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# Journal of Threatened Taxa

Building evidence for conservation globally

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ISSN 0974-7907 (Online) | ISSN 0974-7893 (Print)

## COMMUNICATION

### NOT ALL GONE: THE REDISCOVERY OF JAGUAR (*CARNIVORA: FELIDAE: PANTHERA ONCA*) AND RECORDS OF THREATENED MONKEYS (*PRIMATES: MAMMALIA*) IN THE MAGDALENA RIVER VALLEY OF CALDAS DEPARTMENT IN COLOMBIA, A CALL FOR THEIR CONSERVATION

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26 March 2021 | Vol. 13 | No. 3 | Pages: 17865–17874  
DOI: 10.11609/jott.6673.13.3.17865-17874



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## INTRODUCTION

The inter-Andean valley of the Magdalena River is an important area from the historical, cultural, and ecological perspectives (Mancera-Rodríguez & Rodríguez-Sánchez 2002; Fernández-Méndez et al. 2013). This valley crosses Colombia from south to north, encompassing a variety of ecoregions from Caribbean mangroves and xeric shrubs to dry and moist forests (Olson et al. 2001). Specifically, the middle Magdalena Valley is particularly composed by moist forest to the north and dry forests to the south, reason why the middle part of such area is a transition (ecotone) between those type of forests (Fernández-Méndez et al. 2013). For decades, the middle Magdalena Valley has been a scene of heavy social and civil conflict, which has resulted in extensive deforestation and expansion of the agricultural border with most lands mainly dedicated to extensive livestock farming (Fergusson et al. 2014). Such disturbances have led to a progressive loss of the natural forests of the region, threatening the natural resources base in general and biodiversity in particular (Fernández-Méndez et al. 2013; Fergusson et al. 2014). Furthermore, the unique dry and moist forests of the middle Magdalena River valley are poorly represented in the regional and local protected areas systems and are currently not represented at all within national protected areas (SIAC 2020). Nowadays, the forests that once covered the middle Magdalena have almost disappeared and the few remnants of forest that still persist are extremely fragmented and isolated (Fernández-Méndez et al. 2013). Despite these large-scale deforestation processes, the middle Magdalena River valley is still home to many endemic species, but with high risk of disappearing if appropriate conservation actions are not urgently taken (Andrade et al. 2013).

Large and medium-sized mammals are considered a group highly susceptible to local extinction, because they usually require large extensions of habitat with a good degree of connectivity to be able to disperse between fragments (Powell & Mitchell 2012). In this sense, it is especially important to identify the last remnants of habitat that still persist in the middle Magdalena and that are inhabited by endemic and threatened mammal species (Castaño & Corrales 2010; Andrade et al. 2013). Therefore, the goal of this work is to report the presence of Jaguar *Panthera onca* and four threatened and endemic monkeys, the Variegated Spider Monkey *Ateles hybridus*, the Silvery-brown Tamarin *Saguinus leucopus*, the Varied White-fronted Capuchin *Cebus versicolor*, and the Grey-handed Night Monkey *Aotus griseimembra*

inside an isolated remnant of tropical rainforest called “Ciénaga de la Tortuga” in the Magdalena River valley of the department of Caldas, Colombia.

