

Noteworthy record of melanism in *Leopardus tigrinus* from El Cocuy National Natural Park, Colombia

Registro notable de melanismo en *Leopardus tigrinus* en el Parque Nacional Natural El Cocuy, Colombia

CARLOS H. CÁCERES-MARTÍNEZ^{1*}, JOAN GASTÓN ZAMORA-ABREGO², AND JOSÉ F. GONZÁLEZ-MAYA^{3,4}

¹Grupo de Investigación en Ecología y Biogeografía (GIEB), Departamento de Biología, Facultad de Ciencias Básicas, Universidad de Pamplona. Km 1 vía a Bucaramanga, C. P. 543050, Pamplona. Norte de Santander, Colombia. E-mail: carloscaceres@unipamplona.edu.co (CHC-M).

²Grupo de Investigación en Ecología y Conservación de Fauna Silvestre (ECOFAUNAS), Universidad Nacional de Colombia, Sede de La Paz. Km 9 vía Valledupar a La Paz, C. P. 202010, La Paz. Cesar, Colombia. E-mail: jogzamoraab@unal.edu.co (JGZ-A).

³Departamento de Ciencias Ambientales, Universidad Autónoma Metropolitana, Unidad Lerma. Av. de las Garzas No 10, Col. El Panteón, C. P. 52005, Lerma de Villada. Estado de México, México. E-mail: jfgonzalezmaya@gmail.com (JFG-M).

⁴Proyecto de Conservación de Aguas y Tierras – ProCAT Colombia/Internacional. Carrera 8, 127c-36, Of 101, Bogotá. D. C., Colombia.

*Corresponding author

Melanism is the excess of dark pigmentation that partially or completely covers the body of an animal. The presence of melanic individuals is relatively common in several feline species. The objective of this note is to report the second case of melanism in free-living *Leopardus tigrinus* in Colombia. For the country, there is only one published record for the Department of Caldas. Between June 2012 and March 2020, 158 single camera-trap stations were set up in 5 protected areas in the Eastern Cordillera of Colombia. After almost 8 years of monitoring and with a sampling effort of 60,704 nights/trap, we recorded one melanic individual of *L. tigrinus*, in El Cocuy National Natural Park. So far, the presence of melanic individuals of *L. tigrinus* has been recorded mainly in Brazil (although once its taxonomy is clarified it may correspond to a different species). For Colombia, there is one documented record more than 350 km away from ours (Department of Boyacá). It is considered that this phenomenon may be an adaptive response of the species to environmental evolutionary pressures and has been proposed as a niche segregation strategy; however, given the rarity of this phenotype in the study area, and in general throughout its distribution, it is necessary to gather more evidence that could potentially explain the selective forces that favor or limit this type of phenotypic expression.

Key words: Boyacá; camera-trapping; dark pigmentation; National Natural Parks; ocelot.

El melanismo es el exceso de la pigmentación oscura que cubre parcial o totalmente el cuerpo de un animal. La presencia de individuos melánicos es relativamente común en varias de las especies de felinos. El objetivo de esta nota es reportar el segundo caso de melanismo en *Leopardus tigrinus* en vida libre para Colombia. Para el país solo existe un registro publicado para el departamento de Caldas. Entre junio de 2012 y marzo de 2020 se colocaron 158 estaciones simples de fototrampeo, en 5 áreas protegidas en la Cordillera Oriental de Colombia. Después de casi 8 años de monitoreo y con un esfuerzo de muestreo de 60,704 noches/trampa, registramos un individuo melánico de *L. tigrinus*, en el Parque Nacional Natural El Cocuy. Hasta ahora, la presencia de individuos de *L. tigrinus* melánicos se ha registrado principalmente en Brasil (aunque una vez se aclare su taxonomía pueda corresponder a una especie diferente). Para Colombia se cuenta con un registro documentado a más de 350 km de distancia del nuestro (departamento de Boyacá). Se considera que este fenómeno puede ser una respuesta adaptativa de las especies a presiones evolutivas del ambiente, y ha sido propuesta como una estrategia de segregación de nicho; sin embargo, dada la rareza de este fenotipo en el área de estudio, y en general a lo largo de su distribución, es necesario recabar mayor evidencia que pueda potencialmente explicar las fuerzas selectivas que favorecen o limitan este tipo de expresión fenotípica.

