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NOTES ON GEOGRAPHIC DISTRIBUTION

New records and co-occurrence in the Amazon Region of Colombia of Short-eared Dog, *Atelocynus microtis* (Sclater, 1883), and Crab-eating Fox, *Cerdocyon thous* (Linnaeus, 1766) (Mammalia, Canidae)

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Abstract. *Atelocynus microtis* (Sclater, 1883) is a rare canid whose distribution spans the entire Amazon Basin. It is the least known canid in Colombia, where sightings have been reported from six localities. In contrast, *Cerdocyon thous* (Linnaeus, 1766) is the most common canid species in Colombia, with its distribution linked to open areas, human-modified landscapes, and agroecosystems. Here, we report new records of *A. microtis* and *C. thous* in the Colombian Amazon, documenting a range extension of *C. thous* and suggesting that forest loss driven by human activity may promote contact between these two otherwise allopatric canids.

Key words. Allopatry, competitive exclusion, deforestation, interspecific competition, photographs, trail camera

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Introduction

Uncovering species co-occurrence patterns provides key insights into the mechanisms that structure biological communities (Schoener 1974; Finke and Snyder 2008; Vacher et al. 2016). In carnivoran mammals (Mammalia, Carnivora), these mechanisms include resource partitioning between generalist and specialist species (Randa et al. 2009; Zhang et al. 2009; Masters and Maher 2021), interspecific competition, and the presence of dominant predators that reduce the populations of subordinate species (Ritchie and Johnson 2009; Shores et al. 2019). Subordinate species adjust their habitats to reduce spatial overlap with dominant predators by segregating in diet, space, and time to prevent risky encounters (Vanak and Gompper 2009; Sunarto et al. 2015; Sévêque et al. 2020; Ho et al. 2025). However, documented changes in canid distribution over the last century due to human pressures (Johnson et al. 1996; Porto 2022) and how they affect co-occurrence patterns (Hody et al. 2019) are rare.

Currently, natural areas in the Neotropics are undergoing continuous changes due to human activities (Brooke et al. 2020; Correa Ayram et al. 2020). At the continental level, native forests have been modified by humans, with the expansion of the agricultural frontier, infrastructure development, illicit crops, increase in human settlements and timber extraction being the most important causes (Clerici et al. 2020; Murillo-Sandoval et al. 2021; Rivadeneyra et al. 2023). This human influence can alter species distribution (Sévêque et al. 2020; Boron et al. 2023; Tsunoda et al. 2024), promoting sympatry of historically allopatric species. For example, recent evidence indicates that continued deforestation

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may lead to co-occurrence between Coyotes, *Canis latrans* Say, 1823 (in James 1823), and Crab-eating Foxes, *Cerdocyon thous* (Linnaeus, 1766), in regions of the Panamanian isthmus (Hody et al. 2019). Despite this, studies on co-occurrence patterns have traditionally focused on pairs or groups of carnivorans in their natural environment (e.g. Wang 2002; Vanak and Gompper 2009; Silva-Pereira et al. 2011; Ho et al. 2025). New evidence is needed in rapidly changing environments like the Amazon region, particularly for poorly documented Neotropical canid species.

Within Neotropical canids, the Crab-eating Fox, *C. thous*, is a medium-sized and highly adaptable canid, capable of colonizing new areas and expanding its geographical in response to forest conversion into human-modified landscapes (Hody et al. 2019; Pardo et al. 2019, 2024). Recent range expansions have been documented in new areas across northern South America and the Darién region in Central America, where the species was not previously known (de Thoisy et al. 2013; Hadik-Barkoczy 2013; Ramírez-Chaves and Pérez 2015). In contrast to *C. thous*, the Short-eared Dog, *Atelocynus microtis* (Sclater, 1883), is scarcely documented; sightings are uncommon, and the species is considered one of the rarest carnivores in South America (Leite Pitman and Williams 2004). The short-eared dog is one of the largest Neotropical forest-dwelling canids, inhabiting the Amazon region from Colombia and Ecuador southward through Peru and Brazil to northern Bolivia (Hershkovitz 1961; Berta 1986; Leite Pitman and Williams 2004). Besides its rarity, the low number of records may also reflect logistical challenges of sampling in the Amazon (Rocha et al. 2015; Suárez-Castro et al. 2021). This is also true for Colombia, where *A. microtis* is one of the least known canids (Andrade-Ponce et al. 2016). Despite being first documented in literature in Colombia in 1957 (Hershkovitz 1957), little is known about many aspects of this species. Available information is largely restricted to its distribution (Hershkovitz 1957, 1961; Defler and Santacruz 1994; Ayure and González-Maya 2014), ecology (Thatcher 1971; Acevedo-Quintero and Zamora-Abrego 2016), relative abundance, and activity patterns (Andrade-Ponce et al. 2016; Payán and Escudero 2016).