## MATERIALS AND METHODS

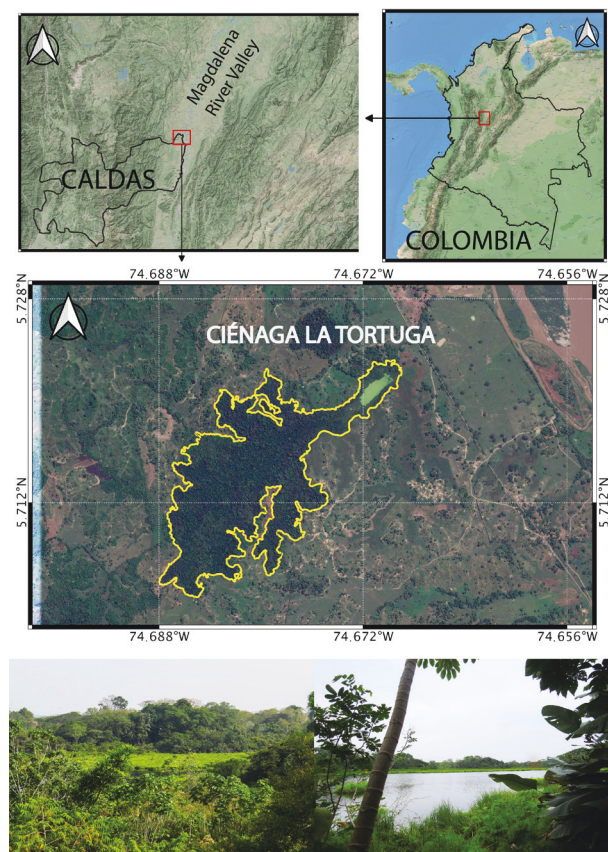
### Study area

The study was carried out at a remnant of tropical rainforest called “Ciénaga de la Tortuga” (5.714°N, -74.680°W, 167 msnm, WGS 84) located close to the La Miel River mouth into the Magdalena River (Image 1). According to the ecoregions defined by Olson et al. (2001), the study area corresponds to “Magdalena-Urabá moist forests”. This isolated remnant of forest has an extension of 167.3ha and a perimeter of 17.3km, located in Buenavista Village, La Dorada municipality, in the northeastern portion of the department of Caldas, middle Magdalena River valley, Colombia. The Ciénaga de la Tortuga is one of the last remnants of tropical rainforest in the region, it is immersed in lands dedicated to extensive livestock farming and is under private ownership as the “Hacienda Santa Clara” and “Hacienda La Tortuga”. The rainfall regime is bimodal with the first peak of rains between March–May and the second between September–November (SIAC 2020). The major dry season occurs from June to August and there is a less pronounced dry season around December–February (SIAC 2020).

## METHODS

Between September 2014 and March 2020, we carried out 11 short expeditions to the tropical rainforest “Ciénaga de la Tortuga”, which together had a duration of 56 days and 327 hours (Table 1). The expeditions had two general aims, the first was to monitor the conservation status of the forest, looking for early deforestation alerts and the second was to evaluate if the forest is inhabited by endemic and threatened mammal species in order to better assess the conservation status of these forests. To record the endemic and threatened mammals, we made ad-libitum walks inside and around the rainforest which together had an extension of 28km. We used binoculars and cameras to record all individuals sighted and indirect signals (e.g., footprints, feeders, burrows, among others). The date and time of each of the sightings was recorded.





**Image 1.** Geographic location of the tropical rainforest remnant called “Ciénaga de la Tortuga” in the Magdalena River valley of the department of Caldas, Colombia. Ciénaga de la Tortuga is immersed in lands dedicated to extensive livestock farming and is under private ownership as “Hacienda Santa Clara” and “Hacienda La Tortuga”. Note the degree of isolation of the forest patch.

**Table 1.** Description of ad-libitum expeditions carried out in tropical rainforest remnant called “Ciénaga de la Tortuga” in the Magdalena River valley of the department of Caldas, Colombia.

| Date   | Days of survey | Time of survey | Distance walked (m) |
|--------|----------------|----------------|---------------------|
| Sep-14 | 3              | 16 hours       | 1500                |
| May-15 | 4              | 28 hours       | 2000                |
| Aug-16 | 1              | 5 hours        | 500                 |
| Nov-17 | 3              | 21 hours       | 1500                |
| Dec-17 | 2              | 18 hours       | 1000                |
| Jan-18 | 7              | 35 hours       | 3500                |
| Feb-18 | 9              | 50 hours       | 4500                |
| Mar-18 | 9              | 48 hours       | 4500                |
| Apr-18 | 6              | 30 hours       | 3000                |
| May-18 | 5              | 36 hours       | 2500                |
| Mar-20 | 7              | 40 hours       | 3500                |