Palabras clave: Boyacá; cámaras trampa; parques nacionales naturales; pigmentación oscura; tigrillo.

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Northern tiger cat (*Leopardus tigrinus*, Schreber 1775) is one of the 7 wild felids of Colombia ([Ramírez-Chaves et al. 2016](#)), considered the smallest species and one of the least known both at national and global scale ([Clavijo and Ramírez 2012](#); [Cossíos et al. 2012](#); [Suárez-Castro and Ramírez-Chaves 2015](#); [González-Maya et al. 2022](#)), despite its relatively large distribution from northern Argentina to Costa Rica, covering a significant portion of Brazil (although with pending taxonomic issues), in an elevational range between 0 and 3,626 m ([Payán-Garrido and González-Maya 2011](#); [Payan and](#)

[de Oliveira 2016](#)). In Colombia, Northern tiger cat occurs through the Eastern, Central and Western ranges of the Andes ([González-Maya et al. 2022](#)), mainly associated with open and closed forested areas ([Bellani 2019](#)). The species feeds primarily on birds and mammals, mainly small rodents, and occasionally reptiles and invertebrates, and even traces of plant material have actually been reported in its diet ([Trigo et al. 2013](#)). The Northern tiger cat is characterized by having light yellow-gray fur, with black stripes on the neck that extend towards the back and sides, with

elongated black spots of brown color, and with the length of the tail representing 60 % of the head-body length (Bellani 2019) and neck hair directed backwards, contrary to *L. wiedii*, a very similar species that is also sympatric on certain areas of their distributions (Pacheco et al. 2001). Although this color pattern is the typical one reported in the literature for most of its distribution (Nascimento and Feijó 2017), occasionally it is possible that chromatic anomalies appear in this species (Graipel et al. 2014), as in other spotted felids (Eizirik et al. 2003; Schneider et al. 2012; González-Maya et al. 2018).

There are several types of chromatic abnormalities in mammals, among which albinism, leucism and melanism stand out (Uieda 2000; Brito and Valdivieso-Bermeo 2016; Mahabal et al. 2019). The first two of them are chromatic disorders caused by recessive genes that generate snow tones in organisms, causing total or partial absence of pigmentation in the fur (Binkley 2001; Guevara et al. 2011); while melanism is the excess of dark pigmentation that partially or totally covers the body of an animal, due to the mutation of various genes such as the melanocortin-1-receptor (MC1R) and the agouti signaling protein (ASIP; Rubio-Gutiérrez and Guevara-Chumacero 2017; Valdivia and Pacheco 2019). Other previous explanations indicate that this phenomenon may also be due to the expression of a recessive gene, which may be hereditary (Rubio-Gutiérrez and Guevara-Chumacero 2017). The presence of melanistic

individuals is considered relatively common among several felid species (Eizirik et al. 2003; Rubio-Gutiérrez and Guevara-Chumacero 2017) and their presence may be due to recessive monogenic expression in a polymorphic population, which could be being refined (Roulin et al. 2011; Dreiss et al. 2012; Kaelin et al. 2012). It has also been documented that melanism could provide certain adaptive and ecological advantages: resistance to viral infections and other diseases (Miyazawa 2002), greater absorption of solar radiation and thus greater adaptation to living at higher altitudes, improvements in temperature regulation in humid environments (Majerus and Mundy 2003), or advantages such as anti-predator strategies (Van den Brink et al. 2012). In this work we document a notable record of melanism in the free-living Northern tiger cat (*L. tigrinus*) in the Eastern Cordillera of Colombia.

The study area is located in the extreme north of the Eastern Cordillera of Colombia, in which 5 protected areas were included: Parque Nacional Natural (PNN) Tamá, PNN El Cocuy, PNN Pisba, Santuario de Fauna Flora Guanenta Alto Río Fonce (SFF GARF) and Área Natural Única Los Estoraques (ANULE); including their buffer zones in the departments of Santander, Norte de Santander and Boyacá (Figure 1). The sampling consisted of the installation of 158 simple Bushnell Trophy Cam (Agressor HD, Reconyx RM45 y HC500) and Primos Truth (Cam 35) camera-trap sta-