Despite well-documented changes in natural forested areas in the Amazon region, evidence regarding the effects of these changes on broad-scale distributions of carnivoran species remains scarce. Here, we report new records of *A. microtis* and *C. thous* obtained using trail cameras in the Colombian Andean foothills and Amazon regions. These records provide new evidence that the loss of natural forest habitats due to human activities may promote contact between otherwise allopatric canid species. We also review previous records of both species for the country and estimate the Extent of Occurrence (EOO) and the Area of Occupancy (AOO) for each species. We hope this information may contribute to the development of conservation action plans for rare species facing emerging threats from interactions with more generalist species.

Methods

The new records of *Atelocynus microtis* were obtained through the TEAM monitoring protocol (http://www.teamnetwork.org/), implemented under the Biocuencas and Amazonia Verde projects led by Conservación Internacional Colombia, using 60–120 trail cameras between 2016 and 2023 in the Caquetá Moist Forests ecoregion of the Colombian Amazon (Figure 1). Similarly, records of *Cerdocyon thous* were obtained during the Putumayo wild cats conservation project led by Corpoamazonia (Chávez Acosta et al. 2021), using 59 trail cameras, between 2019 and 2020 in rural areas of the municipalities of San Francisco, Mocoa, Villagarzón, Puerto Asís, and Puerto Guzmán, and 60 trail cameras in the departments of Huila (Acevedo, Rivera) and Cauca (Piamonte), installed between 2022 and 2024 as part of the Agroecological Regenerative Cocoa and HYLEA projects led by Salvemos Selva and Conservación Internacional, all within the Andean-Amazon region (Figure 1). We also included incidental observations recorded in 2023 and 2025.

Since *A. microtis* is scarcely documented in Colombia, we also reviewed additional records from the literature (Hershkovitz 1957, 1961; Defler and Santacruz 1994; Ayure and González-Maya 2014; Andrade-Ponce et al. 2016) and natural history collections, including Museo La Salle (MLS), Bogotá, Colombia; Instituto de Ciencias Naturales (ICN), Bogotá; Instituto Alexander von Humboldt (IAvH), Villa de Leyva, Colombia; and Field Museum of Natural History (FMNH), Chicago, USA. From the historical records, we extracted the locality, basis of record, and date (Table 1). When needed, we georeferenced localities using the Geographic Dictionary of the Instituto Geográfico Agustín Codazzi (IGAC 1996). To remove duplicate and dubious data, we used the CoordinateCleaner package in R v. 4.4.1 (Zizka et al. 2019). To estimate the current and historical distributions of *A. microtis* and *C. thous* in Colombia, we compiled records from the Global Biodiversity Information Facility (GBIF) up to July 2025, including

