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# Jaguars, *Panthera onca* (Linnaeus, 1758) (Carnivora, Felidae), in central Mexico: first records from the state of Guanajuato

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**Abstract.** We report the first records of *Panthera onca* (Linnaeus, 1758) in Guanajuato, Mexico. These were observations made within the Sierra Gorda of Guanajuato Biosphere Reserve from August 2024 to May 2025. Seventy-five camera traps documented 11 independent events of two individuals (one female, one male) in oak and tropical dry forests at elevations of 711–1,617 m. These findings fill a critical gap in validating Jaguar corridors across central and eastern Mexico and emphasize the role of protected and community-managed areas. We recommend expanding monitoring, strengthening local conservation agreements, and conducting genetic studies to assess regional connectivity.

**Key words.** Camera trapping, community-based conservation, habitat connectivity, protected areas

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## Introduction

The Jaguar, *Panthera onca* (Linnaeus, 1758), is the largest felid in the Neotropics and historically continuously distributed from the southern United States to northern Argentina (Seymour 1989). However, in recent decades, its range has declined drastically due to habitat loss, prey depletion, and hunting (de la Torre et al. 2018; Ceballos et al. 2021a). In Mexico, where the species reaches the northernmost extent of its distribution, it is classified nationally as Endangered (DOF 2019), and several subpopulations are considered Critically Endangered at the local level (de la Torre et al. 2018). Although over 25% of Mexico's territory has been identified as potential Jaguar habitat, only a small fraction is currently protected or connected through ecological corridors (Ceballos et al. 2018, 2021b). Within this context, maintaining landscape connectivity is essential to support viable populations and gene flow throughout its geographic range (Rabinowitz and Zeller 2010; Rodríguez-Soto et al. 2011; Torres-Romero et al. 2023).

The central and eastern region of Mexico has been identified as a strategic biological corridor connecting Jaguar populations along the Sierra Madre Oriental (Rabinowitz and Zeller 2010; Rodríguez-Soto et al. 2011). Recent studies have highlighted the importance of high-altitude landscapes influenced by anthropogenic activities in expanding the ecological niche of the species, including new records in the central and eastern region of the country, in the states of Aguascalientes, Hidalgo, Querétaro, and San Luis Potosí (Téllez-Girón and López-Forment 1995; Coronel-Arellano et al. 2008; Villordo-Galván et al. 2010; Aguilar-López et al. 2015; Morales-García et al. 2015; Quintero-Díaz et al. 2024). In addition, the value of protected natural areas and community-managed lands for sustaining Jaguar presence

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has been increasingly recognized, with robust results from participatory camera-trap studies in southern Mexico (Lavariega et al. 2020; de la Torre et al. 2018).

Despite these efforts, regions within central and eastern Mexico still present spatial gaps in the ecological validation of the corridors proposed in national strategies and lack confirmed evidence of Jaguar presence (Petracca et al. 2014; Dueñas-López et al. 2015; Ceballos et al. 2018; 2021b). One such region is the state of Guanajuato, particularly the Sierra Gorda of Guanajuato Biosphere Reserve (SGGBR), where, to date, only the other five wild felid species found in Mexico have been documented: *Puma concolor* (Linnaeus, 1771) (Puma), *Leopardus pardalis* (Linnaeus, 1758) (Ocelot), *Leopardus wiedii* (Schinz, 1821) (Margay), *Herpailurus yagouaroundi* (Geoffroy Saint-Hilaire, 1803) (Jaguarundi) and *Lynx rufus* (von Schreber, 1777) (Bobcat) (Iglesias et al. 2008; Charre-Medellín et al. 2012, 2016). Based on this context, our objective is to report new records of Jaguar in central Mexico and confirm its presence in the state of Guanajuato.

## Methods

We conducted systematic monitoring between August 2024 and May 2025 in Rancho La Onza and El Platanal, two quadrants of the SGGBR, where 75 Browning camera traps (Spec Ops Elite HP5 and Dark Ops Pro Dual Lens Nano models) were deployed with the support of local residents (Figure 1). The SGGBR covers an area of 236,882 ha and is located in the north-eastern part of Guanajuato, within the Sierra Madre Oriental ecoregion. It is part of a mountainous complex representing one of the most biodiverse and heterogeneous systems in central Mexico. The reserve spans an altitudinal range of 650–2,700 m, allowing for the presence of various habitats such as xerophytic and submontane