## RESULTS AND DISCUSSION

### Jaguar *Panthera onca* (Linnaeus 1758) rediscovery for Caldas department.

The record of Jaguar was obtained through a footprint (Image 2) recorded on 7 February 2018 at 08.47h, which had all features to be consistently assigned to *P. onca* (sensu Aranda-Sanchez 2012). This is an important rediscovery of the species inside the department of Caldas, because it was believed that the Jaguar populations were locally extinct in the department (Escobar-Lasso et al. 2014). The last confirmed record of the species was made in 1999 (21 years ago) by an adult individual who was hunted by farmers as retaliation for cattle predation near the indigenous reserve “Nuestra Señora Candelaria de la Montaña”, El Rosario Village, Riosucio municipality, Cauca River basin (Escobar-Lasso et al. 2014). Therefore, this work represents the second known record of Jaguar in the department, but maybe it could be one of the last individuals that still persists in the entire region.

At international level, the Jaguar is listed as Near Threatened (NT) throughout its whole distribution range (Quigley et al. 2017) but recent assessments considered 33 of 34 populations in the continent either Endangered or Critically Endangered (de la Torre et al. 2018). At the national level, the species is listed as Vulnerable (VU) by the Colombian Ministry of Environment (MADV 2017). Although most of the Jaguar’s habitat has been deforested and fragmented, the species has a widespread distribution and is found in the five natural regions of the country (Andean, Caribbean, Pacific, Orinoquia and Amazon) (Quigley et al. 2017), although apparently mostly isolated and on reduced numbers (González-Maya & Jiménez-Ortega 2015; de la Torre et al. 2018). The records of Jaguars in the middle Magdalena River valley are rare and their populations are extremely fragmented due to habitat loss (Payán et al. 2016). The few populations that still persist are restricted to the north of the middle Magdalena River valley, from the south of Bolívar department in the Serranía de San Lucas (Payán et al. 2016), to the northeastern of the Antioquia department (Arias-Alzate et al. 2011) and the south-west of Santander department (Boron & Payán 2013; Boron et al. 2016). Therefore, it is important to highlight that our record is considered the southernmost locality for Jaguar in the Magdalena River valley.