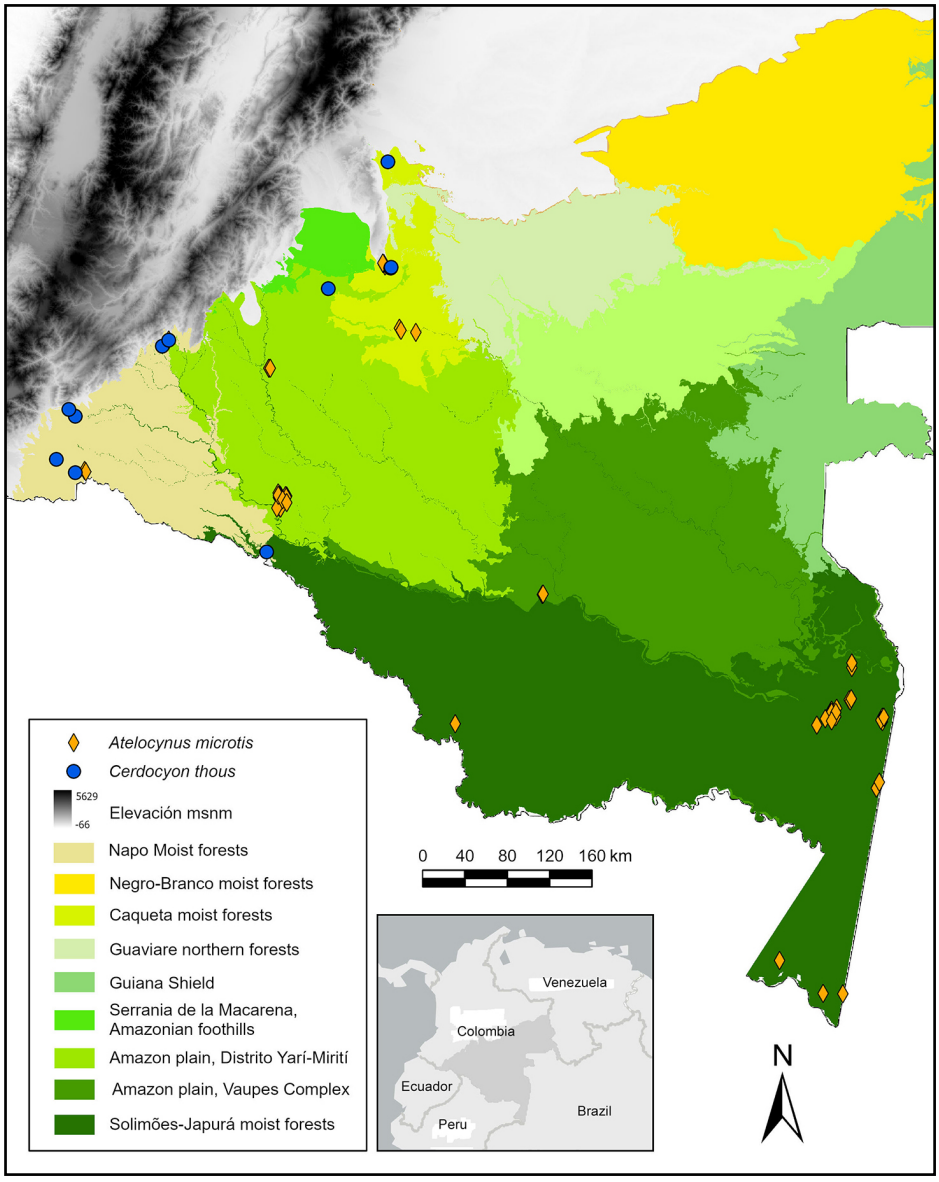


Figure 1. Study area showing trail camera locations within ecoregions that overlap the range of *Atelocynus microtis* in the Amazon region of Colombia. Potential co-occurrence between *Cerdocyon thous* and *A. microtis* is indicated in the Napo Moist Forests and the Caquetá Moist Forests.

Geodetic datum: WGS 1984. Map sources: Esri, TomTom, FAO, NOAA, USGS, © OpenStreetMap contributors, and the GIS User Community.

one literature record not available in GBIF (Ramírez-Chaves and Pérez 2015), as well as novel records obtained from trail cameras and field observations in the Amazon region.

To support future threatened category assessments, we estimated the Extent of Occurrence (EOO) and the Area of Occupancy (AOO) (based on a 2-km cell width) for both species. We calculated the EOO using a minimum convex polygon (linking known occurrence points for the species) and the AOO by summing the area of grid cells in which the species is recorded (Dauby et al. 2017; Dauby 2020). All analyses were conducted in R (R Core Team 2025).

Results

***Atelocynus microtis* (Sclater, 1883)**

Figure 2

New records. COLOMBIA — **Amazonas** • La Pedrera, Parque Nacional Natural Río Puré, Puerto Franco; −1.5720, −69.9639; 115 m; 08.X.2016; JPLO obs.; trail camera; 1 spec. • La Pedrera; −1.5364, −69.9822; 107 m; 01.XI.2016; JPLO obs.; trail camera; 1 spec. • La Pedrera; −1.5543, −69.9460; 112 m; 24.XI.2016; JPLO obs.; trail camera; 1 spec. • La Pedrera; −1.1733, −69.8098; 143 m; 25.V.2022; JPLO obs.; trail camera; 1 spec. • Parque Nacional Natural Río Puré; −2.1477, −69.5762; 116 m; 06.IV.2018; JPLO obs.; trail camera; 1 spec. • Parque Nacional Natural Río Puré; −1.6206, −69.5502; 108 m; 28.XII.2021 and 30.III.2022; JPLO obs.; trail Camera; 1 spec. • Parque Nacional Natural Río Puré; −1.5952, −69.5380;

