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Mammals of the Popayán Botanical Garden: a reference ecosystem for the conservation of the subandean forest

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MAMMALS OF THE POPAYÁN BOTANICAL GARDEN: A REFERENCE ECOSYSTEM FOR THE CONSERVATION OF THE SUBANDEAN FOREST

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ABSTRACT

The Popayán Botanical Garden (JBP) is an environmental conservation zone. However, their populations have been little studied, leading to information gaps about their biodiversity, for this reason, this research consisted of identifying the mammals present in the JBP through the installation of camera traps in an area with little human intervention, which left as results a total of six species of terrestrial mammals and a number of registered flying mammal species to be defined, which highlight the importance of this little-implemented study method in the department of Cauca and which make the study area a place propitious to maintain and preserve the ecological and environmental integrity of ecosystems with the presence of fundamental forest fragments to conserve the biological diversity of the region, the department and the country.

KEYWORDS

Camera trapping, ecosystem, mammalians, wildlife.

RESUMEN

El Jardín Botánico de Popayán (JBP) es una zona de conservación ambiental, sin embargo, sus poblaciones han sido poco estudiadas, conllevando a vacíos de información sobre su biodiversidad, por dicho motivo, esta investigación consistió en identificar los mamíferos presentes en el JBP a través de la instalación de cámaras trampa en una zona con poca intervención humana, que dejaron como resultados un total de seis especies de mamíferos terrestres y un número de especies por definir de mamíferos voladores registradas, que destacan la importancia de este método de estudio poco implementado en el departamento del Cauca y que convierten la zona de estudio en un lugar propicio para mantener y preservar la integridad ecológica y ambiental de ecosistemas con presencia de fragmentos de bosque fundamentales para conservar la diversidad biológica de la región, el departamento y el país.

INTRODUCTION

The biological diversity of natural ecosystems is the foundation of human life, productive activities such as: agriculture, livestock, fishing and aquaculture, wood, medicine production and tourism are some examples of the importance of biodiversity. In the life of the human being, the sub-Andean forests are located between 1000 and 2400 masl (Cuatrecasas 1989) and are recognized as one of the main centers of diversity in the world for being the habitat and food for most of the fauna; With soils rich in organic matter, they regulate the hydrological cycle through the process of evotranspiration, damping the rate of rain fall and regulating solar radiation in the forest canopy (Torres 2020).

In the sub-Andean forests, the fauna fulfills a variety of ecological roles such as: pollination, dispersal and predation of seeds, being important in the architecture of biodiversity (Bascompte and Jordano 2007), in addition to carnivory, organic matter decomposition and nutrient recycling (Castillo 2017), where medium and large mammals are part of one level of the trophic chain in the role of herbivores and meso-predators and at another level in the role of clearly predatory species (Rumiz 2010). However, despite their importance at an ecological level, these ecosystems are threatened and an estimated net loss in the Neotropical Region of 88 million hectares of forests, caused by deforestation, expansion of the agricultural frontier and livestock (Torres 2020). The loss of cover in the sub-Andean forests affects the interactions between faunal groups, interrupting or distorting them, causing the conservation status of medium and large terrestrial mammals in the world to be worrying (Castillo 2017) and causing most of them to be found in some category of threat as reported by the International Union for Conservation of Nature (Serra 2001).

Taking into account that the biodiversity of the sub-Andean forests are the support of various environmental services on which the well-being of human societies depends, it is highlighted that the department of Cauca is an area with a wide variety of flora and fauna, which is related to the variety in its topography and relief (National Natural Parks, s.f), a sample of the biodiversity of Cauca, is observed in the Popayán Botanical Garden (PBG) located at the Los Robles headquarters of the Popayan University Foundation located in the municipality of Timbio, 8 km from Popayán, with fragments of preserved sub-Andean forests and micro-basins, in favor of their conservation, this research focused on identifying and highlighting the presence of wild mammals of the JBP and highlighting the importance of protecting these ecosystems.

