THERYA, Agosto, 2010
Vol.1(2):111-120
DOI: 10.12933/therya-10-12

Ocelot (Leopardus pardalis) distribution in the state of Puebla, Central Mexico

Osvaldo Eric Ramírez-Bravo[1,2,*], Emilio Bravo-Carrete[3]
Cristina Hernández-Santín [1], Stephanie Schinkel-Brault[1], Kinnear Chris[2]

Abstract

Despite the fact that Puebla is in central Mexico and close to Mexico City, little is known about the felid species that inhabit the state. As part of our studies about the jaguar in Puebla, we are determining the distribution of ocelot (Leopardus pardalis) along the state. We conducted surveys among communities and placed camera traps in the field. We got ten reports of the species along the state, indicating the existence of different populations. One report corresponds to the area known as La Mixteca, which indicates a population shared between the states of Morelos, Puebla, and Guerrero and a possible corridor from Estado de Mexico to Veracruz. Most of the reports came from the Sierra Norte part of the Sierra Madre Oriental, which indicates an important corridor connecting populations in the northeastern states with those in the south. This is important for felid conservation as it was thought that their populations in the northeast were isolated.

Key words: Distribution; Mixteca; Ocelot; Puebla; Sierra Madre Oriental, Leopardus pardalis, corredor.

Resumen

A pesar de que Puebla es un estado que se encuentra cerca de la Ciudad de México, se sabe poco acerca de los felinos que lo habitan. Como parte de nuestra investigación sobre el jaguar en el estado, se determinó la distribución de ocelote (Leopardus pardalis) mediante encuestas y foto-trampeo. Se obtuvieron diez reportes diversos de la especie indicando la existencia de una población. Los registros en el suroeste de Puebla indican la existencia de una población compartida entre los estados de Morelos, Puebla y Guerrero y un posible corredor hacia el estado de Veracruz. La mayoría de los registros provienen de la Sierra Madre Oriental, lo cual hace suponer que existe un corredor a lo largo de la misma que conecta poblaciones de ocelote en los estados del noroeste del país con las del sur.

Palabras Clave: Distribución; Mixteca; Ocelote; Puebla; Sierra Madre Oriental, *Leopardus pardalis,* corredor

[1] Departamento de Ciencias Químico-Biológicas, Universidad de las Américas, Puebla, Santa Catarina Mártir, Sin Número, Cholula, Puebla. CP. 72820, México Tel. 01 (222) 2 29 20 67,
[2] Durrell Institute for Conservation Ecology, Marlowe Building, University of Kent, Canterbury, Kent, CT2 7NR, England
[3] Facultad de Medicina Veterinaria y Zootecnia, Universidad Nacional Autónoma de México FES Cuautitlan, Km 2.5 Carretera Cuautitlán-Teoloyucan, San Sebastián Xhala, Cuautitlán Izcalli, Estado de México, CP. 54714, México
[*] Corresponding author contact: ermex02@yahoo.com

Introduction

The Sierra Madre Oriental serves as an important corridor connecting ocelot (*Leopardus pardalis*) populations in the state of Hidalgo in Central Mexico with those in Nuevo León in Northern Mexico (Grigione *et al* 2009). Despite this importance, studies looking into the absence or presence in the area are almost absent or have only recently begun (Grigione *et al*. 2009). In fact, the existence of ocelot populations was proved recently for the states of Guanajuato (Iglesias *et al*. 2008), Queretaro (Lopez Gonzalez and Aceves Lara 2007) and San Luis Potosí (A. Villordo-Galván personal communication).

Puebla in central Mexico would be a key state in this corridor as the presence of an ocelot population in the state would indicate a continual distribution from north to south. The state is not considered as part of the corridor because it has received little attention in felid studies and it lacks information about their presence. However, the existence of a viable population is highly probable due to the multiple reports in the bordering states of Morelos (López-Wilchis and López Jardines 1998, CONANP 2005); Oaxaca (Goldman 1943, Lira *et al*. 2005); Guerrero (Goldman 1943), and Veracruz (SCT 2005).

The ocelot (*L. pardalis*) was mentioned for Puebla by Wilchis and Jardines (1999) but in a carnivore revision made by Ramirez Pulido *et al*. (2005), they failed to find individuals for the state and they just mentioned the possibility of its existence. Villareal *et al*. (2005) mention an individual of ocelot in the municipality of Hueytamalco in the Sierra Norte. Later on Ramirez-Bravo *et al*. (2010) confirmed the existence of the species by camera trapping in the same municipality and mentioned the existence of other two individuals along the Sierra Norte corresponding to the Sierra Madre Oriental. However, there is not enough information on them, or on the distribution of the species along the state.

In this work we would like to present the first effort to delimit the distribution of this species along the state using records obtained by surveys and camera trapping. The *L. pardalis* records presented here were obtained while working on the project "The Jaguar in Puebla: Presence and Human relations", which indicate that *L. pardalis* has a wider range than that which was previously thought.