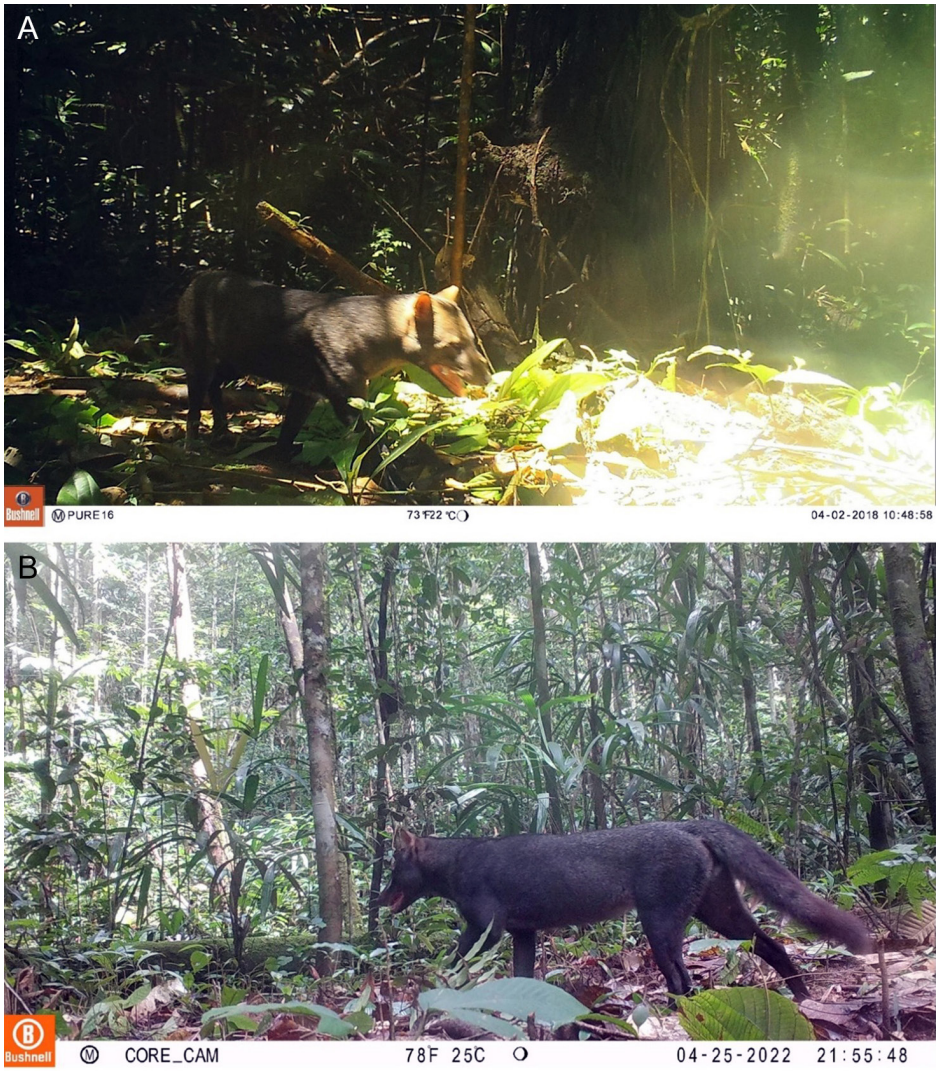


Figure 2. Trail camera records of *Atelocynus microtis* from the Department of Amazonas, Colombia, obtained in 2018 (**A**) and 2022 (**B**).

97 m; 24.X.2023; JPLO obs.; trail camera; 1 spec. • Resguardo Indígena Curare Los Ingleses; −1.5904, −69.9461; 117m; 08.X.2016; JPLO obs.; trail camera; 1 spec. • Resguardo Indígena Curare Los Ingleses; −1.6086, −70.0356; 119 m; 19.XII.2016; JPLO obs.; trail camera • Resguardo Indígena Curare Los Ingleses; −1.4568, −69.8232; 156 m; 18.V.2023 and 24.V.2023; JPLO obs.; trail camera; 1 spec. each • Resguardo Indígena Curare Los Ingleses; −1.4386, −69.8143; 155m; 22.VIII.2023; JPLO obs.; trail camera; 1 spec. • Resguardo Indígena Puerto Córdoba; −1.1733, −69.8098; 140 m; 25.IV.2022 and 01.V.2022; JPLO obs.; trail camera; 1 spec. (Figure 3).

Identification. Following the descriptions of Leite Pitman and Williams (2004), Wallace et al. (2010), and Suárez-Castro and Ramírez-Chaves (2015), *A. microtis* possesses a short, dense coat with coloration ranging from greyish to dark brown or black across the dorsum, fading to a reddish-brown tone on the ventral region. It also has a black band running along the dorsal surface of the tail. The species is distinguished from *Cerdocyon thous* by its larger size and very small ears (approximately 45 mm), which are reddish. Other distinguishing features include a slender, elongated snout and short limbs and tail, with the tail darker than the rest of the body and covered with thick fur (Figure 2).

***Cerdocyon thous* (Linnaeus, 1766)**

Figure 4

Using trail cameras during 2020 at coordinates (1.2124, −76.6728 (Chávez Acosta et al. 2021), three independent recent records of *C. thous* were added. The first was obtained on August 24 at 22:38 h, the second was on August 27 at 05:42 h, and the third on August 28 between 05:19 and 05:22 h. These records were obtained on a farm where *C. thous* was identified preying on hens (Figure 3).

New records. COLOMBIA — **Putumayo** • Mocoa; 1.2124, −76.6728; 82 m; 24.VIII.2020; MHCA and JPCC obs.; trail camera; 1 spec. • same locality; 27.VIII.2020; MHCA and JPCC obs.; trail camera; 1 spec.

