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PENSOFT

Filling distribution gaps: first record of the Western Amazonian Dwarf Porcupine, *Coendou ichillus* Voss & Da Silva, 2001 (Mammalia, Rodentia), in the Napo Moist Forests ecoregion of Colombia

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Abstract
The Western Amazonian Dwarf Porcupine, *Coendou ichillus* Voss & Da Silva, 2001, is poorly known in South America. The species is known only from eight localities in the Amazon and Orinoquia regions of Brazil, Colombia, Ecuador, and Peru. In Colombia, it is known from one locality in the Orinoquía region, based on a specimen collected in 1956. We present a new distribution record which adds information about the presence of *C. ichillus* in the Napo Moist Forests ecoregion, in the Department of Putumayo, Amazon region of Colombia. We suggest that *C. ichillus* is more widely distributed in the Amazon region of the country. However, based on the number of known records to date, *C. ichillus* is the rarest species of porcupine.

Keywords
Amazonia, Erethizontidae, quills, photographs, Putumayo

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Introduction

Knowledge on diversity, distribution, and biology of the genus *Coendou* Lacépède, 1799 (Rodentia, Erethizontidae) in South America has increased in recent years (Voss 2011, 2015; Ramírez-Chaves et al. 2016; Menezes et al. 2020). Most of the species diversity of the genus is represented in Brazil (10 species), Colombia (6 species), and Ecuador (4 species) (Voss 2015; Barthelmess 2016; Ramírez-Chaves et al. 2016; Menezes et al. 2020). In Colombia, there are still several gaps on the distribution for most of the species, despite recent works that have updated and clarified the distribution of two species, *C. prehensilis* (Linnaeus, 1758) and *C. vestitus* Thomas,

1899 (Torres-Martínez et al. 2019; Ramírez-Chaves et al. 2019, 2020).

The Western Amazonian Dwarf Porcupine, *Coendou ichillus* Voss & Da Silva, 2001, is one of the least known species of South American porcupine, distributed in the Amazon region of Brazil, Ecuador, and Peru, and the Orinoquía region of Colombia (Voss and Da Silva 2001; Gregory et al. 2015; Ramírez-Chaves et al. 2016; Menezes et al. 2020). Despite its wide distribution, *C. ichillus* is known from only eight localities. To fill gaps in the distribution of porcupine species in Colombia and South America we provide an updated dataset of the distributional records of *C. ichillus*, presenting a new report from the Napo Moist Forests ecoregion in the Amazon region of Colombia.

Methods

The new record of *Coendou ichillus* is based on photographs of a live animal, obtained in the Department of Putumayo in February 2018 (Fig. 1). To provide an updated distribution, we compiled all available localities in the literature (Voss and Da Silva 2001; Gregory et al. 2015; Ramírez-Chaves et al. 2016; Menezes et al. 2020). We also listed the ecoregions (following Olson et al. 2001) in which the species occurs. We also estimated the species range using Extent of Occurrence (EOO) and Area of Occupancy (AOO). We calculated the EOO using the minimum convex polygon method (the shortest continuous boundary drawn to encompass all known occurrences of the species) and the AOO by summing the area of grid squares in which the species is known (adopting the standard grid cell size of 2 km as recommended by the International Union for the Conservation of Nature (IUCN 2010)) using GeoCAT (Bachman et al. 2011).

Results

With the addition of the new record presented herein, *C. ichillus* is known from nine localities in Brazil, Colombia, Ecuador, and Peru (Table 1). We found that *C. ichillus* occurs in four ecoregions, the Apure-Villavicencio Dry Forests, the Southwest Amazon Moist Forests, the Napo Moist Forests, and the Japurá-Solimões-Negro Moist Forests (Fig. 2). The AOO of the species was 36 km^2 and the EOO of 1,032,335 km^2 (Fig. 2). All records come from an elevational range between 100 and 980 m.

***Coendou ichillus* Voss & Da Silva, 2001**
Figure 1

New record. COLOMBIA • 1 adult unknown sex; Department of Putumayo, Municipality of Puerto Asís, "Vereda" Peneya; 00.5206°N, −076.2861°W; 254 m a.s.l.; 21 Feb. 2018; photographed by Edilson Rosero and Diego Carantón at 2100h near an oil platform at the "Bloque Platanillo" oil camp.