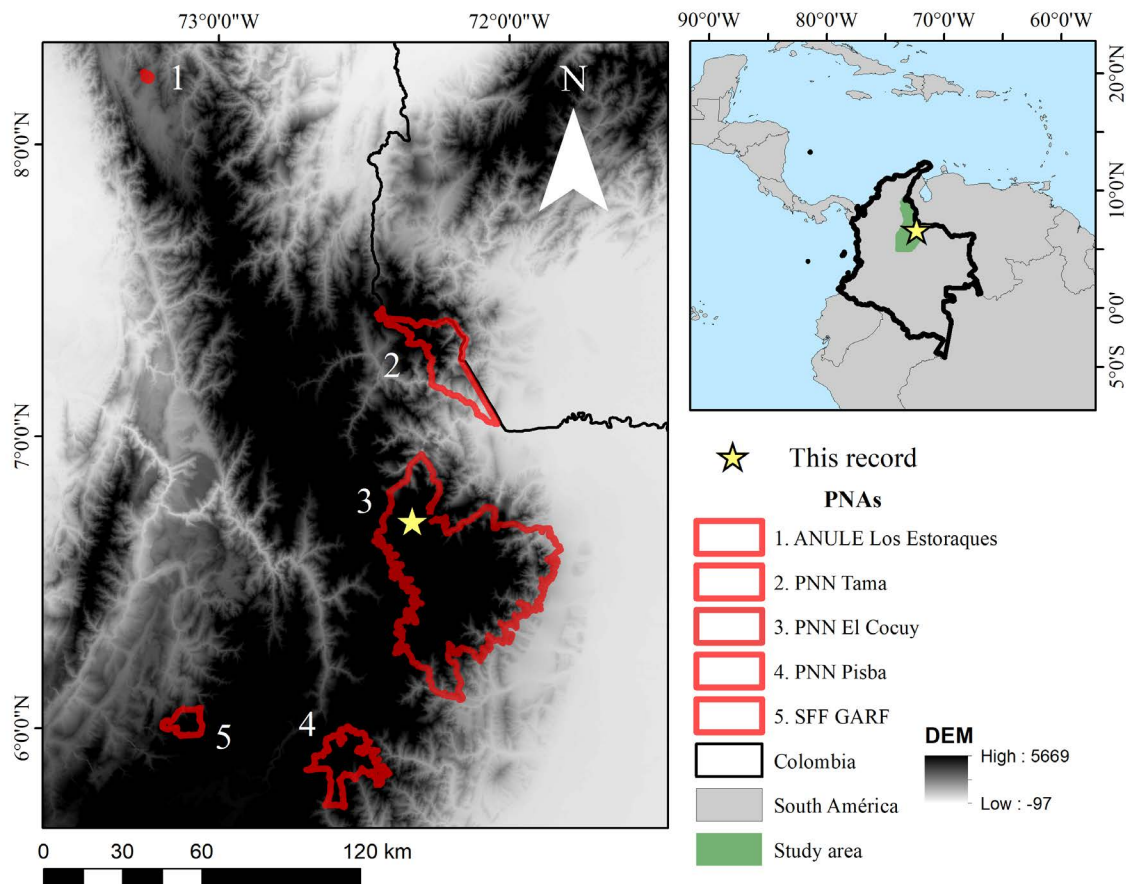


Figure 1. Study area location and locality of the melanistic *Leopardus tigrinus* record in El Cocuy National Natural Park, Colombia. Protected areas (PA) are marked and delimited in red.

tions, in 3 time-periods: i) June 2012 throughout May 2015; ii) October 2017 throughout June 2018; and iii) January 2019 throughout March 2020. The stations were distributed like this: 85 simple stations at PNN Tamá, 16 at PNN El Cocuy, 20 at PNN Pisba, 27 at SFF GARF and 10 stations at ANULE. Each camera was configured with automatic sensitivity level, active during the 24 hr and configured on video with 15 sec length and 15 sec as interval between events. Likewise, we reviewed whether there are other records in the country, both in scientific literature and records in the media, in order to contextualize the rarity of the phenomenon in the country.

