens of the type localities or closer to it, of the Departamento de Ciencias Biológicas de la Escuela Politécnica Nacional (MEPN) and of the Museum of San Marcos (MUSM).

Four standard body measurements were obtained from this specimen in the field: head and body length (HBL), length of tail (LT), length of hind foot (LHF), and length of ear (LE). We also measured the length of the largest mystacial vibrissae (LMV) and the length of the largest superciliary vibrissae (LSV). Twenty tree craniodental measurements were recorded (Reig 1977; Luna and Pacheco 2002; Moreno and Albuja 2012): Greatest length of skull (GLS), condyloincisive length (CIL), condylomolar length (CML), length of rostrum (LR), breadth of rostrum (BR), length of orbital fossa (LOF), length of nasals (LN), breadth of nasals (BN), least interorbital breadth (IO), length of diastema (LD), length of bony palate (LBP), breadth of bony palate (BBP), length of incisive foramina (LIF), breadth of incisive foramina (BIF), length of maxillary toothrow (LM), breadth of palatal bridge across the first upper molars (BPB), breadth of first upper molar (BM1), zygomatic breadth (ZB), breadth of braincase (BB), breadth of zygomatic plate (ZP), depth of incisors (DI), height of braincase (HB), and width of mesopterygoid fossa (WMF). These measurements were taken with a digital calibrator of 0.01mm. The craniodental nomenclature was based on Musser et al. (1998), Luna and Pacheco (2002), Voss (2003), and Moreno and Albuja (2012). Values for these measurements are provided below.

Results

The phenotype of the specimen of *Thomasomys* (MEPN 12549) collected at Yacuri National Park (south of Loja province), did not coincide with the morphological characteristics of the species of *Thomasomys* already known from Ecuador. It was determined as a specimen of *Thomasomys cinereus*. This record is the first one of the species for Ecuador and extends the known species distribution by 10 km to the north (Figure 1A) from Huamba forest, in the town of Ayabaca, Department of Piura, in Peru (Pacheco 2015). The Ecuadorian individual is a typical member of *Thomasomys cinereus*, featuring hypsodont molars, the third lower molar mesolophid is adhered to entoconid, and genal vibrissae is absent (Pacheco 2015). External general coloration of this specimen is ashen gray (Figure 1B) with gray base and white tips, alternating with longer blackish hair, while the abdomen has a grayish-white color. The tail is thick, brown on top and whitish at the base, and lacks a white tip (Thomas 1882; Pacheco 2015). This specimen shows silver ungual tufts in the toes that exceed the length of the nail (Voss 1993), the hairs that cover the top of the metatarsus are white, but the skin is black. The picture in the description of Thomas (1882) shows a ring of blackish hair around the small eyes in relation to the head (Figure 1B).

Specimen MEPN 12549 corresponds to an adult female of age two according to molar enamel wear (Voss 1988). Its recorded measurements, in millimeters, are as follows: HBL = 113; LT = 147; LHF = 29; LE = 20; LMV = 41; LSV = 21; GLS = 31.86; CIL = 29.37; CML = 19.25; LR = 10.55; BR = 6.35; LOF = 10.75; LN = 12.83 BN = 4.11; IO = 5.08; LD = 8.34; LBP = 5.48; BBP = 3.35; LIF = 6.13; BIF = 2.23; LM = 5.26; BPB = 6.74; BM1 = 1.68; ZB = 17.40; BB = 14.23; ZP = 2.63; DI = 1.76; HB = 9.50; WMF = 2.27.