Remarks. The vegetation corresponds to primary and secondary Várzea forests. The locality of the record has forested areas surrounding the clear water or rich in sediments rivers, which grow in the floodplains in several areas of the municipality of Puerto Asís. The canopy is high, between 20 and 30 m, with a sparse understory and a sandy substrate due to frequent flooding during the rainy season. The locality is directly influenced by the Peneyá channel and the Piñuña Blanco and Putumayo rivers.

Identification. We identified the specimen as *C. ichillus* based on external traits (Fig. 1) such as the small size (it is one of the smaller species inhabiting the Amazon region of Colombia), non-inflated external nostrils, lack of visible dorsal fur (not conceals any quills); bicolored (more extensively black-tipped) quills; tricolored (pale-tipped) bristle-quills; spiny ventral pelage (Voss and Da Silva 2001).

Specimens analyzed are housed at the Field Museum of Natural History (FMNH), Chicago, and the Instituto de Ciencias Naturales, Universidad Nacional de Colombia (ICN), Bogotá. The other species of *Coendou* in the Amazon Region of Colombia is *C. prehensilis*, which is larger, has inflated nostrils, and lacks dorsal fur and bristle-quills (Voss 2015; Racero-Casarrubia et al. 2016; Menezes et al. 2020; Ramírez-Chaves et al. 2020a).

Discussion

Our report fills a distribution gap and provides a new record of *Coendou ichillus* in the Napo Moist Forests of Colombia, where its presence was expected based on records from this ecoregion in Ecuador (Voss and Da Silva 2001). The new record confirms that *C. ichillus*

Table 1. Locality records of *Coendou ichillus* in South America. Abbreviations: ICN = Instituto de Ciencias Naturales, Universidad Nacional de Colombia; FMNH = Field Museum of Natural History.

Country	Locality	Year	Elev. (m)	Latitude	Longitude	Reference.
Brazil	Amazonas, Limoeiro, Japurá, Rio Japurá	1977	76	00.0016	−067.4215	Menezes et al. (2020)
Colombia	Meta, Villavicencio, km 30 road to Caños Negros	1956	582	04.1569	−073.5558	ICN 1772: Ramírez-Chaves et al. (2016)
Colombia	Putumayo, Puerto Asís, vereda Peneyá	2018	254	00.5206	−076.2861	This work; photographs
Ecuador	Pastaza, Pastaza River	1936	571	−01.9877	−077.5876	Voss and Da Silva (2001)
Ecuador	Pastaza, Conambo River	1966	300	−02.1167	−076.0667	Voss and Da Silva (2001)
Ecuador	Pastaza, Yana Rumi River (16 km from Puyo City, road Puyo-Macas)	1934	980	−01.5967	−077.8082	FMNH 43289: Voss and Da Silva (2001)
Ecuador	Sucumbíos, La Selva Jungle Lodge	1996	300	−00.5000	−076.3667	Voss and Da Silva (2001)
Peru	Loreto, Iquitos	1971	95	−03.7333	−073.2500	Voss and Da Silva (2001)
Peru	Cuzco, Lower Urubamba Region, adjacent to confluence of Camisea & Urubamba rivers	2012–2013	450–500	−11.7213	−072.9420	Gregory et al. (2015)