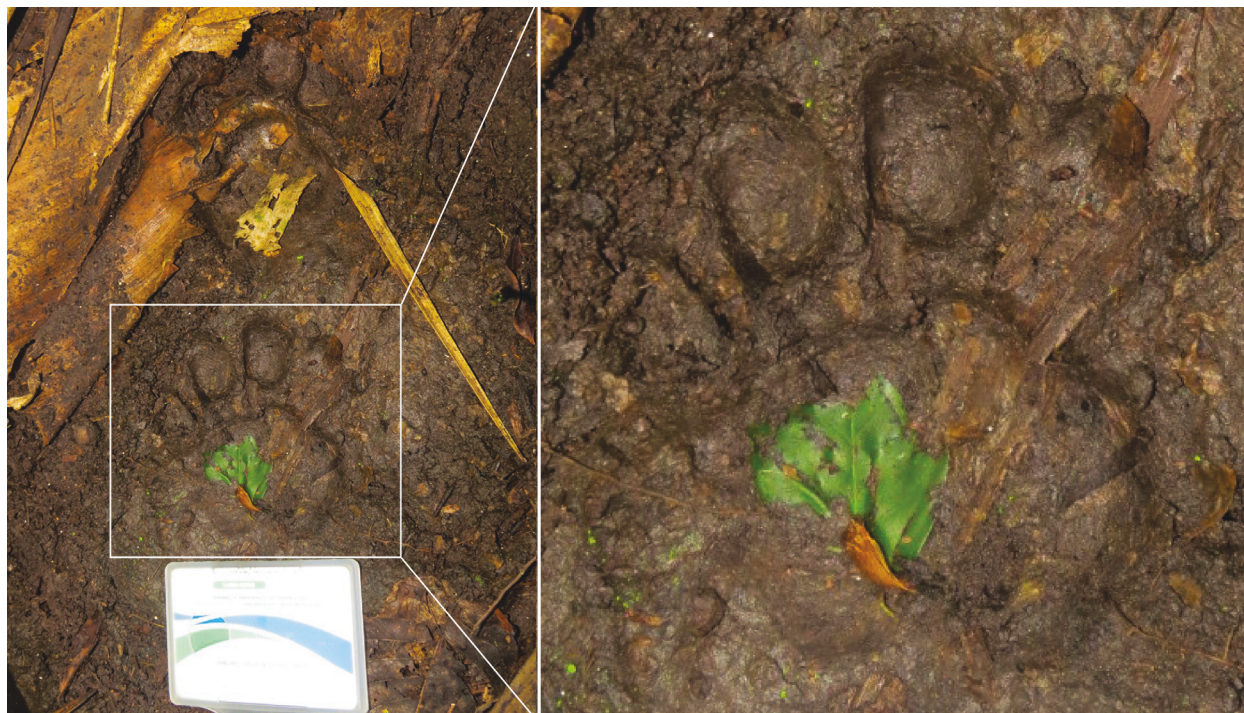


Image 2. Footprints of Jaguar *Panthera onca* recorded inside a tropical rainforest remnant known as “Ciénaga de la Tortuga” in the Magdalena River valley of the department of Caldas, Colombia. © Leonardo Mendieta-Giraldo.

#### Variegated Spider Monkey *Ateles hybridus* Geoffroy, 1829 southernmost records.

The records of the Variegated Spider Monkey *Ateles hybridus* were obtained through direct observations on four occasions (May 2015, November 2017, January–February 2018, and March 2020). During these observations, troops of up to 10 individuals were recorded (Image 3). To date, the only known location of *A. hybridus* for Caldas department is a record made inside the Selva de Florencia National Natural Park (NNP) (Roncancio-Duque 2012). Therefore, this work represents the second known location of *A. hybridus* in the department of Caldas; however, unlike the populations recorded in Selva de Florencia NNP, the individuals of this new location are inhabiting an extremely isolated forest and without any category of conservation.

Globally, the Variegated Spider Monkey is listed as Critically Endangered (CR) under criteria A2cd+3cd given that its populations have declined at least 80% over the past 45 years (three generations) due primarily to hunting and habitat loss (Link et al. 2020). Similarly, at national level, it is listed as Critically Endangered (CR) by the Colombian Ministry of Environment (MADV 2017). In Colombia, *A. hybridus* is found from the middle valley of the Magdalena River to the northeast region of the

Caribbean region, with some populations on the eastern flank of the Eastern mountain range (Hernández-Camacho 1976; de Luna et al. 2017; Link et al. 2020). Therefore, the two locations known, including these records, for the Caldas department can be considered the southernmost localities for the species.

#### Varied White-fronted Capuchin *Cebus versicolor* Pucheran, 1845 first confirmed records for Caldas department.

The records of the Varied White-fronted Capuchin *Cebus versicolor* (Image 4) were obtained through direct observations on six occasions (September 2014, May 2015, August 2016, December 2017, January–March–May 2018, and March 2020). Castaño et al. (2003) suggested the presence of *Cebus albifrons* in the Caldas department based on an individual deposited in the exhibit collection of the Natural History Museum of the Caldas University (without catalogue number). Such individual apparently came from the Samaná municipality, but the collection date, coordinates and other data associated with the specimen are unknown (Castaño et al. 2003). It is currently accepted that *Cebus albifrons versicolor*, classified as a subspecies by Hershkovitz (1949), should be considered a distinct species and the subspecies *Cebus albifrons adustus*



