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DOES *Bradypus tridactylus* Linnaeus (Pilosa: Bradypodidae) OCCUR IN PANAMA?

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ABSTRACT
This note reports the observation of individuals of the genus *Bradypus* in Darien Forest, Panama, that strongly resemble *Bradypus tridactylus* rather than the two-species reported for Panama. The presence of *B. tridactylus* in Panama is unlikely, based on bio-geography but even being just a new variety of this genus, could be another evidence of the progressive movement of mammals, and Panama´s role as a natural bridge between Central and South America. Darien Forest is in critical need of protection, to maintain gene flow in Central American species. We call for specialists in this taxonomic group to join our team to examine whether a new variety of *Bradypus* exists in Panama.

KEYWORDS
Bradypus tridactylus, Panama, Darien, mammals.

¿ESTÁ *Bradypus tridactylus* (Pilosa: Bradypodidae) EN PANAMÁ?

RESUMEN

Se hace la observación de individuos del género *Bradypus* en el bosque del Darién, Panamá, que muestran un fuerte parecido a *Bradypus tridactylus* comparado con las dos especies reportadas para Panamá. La presencia de *B. tridactylus* en Panamá es poco probable, basada en su biogeografía, pero incluso siendo una variedad nueva para este género, podría ser una evidencia más del movimiento progresivo de mamíferos, y el papel de Panamá como puente natural entre Centro y Sur América. El bosque del Darién se encuentra en necesidad crítica de protección, para mantener la fluidez genética en Centro y Sur América de las especies. Hacemos un llamado a los especialistas de este grupo taxonómico para que se unan a nuestro grupo de trabajo y examinemos si esta podría ser una variedad nueva de *Bradypus* viviendo en Panamá.

PALABRAS CLAVES

Bradypus tridactylus, Panamá, Darién, mamíferos.

INTRODUCTION

The habitat of the pale-throated-toed sloth (*Bradypus tridactylus*, Linnaeus, 1758), known in Latin as "Ai siue Ignavus" which translates to "lazy" (Jonstonus, 1678), has been described as similar to the brown-throated three-toed sloth, *Bradypus variegatus* (Eisenberg & Redford, 1999), and reported to be sympatric with Linnaeu's two-toed sloth *Choloepus dydactylus* and Hoffmann's two-toed sloth *C. hoffmanni* (Hayssen, 2009). The type specimen of *Bradypus tridactylus*, then called *B. ignavus*, could have been from Marraganti, Darien Province, but none specimen was collected (Anthony, 1916). The report published as "Panama Mammals Collected in 1914-1915", suggested that this sloth could constitute a new species, as the coloration was different from that of Goldman's ignavus sloth (Goldman, 1920; Allen & Barbour, 1923); the individuals observed in the field were much darker, with the same patterns described for four specimens located in Cituro, Tapalisa and El Real de Darien (Anthony, 1916). Similar brownish coloration is mentioned in a description of *B. tridactylus* (Eisenberg & Redford, 1999; Hayssen, 2009). Another report mentions the presence of *B. ignavus* in Cerro Sapo, but it

appears to refer to *B. variegatus* (Allen & Barbour, 1923). Taxonomists have changed the classification of *Bradypus* in approximately 20 different nomenclatures, including *Bradypus griseus* from Gatun, Panama (Gray, 1871). However, little scientific research has been conducted on this group in the Darien area, and only *B. variegatus* has been recognized as present in the province (Méndez, 1970; Reid, 1987; ANAM, 1999; Eisenberg & Redford, 1999; Samudio 2002; Moreno, 2006; Goldstain *et al.*, 2008; Moreno, 2008; Moreno & Bustamante, 2009; Méndez-Carvajal, 2014). The scientific literature for Panama includes only two species from the *Bradypus* genus, with the other being the endemic pygmy three-toed sloth species *B. pygmaeus* from Isla Escudo de Veraguas, Bocas del Toro, Panama (Anderson & Hanley, 2001).