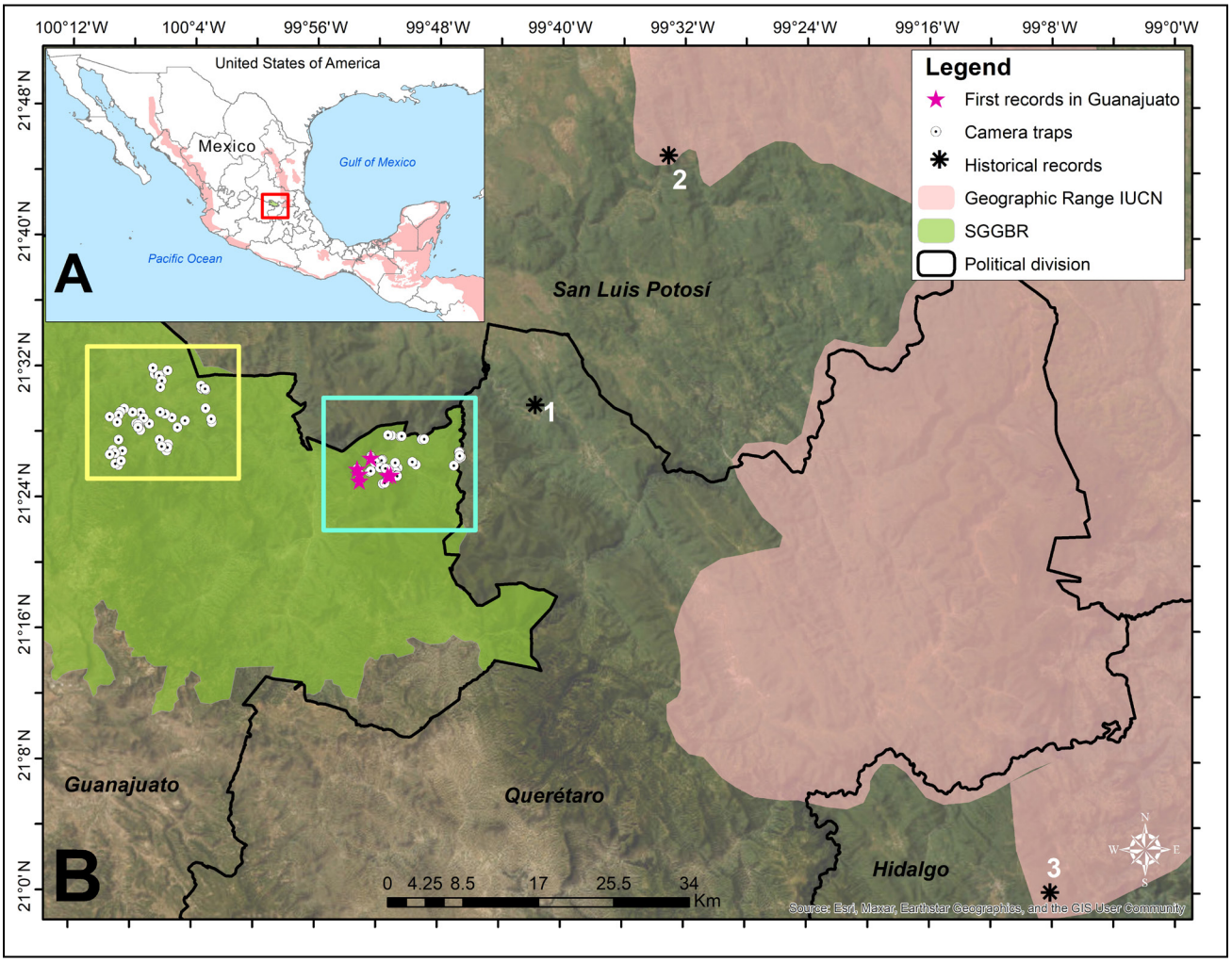


**Figure 1.** Geographic distribution of Jaguar, *Panthera onca*, in Mexico. **A.** According to the IUCN (pink polygon) (Quigley et al. 2017), with the study area marked in red. **B.** First confirmed Jaguar records in Guanajuato, showing the monitoring quadrants (Rancho La Onza in yellow and El Platanal in blue) and the nearest published records: 1 (Téllez-Girón and López-Forment 1995), 2 (Villordo-Galván et al. 2010), 3 (Aguilar-López et al. 2015).

scrub, temperate pine–oak forests, and tropical dry forests (SEMARNAT 2007; Zamudio 2012). This landscape configuration has been identified as potentially functional for wide-ranging species such as the Jaguar, particularly within the context of proposed biological corridors aimed at connecting felid populations in central and eastern Mexico (Petracca et al. 2014; Torres-Romero et al. 2023).