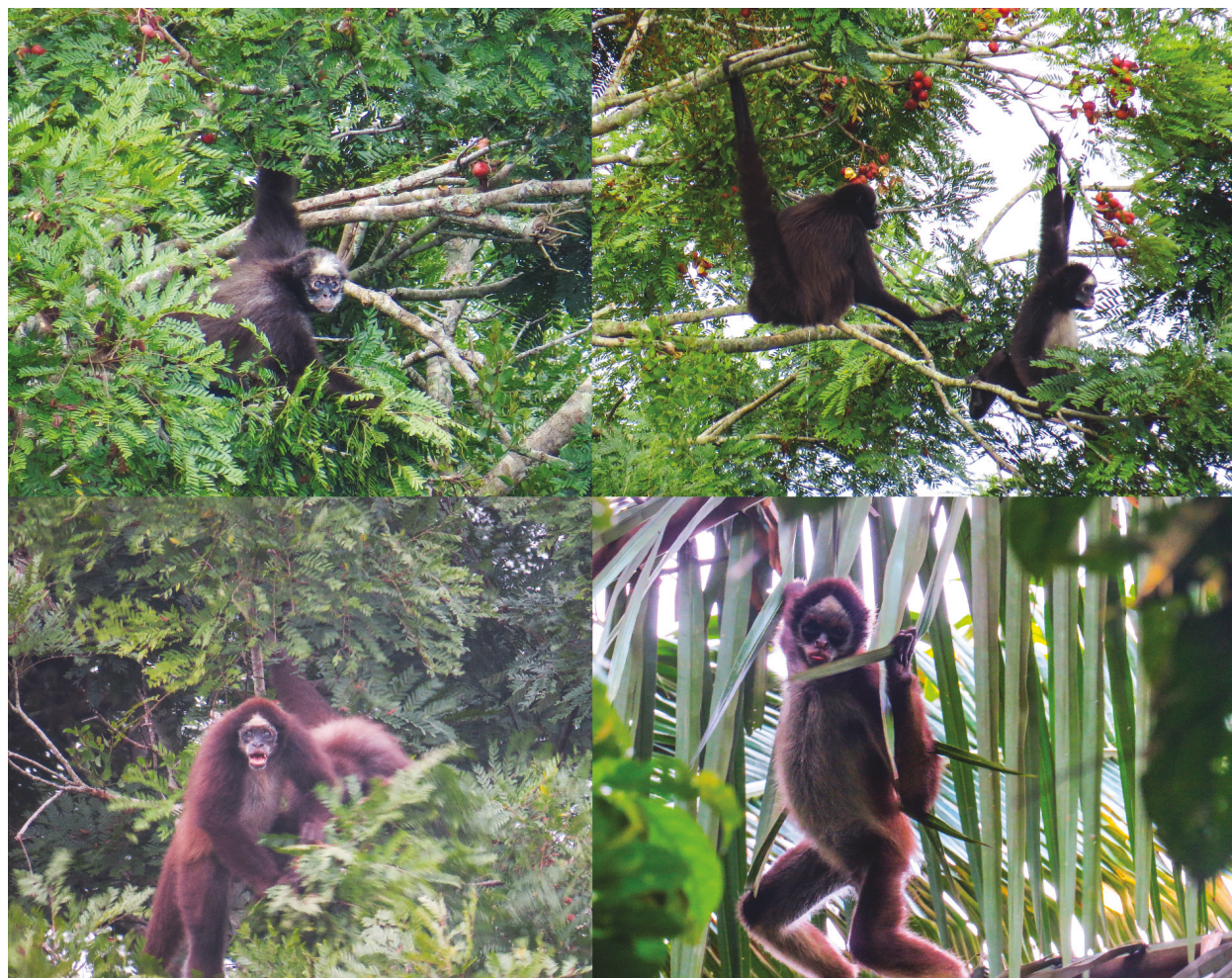


Image 3. The Variegated Spider Monkey *Ateles hybridus* recorded inside a tropical rainforest remnant known as “Ciénaga de la Tortuga” in the Magdalena River valley of the department of Caldas, Colombia. © Leonardo Mendieta-Giraldo.

and *Cebus albifrons leucocephalus* are synonyms of *C. versicolor* (Boubli et al. 2012). Based on this taxonomic discrepancy, and on the record of *C. albifrons* by Castaño et al. (2003), García-R et al. (2018) suggested the presence of *C. versicolor* inside Caldas department. Therefore, our observations of *C. versicolor* can be considered the first confirmed and reliable records of the species for Caldas department; however, it is highly likely that the species has a wider distribution in the middle Magdalena Valley of Caldas.