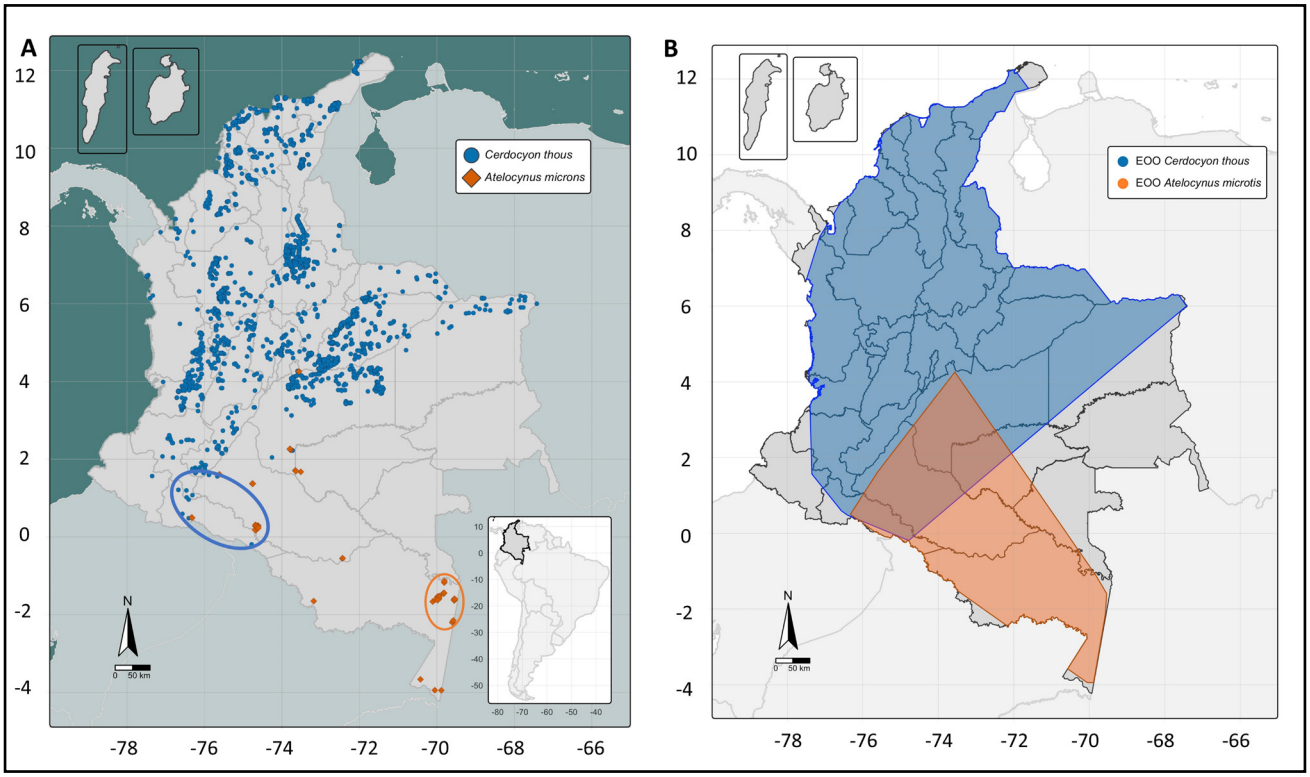
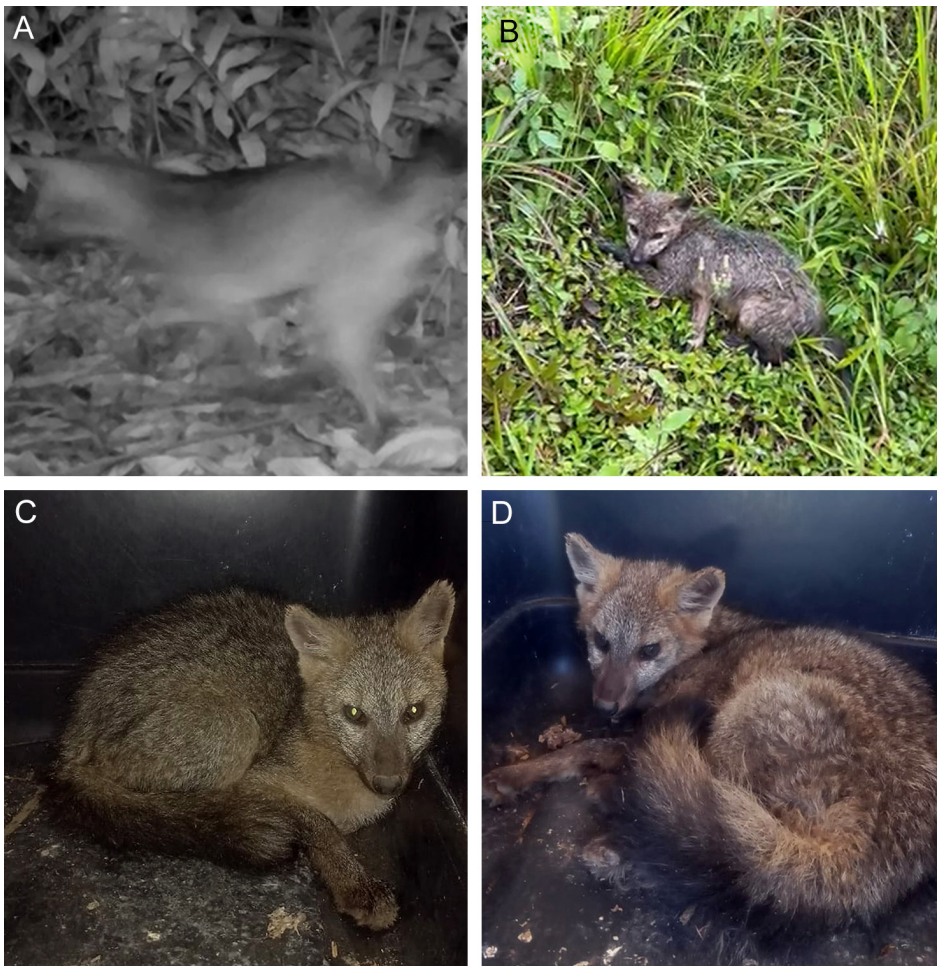