B. tridactylus has been reported to occur from East Andes and South of the Orinoco River to the South-Central Venezuelan area, including the French Guianas (Sinnamary River), Amazon and Rio Negro of Brazil (Eisenberg & Redford, 1999; Taube *et al.*, 1999; Hayssen, 2009). However, some of the localities considered as part of the *B. tridactylus* range are subject to change, due to deforestation and misinterpretation by museum collections, and this species may now be restricted to the Guiana shield region and the northern Amazon River (Chiarello & Moraes-Barros, 2011). This species is easily recognized due to its brownish coloration, white stripes (or black gaps) or spots on the back, front and rear feet for both male and female, yellow throat and face, and orange dorsal patch with strong black line in the middle, and dark pelage for infants (Gray, 1871; Wetzel, 1982; Anderson & Handley, 2001; Hayssen, 2009). However, due to the variety in the coloration patterns of *B. variegatus* it is necessary to confirm the identification of specimens genetically.

METHODS

The Sociedad Panameña de Biología, Fundación Yaguará-Panamá and the Fundación Pro-Conservación de los Primates Panameños (FCPP), have been surveying different areas in Panama, using understory and canopy camera traps, mistnets and *ad-libitum* observations, to generate an up-to-date species distribution database for mammals, following Graham *et al* (2004) and Guisan & Wilfried (2005).

RESULTS

In September 1999, Ricardo Moreno, Magaly Linares (director of Fondo Peregrino Panamá), and Ibelice Añino from the Panamanian Environmental Authority (ANAM), were searching for new harpy eagle nests and possible jaguar tracks along the Chucunaque River (8º08'40.64" N 77º45'13.71" W) when they observed an individual *Bradypus* that showed similar coloration patterns to *B. tridactylus* swimming in the river (Figure 1). The animal was male and the crews helped the animal to cross the river using an oar and took photographs for further identification. In January 2005, Ricardo Moreno and Ninon Meyer found another individual with same characteristics climbing a tree at Cana, Darien (7º45'58.01" N 77º40'24.80" W). In December 2006, the same team observed an adult female crossing the airstrip in Cana Scientific Station, with her infant. All these sightings were of animals with colorations patterns matching those of *B. tridactylus* (7º45'27.66" N 77º41'154" W). In February 2014, Ricardo Moreno and Ninon Meyer found a dead individual with same coloration patterns (Figure 1), 8 km SE of Yaviza Airport (8º03'37.67" N 77º40'06.34" W). Marks on the body suggest that the animal was probably preyed on by a harpy eagle. In the same trip, a male killed by road-traffic was found on the Panamerican Highway, near to Bayano, Panama Province (9º01'50.81" N 77º40'06.34" W) (Figure 1). These sightings led us to suspect that the entire area of El Real, Rio Chico, Rancho Frio and Cana, corresponding to the Pinogana District, Darien Province, and the eastern side of Panama Province, may be populated with this variety of *Bradypus*. We made further surveys in April 2013, alongside the Tuquesa River and north Chucunaque River, as well in Cemaco, Bajo Chiquito (Embera-Wounaan indigenous zone) and Chucanti Nature Reserve, Maje Mountain Chain, (February and April 2014), but found no individuals with similar coloration.

The total body length for the adult male was 450mm and the tail length was 48 mm (Figure 1A). These measurements fall within the range for *B. tridactylus* described by Eisenberg & Redford (1999). The characteristics that resemble *B. tridactylus* are: throat with yellow coloration, absence of long dark stripe extending laterally from the eyes,

face and forehead covered with yellow hairs to the base; and short hair on forehead (Figures 1 and 2). In addition to the characteristics of *B. tridactylus* included in the taxonomic key to the three-toed sloth published by Anderson & Hanley (2001), we also observed the characteristic dorsal orange-yellow patch with a black central line mentioned by Hayssen (2009), consistently in four other individuals in the area, and the entire body was covered by dark spots (contrasting white-yellowish pelage strips), including the rear and forearms (Figure 1).

