

SHORT NOTE

Occurrence of jaguar (*Panthera onca*) in the Chinantla region, southern Mexico

Presencia del jaguar (*Panthera onca*) en la región Chinantla, sur de México

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ABSTRACT

The jaguar (*Panthera onca*) has been experiencing a considerable range reduction due to habitat loss and poaching. Habitat suitability models have identified areas likely to maintain populations, but field data are scarce for several of them. Between 2012 and 2017, we investigated the jaguar occurrence in 35 communities of the Chinantla region, southern Mexico, throughout camera trapping in non-systematic surveys. We recorded 124 independent events of 23 jaguars in thirteen communities. Jaguars recorded over the years, couples and pregnant females are highlighted in the Chinantla region as a stronghold to the jaguar.

Keywords. Camera trapping, community conservation, human-carnivore coexistence, montane tropical forest, Oaxaca, participatory monitoring.

RESUMEN

El jaguar (*Panthera onca*) ha experimentado una reducción considerable de su área de distribución debido a la pérdida de hábitat y la cacería. Modelos de hábitat han identificado áreas con probabilidad de mantener poblaciones, sin embargo se carece de información de campo de varias de ellas. Entre 2012 y 2017 se investigó la presencia del jaguar en 35 comunidades de la región Chinantla, sur de México, mediante fototrampeo en muestreos no sistemáticos. Se registraron 124 eventos independientes de 23 jaguares en trece comunidades. Se destacan los jaguares registrados a lo largo de los años, parejas y hembras preñadas y la región de Chinantla como un baluarte del jaguar.

Palabras clave. Bosque tropical de montaña, coexistencia humano-carnívoro, conservación comunitaria, fototrampeo, monitoreo participativo, Oaxaca.

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The jaguar (*Panthera onca* Linnaeus, 1758) range has been considerably reduced and fragmented as a result of habitat loss and poaching. It is extinct in several areas of America, and is considered a threatened species (Quigley *et al.* 2017). In Mexico, there are well-known isolated populations of jaguars (Rabinowitz and Zeller 2010), while other regions have been predicted to harbor populations (Jędrzejewski *et al.* 2018), but there is a scarcity of spatial and temporal data to confirm it.

The objective of this work was to document records of jaguar, count the number of different individuals between 2012 and 2017 in the Chinantla region throughout an extensive array of camera-trapping sampling framework in participative monitoring projects.

The Chinantla region (17°21 and 18°07 North and 96°35 and 96°39 ° West; Fig. 1) has montane cloud forest, rain-forest, and oak forest as main vegetation types. Currently, nearly a third of the region has been fragmented or cleared for agriculture and grazing (INEGI 2013). The land tenure system (mostly communal ownership) belongs to the Chinantec community, where there are 26 Voluntary Conservation Areas certified by the government, as well as protected

areas through internal agreements (Martin *et al.* 2011). To collect jaguar evidence, participative monitoring was conducted with camera-trapping surveys in 35 communities between 2012 and 2017. In these communities, local people were trained in camera-trapping techniques (Padilla-Gómez *et al.* 2018). The number of cameras per community ranged from two to ten devices and the operating time of the cameras in the field ranged from one to 30 days.

Photographs or videos of individuals recorded in the same camera trap after a period > 24 hours, was considered as independent event. Photographs or videos of the jaguars were separated in three groups: 1) jaguars recorded only by left flank; 2) jaguars recorded only by right flank; 3) jaguars recorded by both flanks. Photographs or videos of jaguars of every group and among groups were meticulously revised to identify individuals. Jaguar individuals were identified from their spot and rosette patterns and sexed by visual inspection of external genitalia (Soisalo and Cavalcanti 2006).