Figure 3. Distribution of *Atelocynus microtis* and *Cerdocyon thous* in Colombia. **A.** Records of *A. microtis* (circles) and *C. thous* (diamonds) in Colombia. New localities in the Department of Amazonas, and Cauca and Putumayo are shown with an oval form. **B.** Polygons showing possible overlaps in the distribution of the species in cis-Andean Colombia. Extent of Occurrence (EOO) for both species.

Figure 4. Records of *Cerdocyon thous* in Department of Putumayo, Colombia. **A.** Trail camera record in Municipality of Puerto Guzmán. **B.** Observation in Municipality of Puerto Asís. **C, D.** Observation in Municipality of Puerto Leguízamo.



• same locality; 28.VIII.2020; MHCA and JPCC obs.; trail camera; 1 spec. • Puerto Asís, Corregimiento de Santana; 0.5950, −76.5686; 268 m; 11.VIII.2025. JPCC obs.; video; 1 spec. • Puerto Guzmán; 0.9300, −76.4500; 557 m; 14.IX.2021; MHCA and JPCC obs.; trail camera; 1 spec. • Puerto Leguízamo; −0.1861, −74.7778; 177 m; 11.IV.2023; MHCA and JPCC obs.; photographs; 1 spec. — **Cauca** • Piamonte; Vereda La Vega; 1.0752, −76.3106; 294 m; 6.XII.2022, 16.I.2023; JPLO obs.; trail camera; 1 spec. • Piamonte; Vereda La Guajira; 1.0197, −76.4606; 296 m; 12.IV.2022; JPLO obs.; trail camera; 1 spec. • Piamonte; Miraflor; 1.1975, −76.4655; 1985 m; 24.III.2023; JPLO obs.; trail camera; 1 spec. • Piamonte; Miraflor; 1.7517, −76.3156; 2441 m; 02.IV.2023; JPLO obs.; trail camera; 1 spec. — **Huila** • Acevedo; San Luis; 1.7517, −75.9915; 1809 m; 14.X.2021; JPLO obs.; trail camera; 1 spec. • Acevedo; Vereda La Ilusión; 1.6456, −76.02333; 1724 m; 18.X.2021 and 12.II.2023; JPLO obs.; trail camera; 1 spec. • Rivera; Vereda Honda Alta; 2.7809, −75.1671; 1875 m; 20.VII. 2023; JPLO obs.; trail camera; 1 spec. • Rivera; Vereda Honda Alta; 2.7722, −75.1847; 1410 m; 22.VI.2023; JPLO obs.; trail camera; 1 spec. • Colombia; Vereda La Legiosa; 2150 m; 14.XI.2023; JPLO obs.; trail camera; 1 spec. • Campoalegre; Vereda Alto Bejucal; 2.7006, −75.2297; 2147 m; 14.XI.2023; JPLO obs.; trail camera; 1 spec. • Garzón; Vereda La Cabaña; 2.1492, −75.5406; 1794 m; 27.XII.2023; JPLO obs.; trail camera; 1 spec. • Garzón; Cerro Páramo de Miraflores; 2.2353, −75.444270; 3013m; 9.IV.2024; JPLO obs.; trail camera; 1 spec. (Fig. 3).

Identification. *Cerdocyon thous* is a medium-sized canid (Fig. 4) characterized by dark grey fur that becomes darker along the back and parts of the tail (Courtenay and Maffei 2004; Suárez-Castro and Ramírez-Chaves 2015). The ventral region varies from light grey to cream. It differs from *Atelocynus microtis* by its smaller size, shorter coat with a distinct black-and-grey dorsal stripe extending laterally, a much lighter belly contrasting with the back, and black coloration on the tips of the ears, tail, legs, and jaw. Additionally, *C. thous* has a shorter but less bushy tail, a shorter snout, and relatively large and more triangular ears compared to *A. microtis*.

Species distributions

To update the distribution of both species in Colombia, we collected a total of 9,459 records from data portals, bibliography, and our own results. After filtering records with uncertain coordinates, we retained 9,388 records of *C. thous* and 71 of *A. microtis* for Colombia. For *C. thous*, 9,368 records were obtained from GBIF (2025a), one from literature (Ramírez-Chaves and Pérez 2015), and 19 represent new records. For *A. microtis*, we obtained 56 records from GBIF (2025b), three from literature, and 12 from our new records. The AOO and EOO for *C. thous* were 1,989 km^2 (Red List Criteria, Criterion B: Near