We obtained a total sampling efforts of 60,704 trap-nights (t-n) for the entire study, distributed in: 29,032 t-n for PNN Tamá, 2,770 t-n for ANULE, 9,080 t-n for PNN Pisba, 12,558 t-n for SFF GARF and 7,264 t-n for PNN El Cocuy. During the sampling period, on September 19, 2019 at 4:53 hr, in vereda Las Tapias, Chiscas municipality, Boyacá, at 4,254 m within PNN El Cocuy (06° 42' 31.6" N, 72° 20' 30.1" W, WGS84; Figure 1), we recorded one individual of *L. tigrinus* with evident melanism on the face (Figure 2a, b). We should note that during the sampling period at the same camera trapping station, 3 individuals were also recorded but all presented typical coloration (Figure 2c, d). Likewise, during

the entire study, 33 individuals of the species with the typical coloration were recorded; however, this melanistic individual was recorded in a single event and it was not possible to obtain a photographic record of its entire body.

The quick review of the press articles allowed us to identify some occasional records of melanism in *L. tigrinus* in departments such as Antioquia, Huila, Cauca and Valle del Cauca, along with records for Valle del Cauca for *L. wiedii* (Table 1); recently, in addition, 2 records for the Eastern Cordillera reported in the press were made public (Santander and Boyacá departments), although there is not much information about them, and they have not been documented in the literature or adequately validated (Table 1).

Although in Brazil this type of phenotypic expression seems to be common in both *L. tigrinus* and in similar species (Graipel et al. 2014), in Colombia there is only one report documented by Ramírez-Mejía and Sánchez (2015), who reported the presence of one melanistic individual in the "CHEC" reserve, in the department of Caldas, in the Central Cordillera of Colombia, 350.5 km northeast from this record (05° 01' 0.5" N, 75° 23' 0.0" W, WGS84). On the other hand, González-Maya et al. (2018) reported this phenomenon for *L. wiedii* in the department of Magdalena, Colombia (~ 500 km away), so this would be the second and most recent