The skull of the Ecuadorian specimen of *Thomasomys cinereus* is slightly narrower than that of the holotype of the

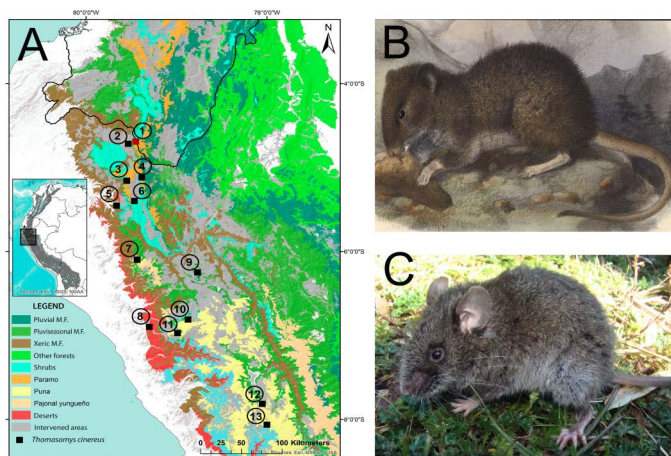


Figure 1. A) Map of recording localities of *Thomasomys cinereus* in northern Peru and southern Ecuador (see locality names in Appendix 1) in Andean montane forests (M.F.; Cuesta et al. 2009). The new Ecuadorian record from Yacuri National Park is shown with the red filled square. Records from Peru (in black squares) were taken from Pacheco (2015). *Thomasomys cinereus*. B) Plate IV in the original description by Thomas (1882). C) Specimen (MEPN 12549 female) from southern Loja, Ecuador.

species, from Cutervo, at 2,800 masl, in the Department of Cajamarca in Peru. Cranial and dental features match those indicated by [Voss \(1993\)](#), [Pacheco \(2003\)](#) and [Pacheco \(2015\)](#). These features include the absence of a rostral tube, for an incomplete premaxilla conjugation in the front of rostrum, same shape and arrangement of the zygomatic notch and zygomatic plate, and interorbital constriction hourglass shaped and flattened on its lateral view (Figure 2A). The palatal bone is short with a minute posterolateral palatal pits on each side, and with a palatal spine on the back, which is between the last molars. Basisphenoid-pre-sphenoid suture without sphenopalatine vacuities (Figure 2B). Elongated and oval incisive foramina. The alisphenoid struts are not robust. The skull shows the circulation pattern 1, with a large stapedial foramen, a notorious squamosal-alisphenoid groove and a sphenofrontal foramen ([Voss 1988](#)). The tegmen tympani, of the periotic, overlaps the back suspensory process of the squamosal. Capsular process of the lower incisor alveolus not widely extended laterally below the coronoid process base.

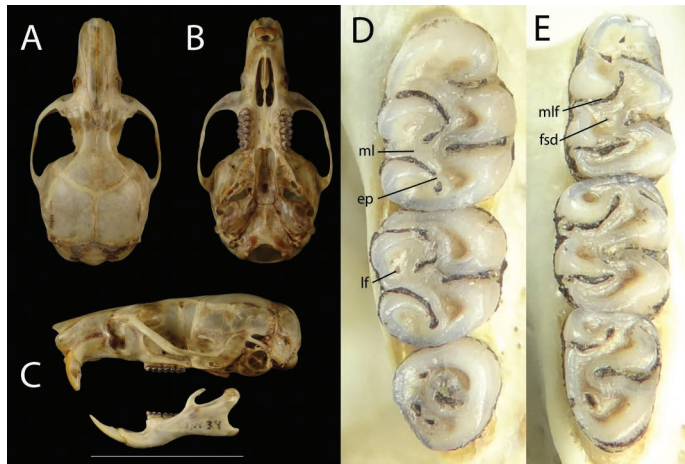


Figure 2. Skull and mandible of the specimen of *Thomasomys cinereus* from Loja (MEPN 12549 female): A) Dorsal, B) Ventral, C) Lateral view. Scale: 21 mm. Occlusal views of the molars (D: upper right; E: lower right) of specimen MEPN 12549 of *Thomasomys cinereus* from Loja, Ecuador. ep = enamel projection, fsd = fossetid, lf = labial fossetid, ml = mesoloph, mlf = mesolophid.