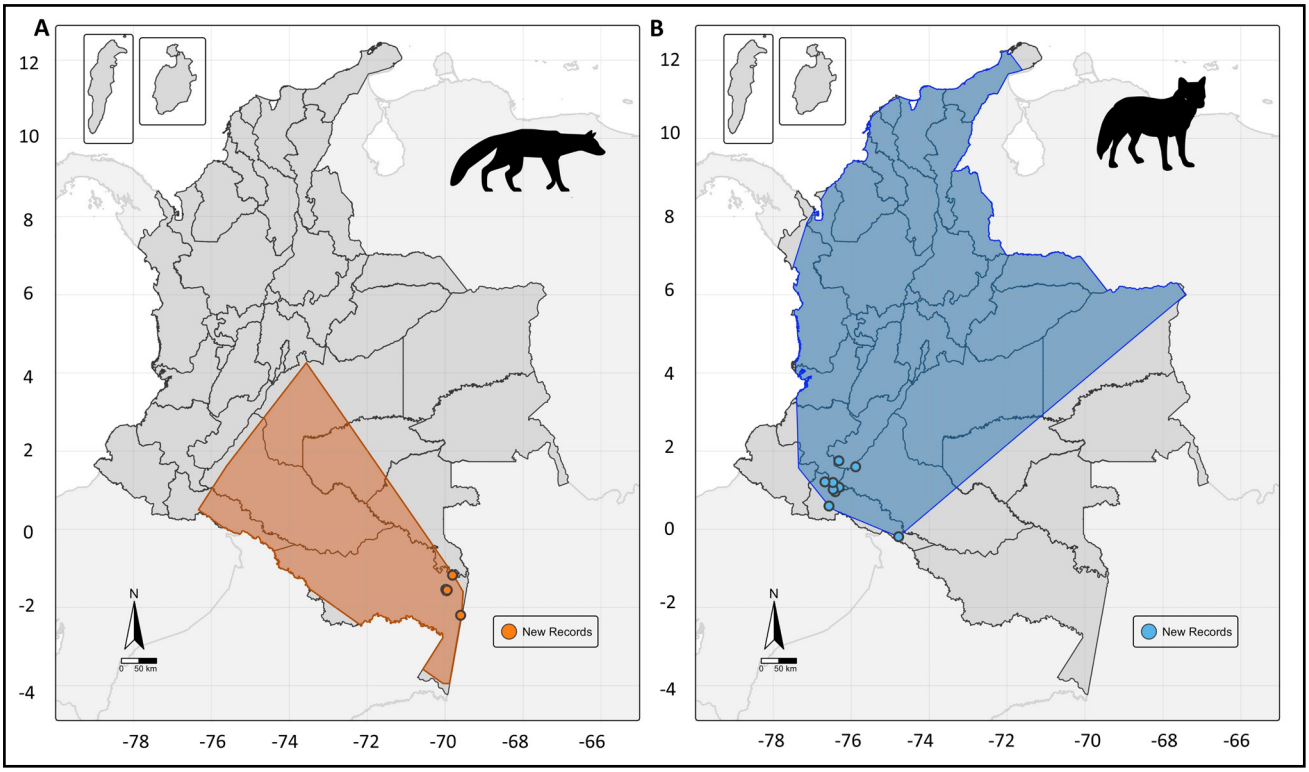


Figure 5. Minimum convex polygon for (**A**) *Atelocynus microtis* and (**B**) *Cerdocyon thous* in Colombia, based on all the occurrences recorded in this study. Circles indicate new records.

Table 1. Key locality records of the short-eared dog in Colombia. Vouchers: ICN: Instituto de Ciencias Naturales, Bogotá; FMNH: Field Museum of Natural History, Chicago; IAvH: Instituto Alexander von Humboldt, Villa de Leyva; MLS: Museo La Salle, Bogotá; TC: trail cameras.

Locality in Colombia	Elevation (m)	Date	Basis of record
Amazonas: Leticia, Estación biológica "El Zafire" de la Universidad Nacional de Colombia	76	Feb. – Nov. 2012	TC; Acevedo-Quintero and Zamora-Abrego 2016
Amazonas: Puerto Nariño: San José de Villa Andrea	94	4–19 Jun. 2009	TC; Ayure and González-Maya 2014
Amazonas: Arica, near desembocadura Igará River - Paraná in the Putumayo	106	—	IAvH-M-2589
Amazonas: Parque Nacional Natural Río Puré, Puerto Franco	115	2 Apr. 2018	TC; this work
Amazonas: La Pedrera, Área de Conservación. Resguardo Indígena Curare Los Ingleses	115	8 Oct. – 4 Nov. 2016	TC; this work
Caquetá: Cartagena del Chairá	220	27 Mar. 2018	TC; Bonell et al. 2018
Caquetá: Solano	110	30 Jul. 2019	TC
Meta: La Macarena	242	19 Nov. 2016	TC; Díaz-Pulido et al. 2016
Meta: La Macarena, Caño Cristales	296	29 Nov. 2016	TC; Díaz-Pulido et al. 2016
Meta: Río Ariari	233	—	ICN 1917
Meta: Restrepo	410	—	MLS 2351
Vaupés: Mitú, Río Vaupés	198	1961	FMNH; Hershkovitz 1957, 1961

Threatened) and 744,408 km^2 (Least Concern), respectively, and for *A. microtis* 49 km^2 (Vulnerable) and 283,814 km^2 (Least Concern), respectively (Figure 5). The new locality records of *A. microtis* occur 52–195 km from the nearest previously known localities.