The phytophysiognomy differed between the two monitoring quadrants. El Platanal, where Jaguar records were obtained, is characterized by a heterogeneous mosaic of well-preserved oak and pine–oak forests interspersed with tropical dry forest patches, dense understory vegetation, rugged topography, and seasonal streams that provide structural complexity and cover. In contrast, Rancho La Onza presents a more fragmented landscape dominated by secondary vegetation, submontane scrub, and areas influenced by extensive livestock activity, with lower canopy cover and greater edge density. Although both quadrants fall within the altitudinal and ecological range of the SGGBR, El Platanal has larger continuous forest patches and reduced anthropogenic disturbance, which may increase its suitability for wide-ranging carnivores.

The sampling sites within the quadrants were selected based on preserved vegetation cover, logistical accessibility, continuity with suitable habitats for felids, and prior evidence of other wild cat species (Iglesias et al. 2008; Charre-Medellín et al. 2012, 2016). Cameras were placed at variable intervals ranging from 500 m to 2 km preferentially in areas with a high probability of wildlife passage, such as natural trails, seasonal streambeds, livestock paths, and dense vegetation. The variation in spacing between camera traps was determined by local topographic conditions, land accessibility, landowner permission, and security considerations. Cameras were programmed to record 20-s videos upon detection and were checked every two months for memory and battery replacement. Based on Jaguar records reported for central and eastern Mexico by Téllez-Girón and López-Forment (1995), Villordo-Galván et al. (2010), and Aguilar-López et al. (2015) in the states of Querétaro, San Luis Potosí, and Hidalgo, respectively, we calculated the Euclidean distance to our records.

# Results

With a total sampling effort of 21,375 trap-days, we documented 11 independent Jaguar events corresponding to at least two identified individuals, one female ($n$ = 6) and one male ($n$ = 5) (Figure 2). All records were obtained within the El Platanal quadrant (Figure 1). Detections occurred between 15 September 2024 and 1 May 2025 in two main vegetation types: oak forest ($n$ = 6) and tropical dry forest ($n$ = 5), at elevations of 711–1,617 m a.s.l. Temporal patterns showed nocturnal and crepuscular activity, with 80% of detections occurring between 18:00 and 06:00 h. These records are located 20.5 km southwest of the record reported in 1989 for Querétaro, 50 km southwest of those reported in San Luis Potosí in 2006, and 90 km northwest of those in Hidalgo in 2013 (Figure 1). In addition to Jaguar presence, we documented 22 mammal species, including the five other felids (*P. concolor*, *L. pardalis*, *L. wiedii*, *H. yagouaroundi*, and *L. rufus*), and potential prey species such as *Dicotyles tajacu* (Linnaeus, 1758) (Collared Peccary), *Odocoileus virginianus* (Zimmermann, 1780) (White-tailed Deer), *Nasua narica* (Linnaeus, 1766) (White-nosed Coati), and *Dasypus novemcinctus* (Linnaeus, 1758) (Nine-banded Armadillo).

**New records.** MEXICO — Guanajuato • Xichú, Sierra Gorda Biosphere Reserve of Guanajuato, El Platanal; 21°25′27.57″N, 099°51′07.45″W; 1617 m alt.; 15.IX.2024; J.F. Charre-Medellin obs.; camera traps set in a pine–oak forests; 1 ♀, adult; video recording; same locality; 25.I.2025; J.F. Charre-Medellín obs.; 1 ♂, adult; video recording • Xichú, Sierra Gorda Biosphere Reserve of Guanajuato, El Platanal; 21°25′24.03″N, 099°50′41.95″W; 1558 m alt.; 15.IX.2024; J.F. Charre-Medellin obs.; camera traps set in a temperate pine–oak forests; 1 ♀, adult; video recording • Xichú, Sierra Gorda Biosphere Reserve of Guanajuato, El Platanal; 21°25′07.37″N, 099°53′11.41″W; 1295 m alt.; 23.I.2025; J.F. Charre-Medellin obs.; camera traps set in a temperate pine–oak forests; 1 ♂, adult; video recording; same locality; 24.I.2025; J.F. Charre-Medellín obs.; 1 ♂, adult; video recording; same locality; 26.II.2025; J.F. Charre-Medellín obs.; 1 ♂, adult; video recording • Xichú, Sierra Gorda Biosphere Reserve of Guanajuato, El Platanal; 21°25′31.41″N, 099°53′11.03″W; 1146 m alt.; 22.I.2025; J.F. Charre-Medellin obs.; camera traps set in a tropical dry forest; 1 ♀, adult; video recording • Xichú, Sierra Gorda Biosphere Reserve of Guanajuato, El Platanal; 21°25′50.76″N, 099°53′20.24″W; 1051 m alt.; 21.I.2025; J.F. Charre-Medellin obs.; camera traps set in a tropical dry forest; 1 ♀, adult; video recording • Xichú, Sierra Gorda Biosphere Reserve of Guanajuato, El Platanal; 21°26′37.04″N, 099°52′26.89″W; 781m alt.; 21.I.2025; J.F. Charre-Medellin obs.; camera traps set in a tropical dry forest; 1 ♀, adult; video recording; same locality; 28.I.2025; J.F. Charre-Medellin obs.; 1 ♀, adult; video recording; same locality; 01.V.2025; J.F. Charre-Medellin obs.; 1 ♀, adult; video recording.