Long upper incisors, wide and almost orthodont; with orange color on the front. Molars have some degree of hypsodont, with paraflexus and metaflexus of first upper molar and second upper molar wrapping the paracone and metacone. The mesoloph of the specimen from Loja is more robust than indicated for *T. cinereus* by [Voss \(1993\)](#), because the mesoloph in Ecuadorian specimen is worn (Figure 2D), from the medial mure to the mesostyle, which is adhered to the paracone by a paralophule. In specimen MEPN 12549 this paralophule is almost in the rear half of the paracone and is connected at the middle in the mesoloph. Second upper molar also shows that behind the connection of the paralophule of the paracone and the mesostyle, there is a fossetid up to half the mesoloph (Figure 2D), which is also shown in specimen LSU 27056 ([Voss 1993](#); Figure 9C). In the first upper molar there is an enamel projection from the metacone to the medium mure similar to a metalophule

([Reig 1977](#)), which divides the back metaflexus in two (Figure 2D). The procingulum of the first upper molar is divided by a worn anteromedian flexus equally in anterolabial and anterolingual conules. First lower molar and second lower molar do not present ectolophyd, as it is typical in this species of *Thomasomys*. Also, the mesolophid is adhered almost entirely to the front of the entoconid ([Voss 1993](#); Figure 10C) where it is difficult to notice a median murid.

Discussion

With the report of *Thomasomys cinereus*, 14 species of *Thomasomys* are known from Ecuador, of a total of 431 mammal species cited for Ecuador ([Tirira, 2017](#) with modifications).

In the area inhabited by *Thomasomys cinereus* we also collected the following sigmodontine rodents, *Microryzomys altissimus*, *Microryzomys* sp., *Nephelomys* cf. *nimbosus*, *Thomasomys taczanowskii*, and *Akodon orophilus*. These species differ from those mentioned by [Lee et al. \(2019\)](#).

The habitat of *Thomasomys cinereus* in Ecuador is composed mainly of three main tree genera *Aegiphila*, *Miconia*, and *Oreopanax*; these trees show stems up to 20 cm of DBH (Diameter Breast Height; [MAE 2013](#)).

The habitat of the Ecuadorian specimen of *Thomasomys cinereus* is similar to the habitats inhabited by the species in Peru, including pluviseasonal montane forests, shrubs, and Yungas from the Andes western side ([Pacheco 2015](#)). The species distributes south and north of "Huancabamba Depression" (Figure 1A), which has been regarded as a biogeographical barrier for small mammals ([Jiménez et al. 2013](#); [Carleton 2015](#)). Further studies would assess the degree of differentiation of populations of *Thomasomys cinereus* south and north of the Huancabamba Depression.

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Appendix

Collection localities of *Thomasomys cinereus* in Ecuador and Peru (see also Figure 1); those from Peru were taken from Pacheco (2015).

Ecuador: Loja: 1) Guardianía, Yacuri National Park, 3,205 masl (-4.71247°, -79.44067°).

Peru: Piura: 2) Ayabaca, Bosque de Huamba, 44 Km E of Ayabaca, 2,950 masl (-4.71872°, -79.53085°). 3) Canchaque road, 15 km E, 2,137 masl (-5.40000°, -79.46466°). 4) Cerro Chinguela, ca. 5 km NE of Zapalache, 2,900 masl (-5.11667°, -79.38333°). 5) 33 road km SW of Huancabamba, 3,000 masl (-5.45545°, -79.66216°). 6) Paríamarca Alto, 2,900 masl (-5.15867°, -79.54901°). Lambayeque: 7) Bosque de Chimana, 2,550 masl (-6.10000°, -79.43333°). 8) Seques, 288 masl (-6.90000°, -79.30000°); Cajamarca: 9) Cutervo, San Andrés de Cutervo, Cutervo National Park, 100 m over El Tragadero, 3,000 masl (-6.24997°, -78.76653°). 10) Pisit, 3,399 masl (-6.81139°, -78.87052°). 11) 35 miles WNW of Cajamarca, 3,268 masl (-6.97180°, -78.98780°). La Libertad: 12) South of Huamachuco, 3,189 masl (-7.81483°, -78.05030°). 13) Cachicadan, 3,100 masl (-8.06463°, -78.00000°).