Between 2012 and 2017, a total of 139 photographs or videos were recorded in 124 independent events. At least one jaguar record was obtained in thirteen of the 35 communities surveyed (Fig. 1). Based on the spot pattern, eleven

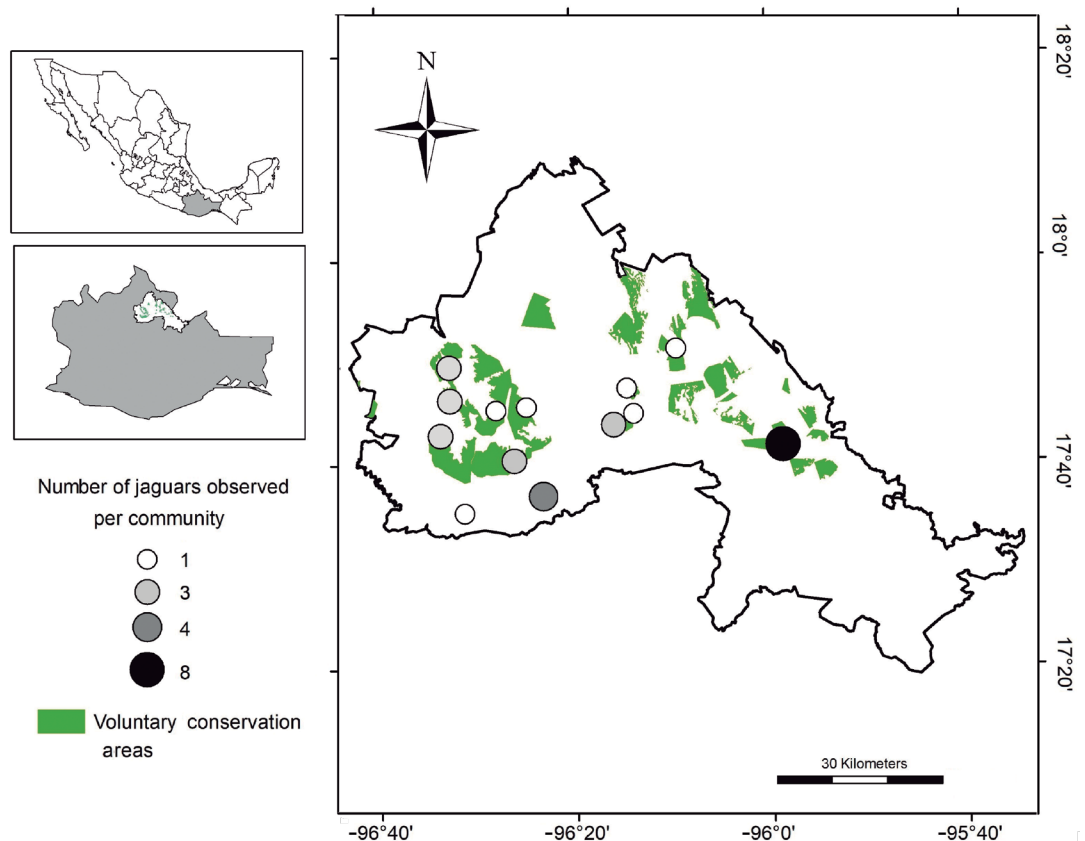


Figure 1. Occurrence and number of jaguars recorded between 2012 and 2017 in the Chinantla region, Mexico.

jaguars were identified only by the left flank, twelve jaguars only by the right flank, and eleven jaguars by both flanks. Therefore, the minimum number of jaguars was 23 (the sum of jaguars identified by the right flank and by the two flanks). Of the 23 jaguars, ten males and five females were identified, while eight were undetermined. Most of the jaguars in groups two and three were recorded for only one year ($n=15$), while three individuals were recorded for two years. Four jaguars were recorded for three years, and one jaguar was present for four years ([supplementary material table 1](#)).