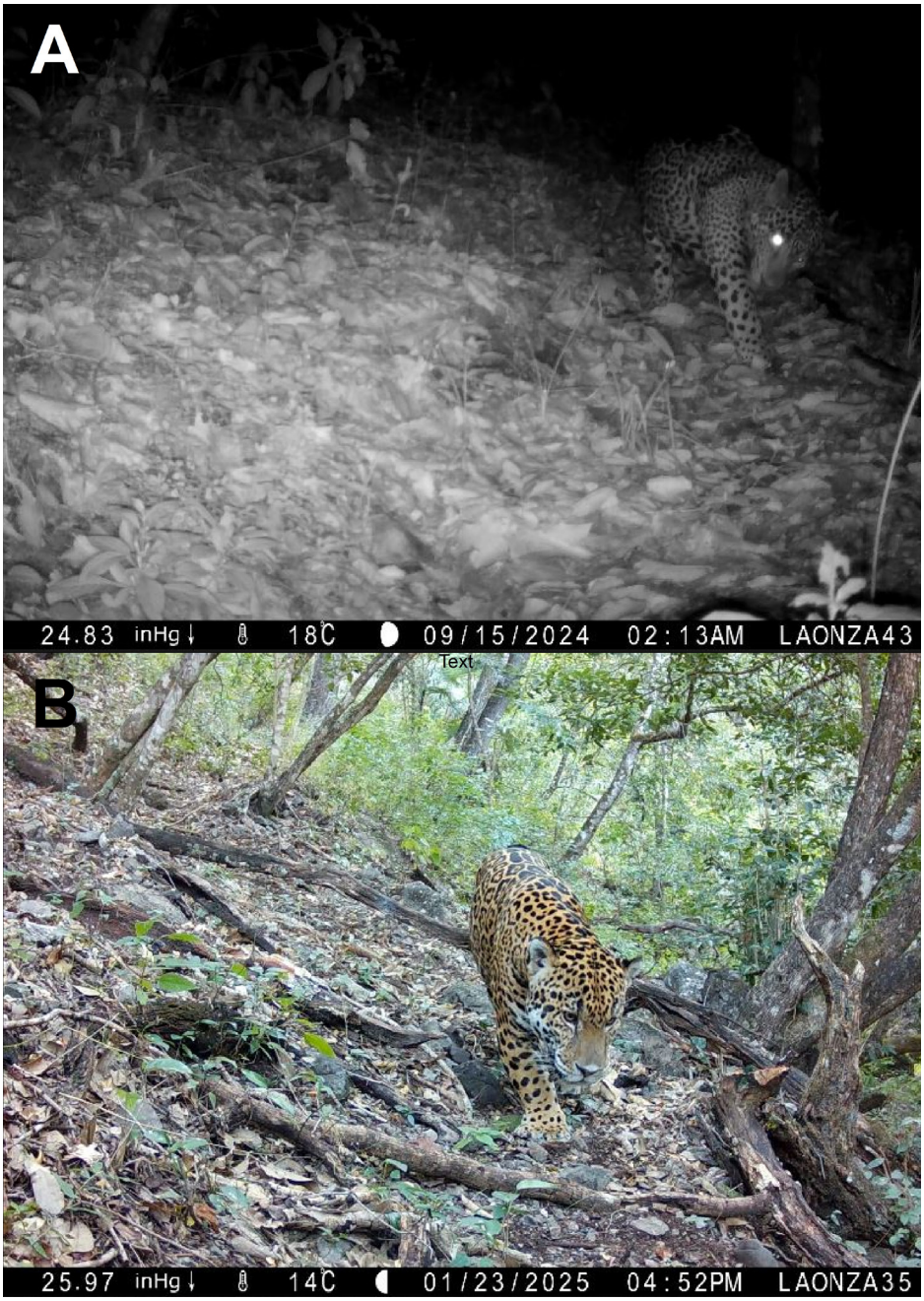


**Figure 2.** First confirmed records of Jaguar, *Panthera onca*, in Guanajuato, Mexico. **A**. Female individual. **B** Male individual.