At international level, the Varied White-fronted Capuchin is listed as Endangered (EN) under criteria A2cd mainly due to habitat loss and illegal wildlife trade (Torre et al. 2015). At national level, however, the Colombian Ministry of Environment (MADV 2017) has not yet assessed the species. *C. versicolor* is endemic to the lower and middle parts of the Magdalena River basin of Colombia and, including these new records,

the species is found in nine departments: Bolívar, Cesar, Sucre, Santander, Norte de Santander, Antioquia, Cundinamarca, Boyacá, Caldas, and Tolima (Ramírez-Chaves et al. 2016; García-R et al. 2018; This work). Therefore, it is necessary to promote studies focused on establishing a national program for conservation and management of *C. versicolor* and establish its conservation status at the national level.

#### New records for the Silvery-brown Tamarin *Saguinus leucopus* (Günther, 1877).

The records of the Silvery-brown Tamarin *Saguinus leucopus* (Image 5) were obtained through direct observations on six occasions (September 2014, January–March 2018, and March 2020). Many troops of *S. leucopus* have been recorded inhabiting many forest patches throughout the Magdalena River valley of the Caldas department (see Castaño et al. 2003;





Image 4. The Varied White-fronted Capuchin *Cebus versicolor* recorded inside a tropical rainforest remnant known as “Ciénaga de la Tortuga” in the Magdalena River valley of the department of Caldas, Colombia. © Leonardo Mendieta-Giraldo.

Roncancio-Duque et al. 2008; Castaño & Corrales 2010; Alba-Mejia et al. 2013; Arias-Alzate et al. 2014; Ruiz-García et al. 2014; Garcés-Restrepo et al. 2016; Vélez-García et al. 2019). Even more, a species conservation and management plan was recently generated for the department in 2012 (Roncancio-Duque et al. 2012); however, the effectiveness and degree of application of such plan is unknown. This work represents a new location for the species in the Magdalena River valley of the department, which must be prioritized and considered in the present and future conservation actions due to the high degree of isolation of “Ciénaga de la Tortuga”.

At the international level, the Silvery-brown Tamarin is listed as Endangered (EN) under criteria A2cd mainly due to habitat loss and illegal wildlife trade (Morales-Jiménez et al. 2008). At national level the species is listed as Vulnerable (VU; MADV 2017). This species is endemic to the country, found only in northern Colombia, between the Magdalena and Cauca rivers

(Morales-Jiménez et al. 2008). In the Magdalena River valley, populations of *S. leucopus* located in the Caldas and Tolima departments represent the southernmost populations of its distribution, which are key to enable the dispersal of the species to the rest of the Magdalena River valley.

#### New records for the Grey-handed Night Monkey *Aotus griseimembra* Elliot, 1912.

The Grey-handed Night Monkey *Aotus griseimembra* (Image 6) records were obtained through direct observations on four occasions (May 2015, February–May 2018, and March 2020). The presence of *A. griseimembra* had already been recorded in the middle Magdalena River valley of the Caldas department, specifically in the municipality of Victoria and La Dorada (Castaño et al. 2003; Garcés-Restrepo et al. 2016; García-R et al. 2018). Therefore, this work represents a new location for the species in the Magdalena River valley of the Caldas department, which must be





Image 5. The Silvery-brown Tamarin *Saguinus leucopus* recorded inside a tropical rainforest remnant known as “Ciénaga de la Tortuga” in the Magdalena River valley of the department of Caldas, Colombia. © Leonardo Mendieta-Giraldo.

prioritized and considered in the present and future conservation actions due to the high degree of isolation of “Ciénaga de la Tortuga”.

At the international level, the Grey-handed Night Monkey is listed as Vulnerable (VU) under criteria A2c due to population decreasing, being its main threats habitat loss for urban and agriculture purposes (Link et al. 2019). At the national level, it is listed as Vulnerable (VU) (MADV 2017). In Colombia, *A. griseimembra* is distributed in the inter-Andean river valleys of Magdalena and Cauca rivers, and in the Caribbean region including Serranía de San Lucas, Serranía del Perijá, Montes de María and Sierra Nevada de Santa Marta (Link et al. 2019). It is important to highlight that the eastern of the Caldas department is an important area to allow the dispersion of *A. griseimembra* from south to north throughout the Magdalena River Valley.