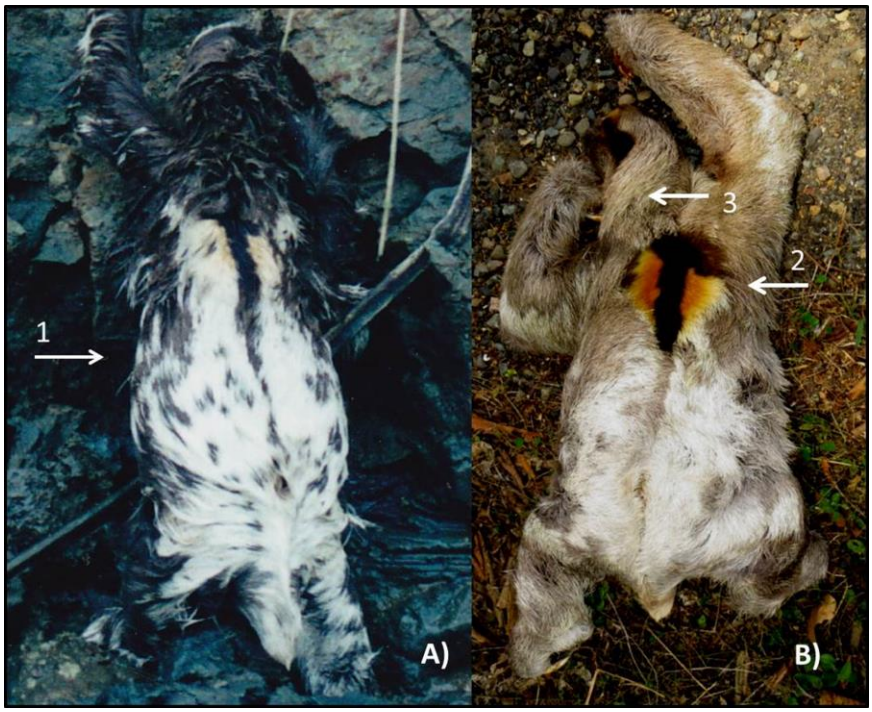

Fig. 1 Individuals of the observed *Bradypus* found at Darien Province, Panama: **A)** Tuira River, swimming; **B)** Yaviza airport, road killed.1-Coloration pattern for an adult male (wet), with dark spots, 2-Male with dorsal orange-yellow patch with black central line, 3-Throat with yellow hairs.

Fig. 2 Female and an infant of the *Bradypus* found in Yaviza, Pinogana District, Darien Province, Panama. 4-Face and forehead covered with yellow hairs, 5-Thorat with yellow coloration and no long dark stripe extending laterally from the eyes, 6-Short hair in forehead, no dark or brown line as occurs with *B. variegatus*, 7-Black spots, dark stripes or contrasting white-yellowish stripes in the forearm, rear foot and in the back, characteristics of *B. tridactylus*.

DISCUSSION AND CONCLUSION

We consider the presence of this possible variety of *Bradypus* in Panama may be related to the connection with the Colombian forest, and the fact that these species are very well adapted to going unnoticed while living in a forested habitat (Anderson & Hanley, 2001). We believe that some species in Darien may have been present in Panama for longer but could

be unnoticed, such as the Andean bear *Tremarctos ornatus* (Goldstein *et al*., 2008), or the crab-eating fox *Cerdocyon thous* (Tejera *et al*., 1999). This finding emphasizes the need of mammal research conducted in the limits between Colombia and Panama, which is often linked to remoteness and logistical difficulties in the area. We remark the importance of this note as a starter to call attention to studies related to the diversity of *Bradypus* spp., to determine if these individuals could be considered as a new subspecies or if they belong to *B. variegatus* or *B. tridactylus* using stronger proof such as Cytochrome b or Cytochrome oxidase (pers. Com. Moraes-Barros). We offer the opportunity here for any specialist who is interested to collaborate with us on this study.

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