**Identification.** *Panthera onca* (Linnaeus, 1758) can be distinguished from other Neotropical felids, such as the ocelot (*Leopardus pardalis*), by its notably larger size, robust build, broad head, and characteristic coat pattern composed of rosettes with central spots, in contrast to the ocelot's elongated and closed rosettes. This species exhibits sexual dimorphism, with males generally larger and more muscular than females. In this study, sex identification was determined through direct observation of external genitalia in camera-trap videos, where the presence of visible testes confirmed the male individual. The female was identified by the absence of these features and by body morphology (Seymour 1989).

## Discussion

The records of Jaguar, *Panthera onca*, presented here constitute the first confirmed report of the species from the state of Guanajuato and increase the number of mammal species recorded in the state (Sanchez et al. 2016). This finding has significant implications at both regional and national levels for the conservation of the species. In the context of central and eastern Mexico, this evidence represents

a critical step toward the empirical validation of previously proposed biological corridors intended to facilitate connectivity among isolated Jaguar subpopulations (Rodríguez-Soto et al. 2011; Dueñas-López et al. 2015; Ceballos et al. 2018).

The confirmation of recurrent presence of two individuals (a female and a male) in the SGGBR not only increases the state mammalian species list (Sánchez et al. 2016) but also reshapes the perception of the reserve's ecological role in the national's network of biological corridors. Until now, north-eastern Guanajuato had been considered to have an information gap for Jaguar presence, and its role functional connectivity had only been inferred through spatial models (Dueñas-López et al. 2015; Ceballos et al. 2018).

The absence of records in Rancho La Onza may be partially explained by differences in phytophysiognomy and land-use intensity between quadrants. Compared to El Platanal, Rancho La Onza exhibits a higher proportion of secondary vegetation and livestock, and reduced continuity of the canopy. Structural complexity of forests and forest cover are known to influence Jaguar habitat use, particularly in peripheral or dispersal areas (Rodríguez-Soto et al. 2011; de la Torre et al. 2018). Although our sampling effort was comparable between quadrants, the greater vegetation continuity and lower levels of disturbance in El Platanal may provide more favorable microhabitat conditions for transient or resident individuals.

These findings also strengthen the hypothesis that central and eastern Mexico, despite its degree of anthropogenic transformation, remains a key region for Jaguar dispersal and persistence, particularly through protected natural areas (Torres-Romero et al. 2023; de la Torre et al. 2018). The ecological functionality of SGGBR in regional connectivity is further supported by its geographic proximity to previous records in the states of Querétaro, Hidalgo, and San Luis Potosí, located 20–90 km away, suggesting the presence of a still-functional habitat matrix for the species.

Despite this encouraging evidence, the landscape of central and eastern Mexico is characterized by increasing anthropogenic pressures, including habitat fragmentation, livestock expansion, road development, and land-use change, which may impose constraints on long-term connectivity (de la Torre et al. 2018; Ceballos et al. 2021a). In regions such as the Sierra Gorda of Guanajuato, potential human–wildlife conflict associated with livestock depredation and land-use intensification could represent emerging local risk factors for Jaguar persistence. Therefore, maintaining functional connectivity in this region will require not only protected area management but also strengthened community-based agreements and landscape-level planning to mitigate fragmentation and reduce potential conflict.

We recommend reinforcing targeted conservation actions, including: (1) expansion of systematic community-based camera-trap monitoring to other areas within and outside the SGGBR; (2) establishment of conservation agreements with local communities to protect areas with Jaguar presence and associated biological corridors; and (3) prioritization of the Sierra Madre Oriental landscape, particularly the Sierra Gorda region, as a regional conservation unit. In addition, it is crucial to promote ecological and genetic studies to determine the degree of functional connectivity and to assess the genetic structure of these individuals in relation to other known populations.

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# Additional information

**Conflict of interest**

The authors declare that no competing interests exist.

**Ethical statement**

No ethical statement is reported.

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**Author contributions**
Conceptualization: JFCM, HRC, LACM. Formal analysis: JFCM, HRC, LACM, EOGD, RAJ, LLH. Investigation: JFCM, HRC, LACM, EOGD, RAJ, LLH. Methodology: JFCM, HRC, LACM, EOGD, RAJ, LLH. Visualization: JFCM, LACM. Writing – original draft: JFCM, HRC, LACM, EOGD. Writing – review and editing: JFCM, HRC, LACM.

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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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