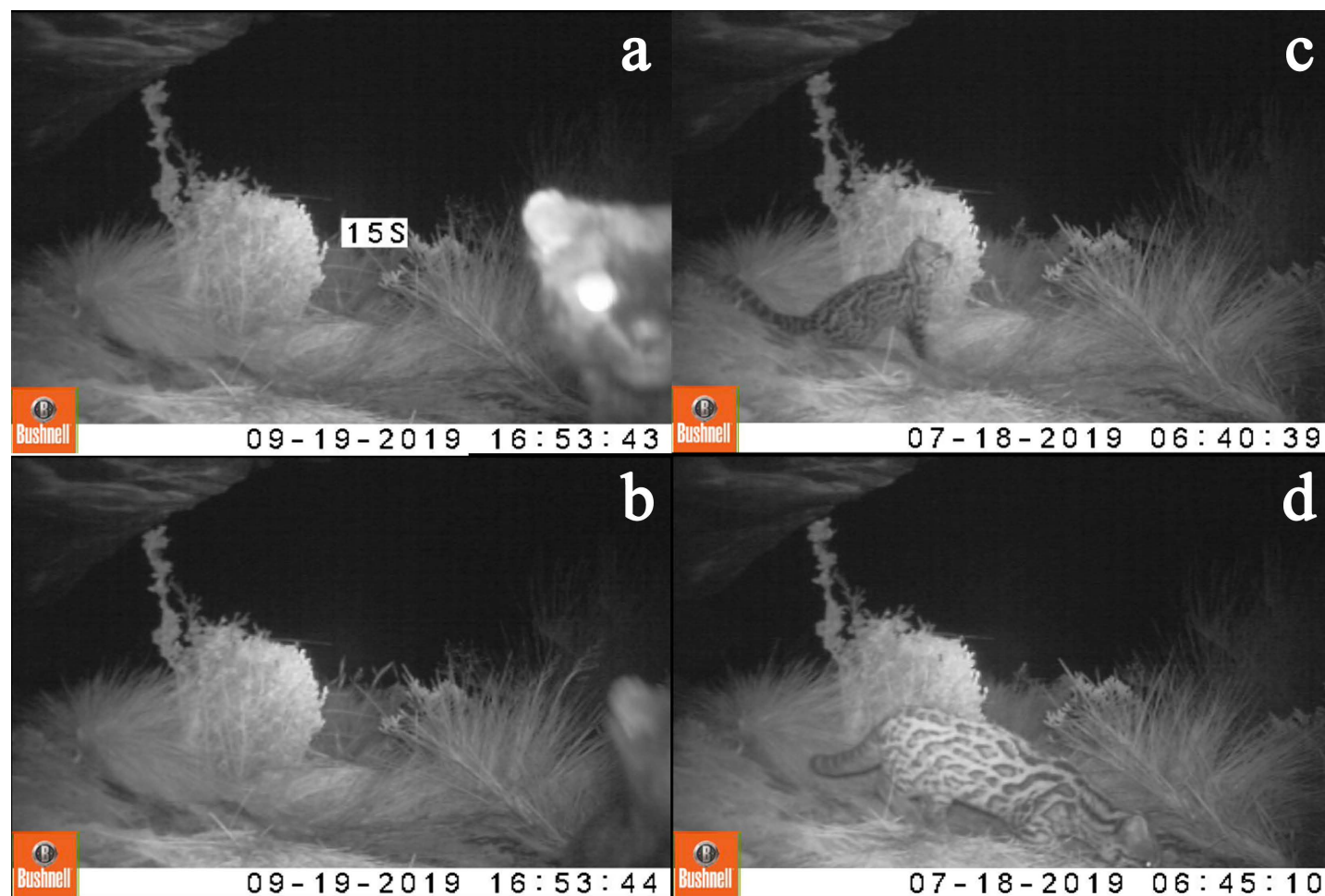


Figure 2. a) and b) Melanistic *Leopardus tigrinus* recorded in camera-traps, with clear pigmentation in the face in El Cocuy National Natural Park, Colombia; c) and d) *L. tigrinus* individual with typical coloration also recorded in the same area.

Table 1. Press sources regarding melanistic records according to departments in Colombia.

Species	Departament	Source
<i>Leopardus tigrinus</i>	Antioquia, Boyacá, Cauca, Huila, Santander, Valle del Cauca	https://www.semana.com/actualidad/articulo/felino-melanico-camaras-captan-por-primera-vez-la-presencia-de-un-tigrillo/58657/
		https://noticias.caracol.tv.com/antioquia/la-leccion-de-un-campesino-de-amalfi-que-salvo-a-este-tigrillo-melanico-de-una-jauria-de-perros
		https://www.metropol.gov.co/Paginas/Noticias/tigrilla-lanuda-melanica-ahora-vive-libre-en-el-alto-de-san-miguel.aspx
		https://www.elcolombiano.com/medio-ambiente/tigrillos-melanicos-en-antioquia-CO20597225
		https://www.bluradio.com/nacion/en-video-quedaron-registrados-tiernos-tigrillos-melanicos-en-el-huila-rg10
		https://www.semana.com/actualidad/articulo/felino-melanico-camaras-captan-por-primera-vez-la-presencia-de-un-tigrillo/58657/
		https://www.bcnoticias.com.co/registrado-por-primera-vez-un-tigrillo-melanico-en-el-parque-nacional-natural-pisba/
<i>Leopardus wiedii</i>	Valle del Cauca	https://www.vanguardia.com/area-metropolitana/bucaramanga/la-historia-del-fascinante-tigrillo-negro-rescatado-en-santander-Fl6486447
		https://www.semana.com/medio-ambiente/articulo/en-video-tigrillo-melanico-ocelote-y-cusumbos-son-captados-en-valle-del-cauca/54345/

record of melanism in *L. tigrinus* formally documented. According to our review, there are only a few isolated observations or unpublished reports in press releases and other media for both species in Colombia; some of these interesting records are worth having them properly identified (Table 1), but at the same time they confirm the need to further study the subject and continue adequately documenting this phenomenon in the country.

Although Graipel *et al.* (2014) state that these phenotypic variations may be part of temporary niche segregation strategies within the same species and with other competing species, the rarity of the records in the study area may indicate that they are random expressions of the genetic code, which could also be demonstrating an evident presence of polymorphisms (Wellenreuther *et al.* 2014; Yuxing *et al.* 2021) in Colombia. However, the considerable elevation of the record (4,170 m) could be related to the advantages that melanism represents to deal with high elevations and low temperatures (Eizirik *et al.* 2003; Majerus and Mundy 2003; Schneider *et al.* 2015); nevertheless, there is not enough information to support this claim. Since several individuals of *L. tigrinus* with typical coloration were recorded at the site where the melanistic individual was recorded, it is recommended to increase the sampling in this area of El Cocuy PNN, in order to know how common this phenotypic expression is. Likewise, in a subsequent study, it seems warranted that is necessary to evaluate the effect that this characteristic may have on the ecological fitness, ecology and survival of the individuals that present this unique condition.

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