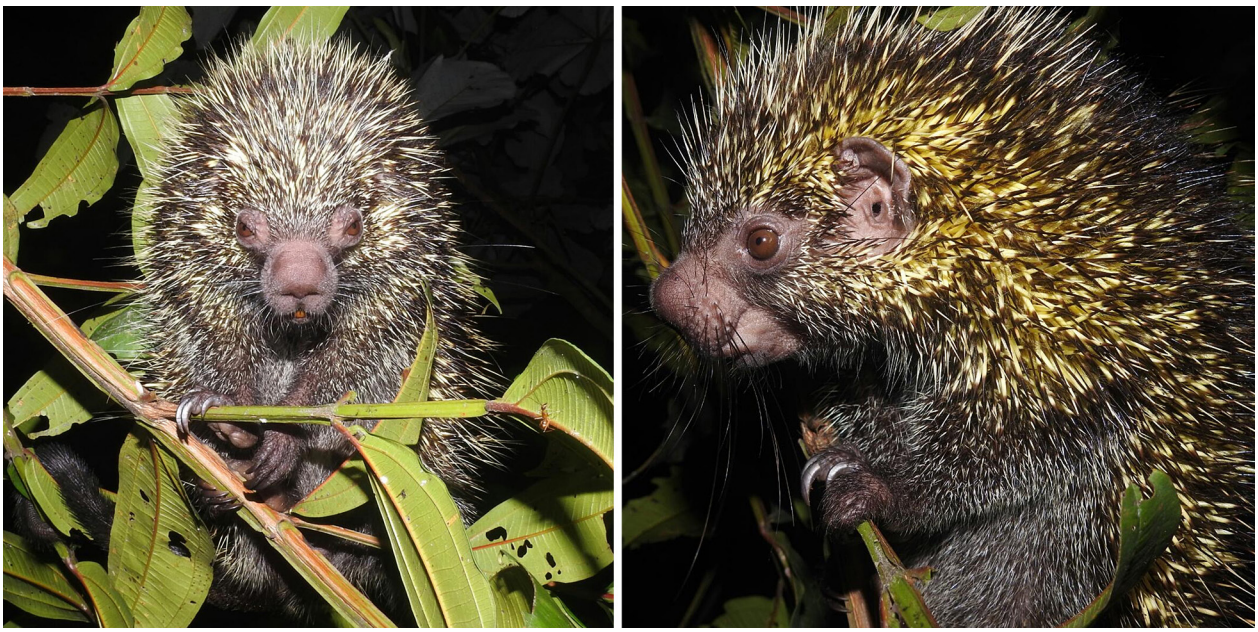

Figure 1. New record of *Coendou ichillus* from Colombia. Note the presence of non-inflated external nostrils, not evident blackish and short dorsal fur that does not conceal any quills; bi-colored (more extensively black-tipped) quills; long and pale-tipped bristle-quills, and spiny ventral pelage (Voss and Da Silva 2001).

is more widely distributed in Colombia than previously thought, as there was a single previous vouchered record from the Apure-Villavicencio Dry Forests, in the Department of Meta (Fig. 2; Ramírez-Chaves et al. 2016). Based on this, the presence of the species in the Caquetá Moist Forests ecoregion is highly likely (Fig. 2). We also provide the first record for the department of Putumayo, where only *C. prehensilis* was previously known (Torres-Martínez et al. 2019).

The recently updated distribution of *Coendou* species in Colombia (e.g., Ramírez-Chaves et al. 2016; Torres-Martínez et al. 2019; Ramírez-Chaves et al. 2020a) shows that the absence of records could be more due to inadequate sampling rather than to real absences. To assist in filling information gaps, complementary sampling or data collection techniques such as camera trapping in several habitat types, including forest canopies, complemented by data from citizen science are recommended, as these techniques have shown positive results for *Coendou* studies (Gregory et al. 2015; Ramírez-Chaves et al. 2020b). Furthermore, wide geographical gaps, especially in Amazonia, the absence of natural history data of the species, and the high possibility of undescribed species within the genus bring up the need to increase the sampling and collecting efforts in the region (Voss and Da Silva 2001).

The distribution of *C. ichillus* comprises the Apure-Villavicencio Dry Forests, the Southwest Amazon Moist Forests, the Napo Moist Forests, and the Japurá-Solimões-Negro (Ramírez-Chaves et al. 2016; Menezes et al. 2020). This also suggests that the species is associated with moist forests, and its current presence in dry environments such as the Apure-Villavicencio Dry Forests should be assessed. In addition, the possible overlapping areas of distribution with other similar species such as *C. pruinosus* Thomas, 1905 (Ramírez-Chaves et al. 2016), or the allopatric distribution between both species in the Amazon and Orinoquía regions of Colombia should be evaluated.

Finally, the geographic information obtained from occasional records are key for planning of conservation strategies. *Coendou ichillus* is listed as Data Deficient by the IUCN (Weksler et al. 2016). Based only on AOO, this species might be Endangered (Least Concern based only on EOO); however, severe fragmentation or continuing declines and extreme fluctuations are unknown. The estimation of the EOO and AOO for little-known species of *Coendou* such as *C. vestitus* has recently helped clarify their Red List categories (Torres-Martínez et al. 2020), and it is a useful tool for first approach to the risk assessment of rare mammal species.