The jaguars recorded along six years of surveys expand the spatial and temporal occurrence knowledge of the previous surveys carried out in the Chinantla region (Figel *et al.*, 2011). Even though the sampling method used in the Chinantla was not systematic in time, space, and effort, the minimal number of individuals (23 jaguars) was notable. As a reference, the number was similar or higher to these observed in non-continuous systematic studies in other areas of Mexico: 24 jaguars in four years, Ávila-Nájera (2015); between eight and nine jaguars in 1.5 years, de la Torre and Medellín-R (2011); ten jaguars in 1.3 years, Gutiérrez-González *et al.* (2012); and five jaguars in 1.5 years; Coronel-Arellano *et al.* (2017). Besides, couples and pregnant females suggest that there is a jaguar resident population in the Chinantla region giving support to habitat suitability models (Jędrzejewski *et al.* 2018).

Communal land tenure and conservation projects for some communities have been an important factor allowing joint efforts addressed to preserve jaguars and their habitats, such as projects for payment for environmental services and biodiversity monitoring managed. Several communities develop strict inter-community agreements that regulates hunting and land-use change for cattle ranching and agriculture (Bray *et al.* 2008).

Future projects should systematically homogenize camera-trap survey protocols to study population trends. Projects should be established as community-based biological monitoring programs that involve community members.

AUTHOR'S PARTICIPATION

JRP-V, MDL-K, MKE-R, EGA, MCL taken and analyzed the data, JRP-V, MDL-K, EGA, RCT, CLA-C, MCL wrote the document.

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CONFLICT OF INTEREST

The authors declare that they do not have conflict of interest.

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SUPPLEMENTARY MATERIAL

Supplementary material of the short note: Occurrence of jaguar (*Panthera onca*) in the Chinantla region, southern Mexico

Material suplementario de la nota corta: Presencia del jaguar (*Panthera onca*) en la región Chinantla, sur de México

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Table 1. Jaguars recorded between 2012 and 2017 in communities of the Chinantla region, Mexico. Only individuals identified by both flanks and by the right flank are presented. The number of independent events (IE) appears between parentheses. Communities: CC, Cerro Concha; LE, La Esperanza; MN, Monte Negro; NR, Nopalera del Rosario; PNLH, Paso Nuevo La Hamaca; SAA, San Antonio Analco; SAB, San Antonio del Barrio; SCLV, San Cristóbal La Vega; SCT, Santa Cruz Tepetotutla; SFL, San Felipe de León; SPT, San Pedro Tlapepusco; S, Soyaltepec; SVH, Soledad Vista Hermosa.

Name	Sex	IE	2012	2013	2014	2015	2016	2017
Hieh Lí 1	male	4	MN (2)	SCLV (2)				
Hieh Lí 2	male	28	SVH (1)	SVH (21)	SVH (6)			
Hieh Lí 3	unknown	3		MN (1)	S (1)	S (1)		
Hieh Lí 4	male	1		SVH (1)				
Hieh Lí 5	male	4		SVH (4)				
Hieh Lí 6	male	21			SAB (3), SCT (1)	SAA (1), SAB (6)	SAB (10)	
Hieh Lí 7	male	7				NR (2), LE (1)	LE (4)	
Hieh Lí 8	unknown	6				SCT (1), NR (5)		

(Continued)

Name	Sex	IE	2012	2013	2014	2015	2016	2017
Hieh Li 9	unknown	1					LE (1)	
Hieh Li 10	unknown	1					LE (1)	
Hieh Li 11	female	1					SAB (1)	
Hieh Li D1	male	1		SVH (1)				
Hieh Li D2	female	1		PNLH (1)				
Hieh Li D3	male	1		MN (1)				
Hieh Li D4	unknown	3		SVH (3)				
Hieh Li D5	female	3			SAA (1)	SAB (1), SPT (1)		
Hieh Li D6	male	2			SCT (1)			SFL (1)
Hieh Li D7	unknown	1			LE (1)			
Hieh Li D8	male	4				NR (3)		SFL (1)
Hieh Li D9	unknown	1				SAA (1)		
Hieh Li D10	female	1				CC (1)		
Hieh Li D11	unknown	1					SVH (1)	
Hieh Li D12	female	1						SVH (1)