Discussion

We provide new evidence that *Cerdocyon thous* is currently expanding its distribution into deforested areas of Colombia, especially in the Amazon region where it may encounter and potentially compete with *Atelocynus microtis* (Figures 1, 3). Historical records of *A. microtis* exist from the Napo Moist Forests in Ecuador (Orcés 1944). *Cerdocyon thous* now inhabits the agricultural and urban landscapes within the Napo Moist Forests (Anaguano-Yancha et al. 2026), an area where this species was not historically recorded (Berta 1982; Courtenay and Maffei 2004). Trail cameras data indicate that *C. thous* has penetrated the Napo Moist Forests and the Eastern Cordillera Real Montane Forests ecoregions in Colombia and Ecuador (Anaguano-Yancha et al. 2026), but we have not yet observed the two species in the exact same locality. This could be because *A. microtis* prefers well-preserved forested areas (Leite-Pitman and Williams 2011). Nevertheless, the expansion of *C. thous* into the Amazon could also add to the threats previously identified for *A. microtis*, including habitat loss due to large-scale forest conversion, reductions in prey availability, and disease transmission (Leite-Pitman and Williams 2011).

The continued expansion of *C. thous* into the Amazon region is also not guaranteed, and ecoregions such as the Solimões-Japurá Moist Forests appear to remain far from being colonized (Figures 1, 3), given that *C. thous* avoid densely forested habitats (Ramírez-Chaves and Pérez 2015; Suárez-Castro and Ramírez-Chaves 2015). In contrast, the Caquetá Moist Forests may be colonized by *C. thous* in a short period of time (<10 years), considering ongoing deforestation driven by activities such as agricultural expansion, timber extraction, mining, armed conflict, illicit crop production (Jones and Ramírez 2021; Murillo-Sandoval et al. 2021; Negret et al. 2021), and records from surrounding ecoregions, including those of the Orinoco region (Ramírez-Chaves and Pérez 2015).

Despite recent progress, much of the potential distribution of *A. microtis* in Colombia remains hypothetical. The species inhabits one of the least explored regions in the country (Suárez-Castro et al. 2021). The most recent records of this species in the country have been obtained over the last decade using trail cameras. Prior to the use of trail cameras, *A. microtis* was known from only six records in the country (Hershkovitz 1957, 1961; Defler and Santacruz 1994; Suárez-Castro and Ramírez-Chaves 2015; Andrade-Ponce et al. 2016), and the only reported records of *A. microtis* in the departments of Amazonas and Meta were supported by voucher specimens housed in mammalogical collections (e.g. Hershkovitz 1957, 1961; Suárez-Castro and Ramírez-Chaves 2015; Figure 2). Recent records obtained by trail cameras have added localities in the departments of Caquetá (Bonell et al. 2018) and Amazonas (Ayure and González-Maya 2014; Acevedo-Quintero and Zamora-Abrego 2016). Since *C. thous* is adapted to open savannas and human-modified habitats, its detection by both trail cameras and human observations (Figures 2, 4) is easier. While our data are insufficient to suggest competition between these two canid species, available ecological information such as activity patterns and an omnivorous diet (Champagne et al. 2024; Santos et al. 2024) makes niche overlap plausible. We suggest more intensive surveys in areas experiencing high human pressure to determine whether *A. microtis* and *C. thous* co-occur in well-preserved areas, and to establish potential mechanisms of interspecific competition between these two species.

Globally, *A. microtis* is currently classified as Near Threatened in the IUCN Red List of Threatened Species (Leite-Pitman and Williams 2011). In contrast, in Colombia, where a large portion (3.6 million hectares) of the Amazon has been modified (Murcia García et al. 2014, 2017; Ruíz-Agudelo et al. 2022), the species is not currently listed in any threatened category (MADS 2024). The Colombian Amazon, as in other regions of the country, is facing accelerated landscape transformation and land-use change in some areas following the signing of the peace agreements (Negret et al. 2017). The estimates of the AOO and EOO suggest that the species should be considered Vulnerable in Colombia or at least align with the global category (Leite-Pitman and Williams 2011). Finally, we recommend additional surveys to explore whether the expansion of the distribution of *C. thous* in the Amazon region of Colombia and neighboring countries such as Ecuador will affect the populations of *A. microtis* or whether ongoing transformation of the Amazon forests may render habitats unsuitable and confine the species to more preserved areas.

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Additional information

Conflict of interest

The authors declare that no competing interests exist.

Ethical statement

No ethical statement is reported.

Author contributions

All authors equally contributed to the construction of the different sections of the manuscript.

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Data availability

All data that support the findings of this study are available in the main text.

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