METHODS

Two camera traps were installed in a study area with two stations located on the hearts micro-basin of the Popayán Botanical Garden, located in the municipality of Timbio, Cauca.

The first station (E1) was located on a tree in direct contact with the body of water and the second (E2) on another tree individual located on the mainland, from April to November 2022, with an installation methodology per month, in which the cameras remained in the study area for three weeks (Díaz-Pulido & Payán-Garrido 2012) and were removed in the last week to charge batteries, extract the records and process the information in a Microsoft Excel database with the data of registration date, time, scientific name, locality, observation, file name and type of registration (photograph or video).

RESULTS

According to the aforementioned methodology, 18 records of *Cerdocyon thous* L., 3 of *Dasympus novemcinctus* L., 31 of *Dasyprocta punctata* Gray, 3 of *Leopardus wiedii* Schinz, 9 of *Mazama americana* Erxleben, 2 of *Melanomys caliginosus* Tomes and 4 individuals of the Order were obtained Chiroptera (Table 1).

Table 1. Monthly and total number of photographic and video records, collected during April-November 2022 in the hearts micro-basin of the Popayán Botanical Garden.

Species	April	May	June	July	August	September	October	November	Total
<i>Cerdocyon thous</i>	1	0	14	3	0	0	0	0	18
<i>Dasympus novemcinctus</i>	0	0	0	1	0	2	0	0	3
<i>Dasyprocta punctata</i>	4	2	7	7	0	0	1	8	29
<i>Leopardus wiedii</i>	2	0	0	1	0	0	0	0	3
<i>Mazama americana</i>	1	1	0	2	0	0	5	0	9
<i>Melanomys caliginosus</i>	0	0	2	0	0	0	0	0	2
<i>Chiroptera</i>	0	0	0	2	2	0	0	0	4

This species has a discontinuous distribution, in Colombia it is located in mountainous areas in the northeast of the country and is also present in the west of the country, below 2,000 meters above sea level. Its habitat and biology indicate that it is mainly nocturnal and crepuscular in habit and that it is found in a wide variety of habitats including tropical and subtropical forest, open forest areas, savannahs and anthropic areas. Regarding its diet, it is of a generalist type and its behavior is based on an opportunistic hunter type that feeds on small vertebrates, invertebrates including crabs and insects, and fruits (Vallejo 2022) (Figure 1).



Fig 1. *Cerdocyon thous* at station E1 of the hearts micro-watershed of the Popayán Botanical Garden.

Its distribution is divided into two groups, but the first is located in Colombia, which goes from Chiapas and Yucatán to southern Mexico and extends through western Venezuela, Colombia and Ecuador from 0 to 2000 meters above sea level, in primary, secondary forests, gallery, forest edges and even near orchards and farms.

It is a species widely distributed in the Neotropics, from the United States to Argentina, below 3200 meters above sea level. In its description it is mentioned that it is a medium armadillo; with 8 to 10 mobile bands in the central portion of the carapace with four fingers on the front legs (Romero 2021) (Figure 2).



Fig 2. *Dasypus novemcinctus* at station E2 of the hearts micro-watershed of the Popayán Botanical Garden

It is mainly diurnal, however, in areas of high human intervention they come out at dusk and feed on ripe fruits, crabs, vegetables and other succulent plants; They are monogamous and each pair occupies a territory where there must be fruit trees and a water source to build their shelters, which attract predators such as the ocelot (*Leopardus pardalis*), which is one of their main predators (Emsen et al. 2014). (Aliaga et al. 2006), which allows us to analyze that, in the case of the Popayán Botanical Garden, the predation of this species by *Leopardus wiedii* (Margay) can occur (Figure 3).



Fig 3. *Dasyprocta punctata* at station E1 of the hearts micro-watershed of the Popayán Botanical Garden

This species is distributed from northern Mexico, through Central America, to northern Argentina and Uruguay; It is not present in Chile, until the north of Argentina.

Its biology allows it to be described as a terrestrial, solitary and predominantly nocturnal feline (Vallejo and Bonilla 2022), which feeds mainly on mammals, but can also consume amphibians, insects and fruits. In addition, he has an excellent ability to move and hunt in the trees, so his diet is mostly of species that inhabit the trees where he takes refuge (Figure 4).