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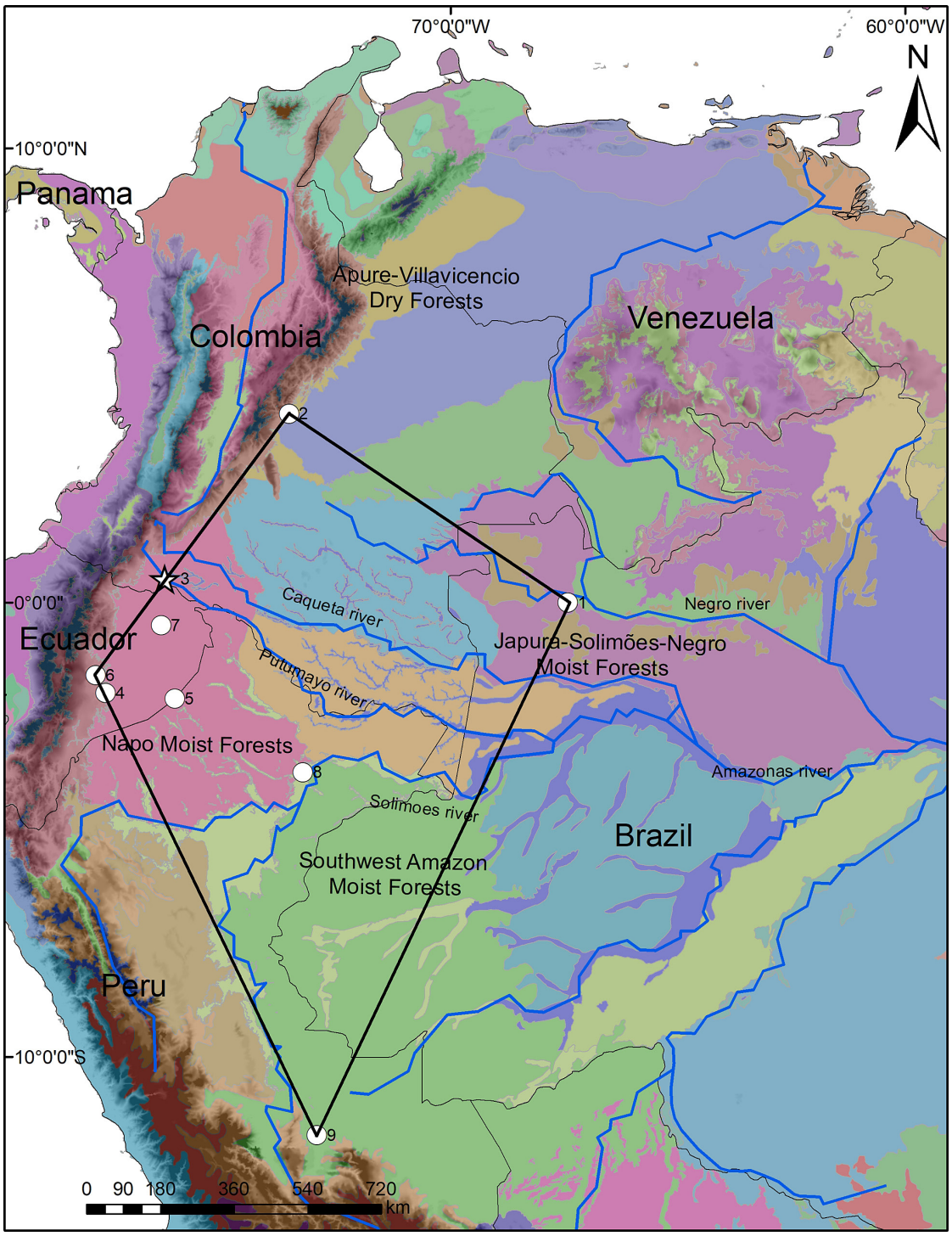

Figure 2. Updated distribution of *Coendou ichillus* in South America. New record (star) is the first confirmed for the Napo Moist Forests ecoregion, Amazon region in the Department of Putumayo, Colombia. Dots show previous records in the literature (Voss and Da Silva 2001; Ramírez-Chaves et al. 2016; Menezes et al. 2020). Polygon represents the Extent of Occurrence (EOO = 1,032,335 km^2).

Authors' Contributions

HERC and DMMM collected data from museums, analyzed the data, prepared maps and figures, and wrote the manuscript. DCA and ER collected data in the field and wrote the manuscript.

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