## CONCLUSIONS

After 21 years of not having reliable records of Jaguars in the Caldas department, this work renews the hope to conserve this iconic species in the territory and is perhaps the last opportunity to take conservation actions to prevent its local extinction in the department. Due to the high degree of isolation of “Ciénaga de la Tortuga”, we believe that this remnant of forest must be prioritized and considered in the present and future conservation actions by the environmental authorities and the local, national, and international organizations dedicated to conservation of nature.

The remnant of tropical rainforest “Ciénaga de la Tortuga”, apart from being inhabited by four threatened species of monkeys, also is inhabited by the Colombian Red Howler Monkey *Alouatta seniculus* (Image 6). Therefore, it is important to highlight that Ciénaga de la Tortuga is to date the only place in the Caldas department where it is possible to see five of the six species of





Image 6. (above) The Grey-handed Night Monkey *Aotus griseimembra* and (below) the Colombian Red Howler Monkey *Alouatta seniculus* recorded inside a tropical rainforest remnant known as “Ciénaga de la Tortuga” in the Magdalena river valley of the department of Caldas, Colombia. © Leonardo Mendieta-Giraldo.

monkeys currently recorded for the department (García-R. et al. 2018). The isolation of this forest patch and the high risk of disappearing in the short term, including these remnant populations of species at risk, make Ciénaga de la Tortuga a conservation priority for the department and even for the whole country; urgent actions are required and seem warranted to secure this remnant and ideally to reconnect it with other forest fragments in the region.

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**Spanish Resumen:** Durante décadas, el Valle Medio del Magdalena de Colombia ha sido escenario de un intenso conflicto social y civil, que ha resultado en una expansión sostenida y extensa de la frontera agrícola, dedicando la mayoría de las tierras a actividades de producción ganadera extensiva. Estas perturbaciones tan extensas han provocado la pérdida progresiva y el aislamiento de los bosques naturales de la región, amenazando gravemente la biodiversidad. Un grupo altamente susceptible a la extinción local en el Valle medio del Magdalena son los mamíferos grandes y medianos, pues suelen requerir grandes extensiones de hábitat con un buen grado de conectividad para poder dispersarse entre fragmentos. En este sentido, es especialmente importante identificar los últimos remanentes de hábitat que aún persisten en el Magdalena medio y que aún están ocupados por especies de mamíferos endémicos y amenazados. Por lo tanto, este trabajo confirma la presencia de Jaguar *Panthera onca* y cuatro monos amenazados, *Ateles hybridus* (En peligro crítico), *Saguinus leucopus* (En peligro), *Cebus versicolor* (En peligro) y *Aotus griseimembra* (Vulnerable) dentro de un remanente aislado de bosque lluvioso tropical llamado “Ciénaga de la Tortuga” en el Valle del Río Magdalena del departamento de Caldas. Luego de 21 años de no contar con registros confiables de Jaguares en el departamento de Caldas, este trabajo renueva la esperanza de conservar esta icónica especie en el territorio y es quizás la última oportunidad para tomar acciones de conservación para prevenir la total extinción local del Jaguar en el departamento. Este trabajo también representa los primeros registros confirmados de *C. versicolor* para el departamento de Caldas y los segundos registros conocidos de *P. onca* y *A. hybridus*. Los registros de *A. hybridus* también se consideran la localidad más austral de la especie.

**Palabras clave:** Grandes felinos, Capuchino *Cebus versicolor*, deforestación, especies amenazadas, especies endémicas, fragmentación, extinción local, Mono Nocturno *Aotus griseimembra*, Mono Araña *Ateles hybridus*, Tamarin *Saguinus leucopus*.

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**Author contribution:** Study design (LMG); Data collection (LMG); Data analysis (SEL, EGS, JFGM); Manuscript write up (SEL, EGS, JFGM).





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ISSN 0974-7907 (Online) | ISSN 0974-7893 (Print)

March 2021 | Vol. 13 | No. 3 | Pages: 17847–18058

Date of Publication: 26 March 2021 (Online & Print)

DOI: 10.11609/jott.2021.13.3.17847-18058

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