Fig 4. *Leopardus wiedii* at station E1 of the hearts micro-watershed of the Popayán Botanical Garden

They are found in the Yucatan Peninsula, Central and South America, and the island of Trinidad. Most species are nocturnal and found mainly in forests, being small to medium in size, with stocky bodies, large ears, and fur that varies from reddish to brown to gray, and feed on leaves, fruit, and shoots (NaturalistaCO s.f) (Figure 5).



Fig 5. *Mazama americana* at station E1 of the hearts micro-watershed of the Popayán Botanical Garden

This species is distributed from the western center of Colombia to the southwestern Ecuador and is characterized by being solitary, diurnal and with probable activity at night. In addition, it is known that it is terrestrial in habit and is found mostly captured in leaf litter, debris from trunks, tree bases or associated with bodies of water and that it inhabits tropical and subtropical forests, mostly humid, primary, secondary, edges of forest and little disturbed areas, being rare in dry forests (Vallejo and Boada 2021) (Figure 6).



Fig 6. *Melanomys caliginosus* at station E1 of the hearts micro-watershed of the Popayán Botanical Garden

DISCUSSION

In the sampling with camera traps carried out in the study area located in the hearts micro-basin of the Popayán Botanical Garden, located in a sub-Andean forest, there are seasons with long periods of rain, in which the majority of mammal species have adaptations to withstand these changes, which is why during the last two sampling months (October and November) only the species *Dasyprocta punctata* and *Mazama americana* were recorded only in October.

Species in a state of least concern, such as *Cerdocyon thous* (Lucherini 2015), *Dasyprocta punctata* (Emmons 2016), *Dasypus novemcinctus* (Loughry, J., McDonough, C. and Abba, A.M.2014), (Cassola, F 2016) and the genus *Mazama* (1993) (García Fernández et al., 1997), should be sought to be conserved in the study area to prevent them from reaching a risk category of greater importance, which could limit their presence and in the case of *Leopardus wiedii*, in the category of near threatened (de Oliveira, T., Paviolo, A., Schipper, J., Bianchi, R., Payan, E. & Carvajal, S.V.2015), should seek to protect itself with effective environmental education strategies in the area of direct and indirect influence and establishing a conservation zone that is not altered by productive activities that considerably modify the structure of the landscape and, therefore, the presence of this species in the ecosystem.

The analysis of previous reports for the sub-Andean forest and the department of Cauca on the species found in this study, allow us to show historical records such as those of Ramírez and Pérez 2007 in a relict of oak forest in the path "La Viuda" of the municipality of Cajibío, Cauca, Colombia for the species *Melanomys caliginosus* and *Cerdocyon thous*; Ramírez and Pérez 2008, in the municipality of Popayán, for *Melanomys caliginosus* and *Dasympus novemcinctus*; the research of Mejía and Díaz 2009 in the Munchique National Park, Colombia for *Cerdocyon thous*, *Leopardus wiedii*, *Mazama americana* and *Dasyprocta punctata* also mentioned by Chaves and Pérez 2010 with presence in the department of Cauca, Colombia.

CONCLUSIONS

This type of research is important to have an approximation to the knowledge of the biodiversity of mammals in the study area and the region, with the aim of using it as evidence of the environmental richness that must be conserved to maintain and preserve the ecological and environmental integrity of ecosystems, fluctuating and interconnected, with the relationships between the different living beings that make it up. In addition, it is important to mention that the implementation of camera trapping in investigations is a booming study method for the department, since, according to the results of the bibliographic search, it was found that there is a small number of investigations developed using cameras trap in the Cauca.

Regarding the important richness recorded in the videos, it is important to highlight that the species are a good indicator of environmental conservation and that ecosystems with the presence of forest fragments demonstrate their fundamental role for the biodiversity of a department with ecological characteristics that allow the conservation of a Biological diversity with high richness of fauna and flora species.

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