Methods

We e-mailed different institutions (government offices, non-governmental organizations [NGOs], and researchers) asking about felid species existing along the state. At the local level we contacted local governments of some municipalities, protected areas, NGOs, ranchers associations, veterinarians, hunters, and surveyed people in communities with their informed consent. We elaborated non-structured interviews to at least three persons in the community during the months of June and July of 2009. Interviews consisted on an informal talk about environmental aspects, migration, hunting, and cultural aspects. We used illustrations of large and medium (greater than three kilograms) sized mammals; like ocelot (*L. pardalis*); margay (*L. weidii*), and jaguarondi (*Puma yaguaroundi*) that could be present in the region; we also included pictures of a lion, tiger, and a bear to verify authenticity of the response.

Field corroboration was done using camera traps (Wildview Xtreme 4) in the Sierra Norte, La Mixteca, and Tehuacán. We had initially five cameras and later another four; we worked with one or two cameras per site, changing them every month to cover as much area as possible. Site selection was made based on to local guides or organizations in the area. The cameras were set at a height of 40 -50 cm along roads, trails, besides

water holes, and other places where recent animal signs were found (Silver 2004).

Results

We confirmed the lack of information about the existence of the species in the state. We obtained answers from 27 of the organizations interviewed: nine government agencies at different levels (federal, state, and municipal), five unions, two ranchers' unions, two protected areas, two companies working in the region, two taxidermists in the city of Puebla, four environmental organizations and three universities. Felid information was obtained from 17 people from ten organizations, with 31 mentions of six felid species, seven were ocelots.

As for local information, we conducted 105 surveys (including local government agencies) in 28 localities of twelve municipalities, with the most surveyed area being northern Puebla (ten municipalities). We obtained 98 felid mentions from 60 people with 12% mentioning ocelot. Since we were still working in the area after the interview period, people kept informing us about the presence of ocelot by commenting or presenting mounted specimens along the different areas where we had worked.

For camera trap settings we selected the municipalities of Hueytamalco, Jalpan in the north and Chiautla de Tapia and Tehuacán in the south because of previous reports and the facilities with which they had. We had a total of 672 night cameras distributed along the state as follows, 246 nights in Hueytamalco, 226 nights in Chiautla, and 220 nights in Tehucán. Despite the diversity of the surveyed areas, we got only two ocelot pictures, which are the first photographic records for the state (Ramirez *et al*. 2010). The summary of all the reports and localizations refer to Table 1 and Figure 1.

Discussion

In this research, surveys proved to be a worthy option to get reports as it is a cost effective methodology helping us to obtain results over a large area in a short period of time. Our results present a skew towards the Sierra Norte due to previous jaguar reports in the area but reports from others areas were easily obtained. On the other hand, the methodology

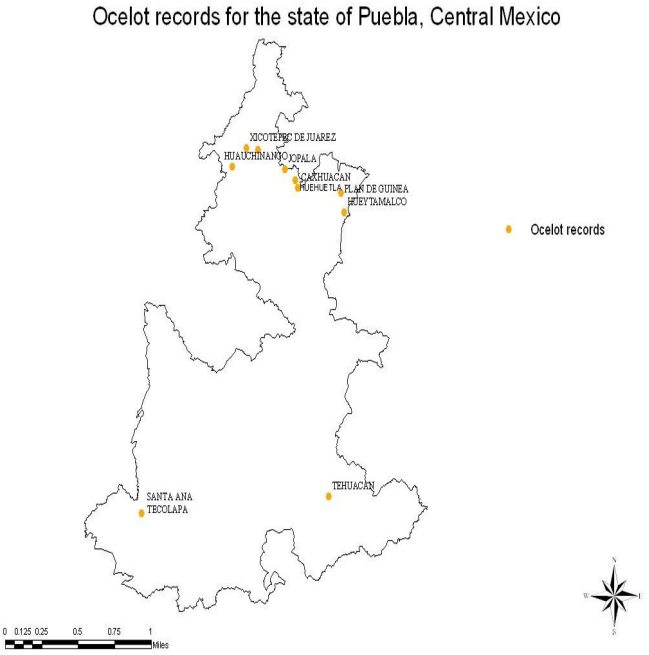

Figure 1. Ocelot records along the state of Puebla; as it can be observed they are distributed along the Sierra Norte.

helped to start delimiting ocelot distribution and to prove that it is more widespread than it was previously thought.

The report from the southwest corresponding to the geographic area known as La Mixteca was unexpected as the most common felid mentions by people are pumas (*Puma concolor*) and bobcats (*Lynx rufus*). On the other hand, the existence of the species is not rare as it has been mentioned previously for the states of Morelos (Álvarez-

Table 1. Ocelot reports collected for the state of Puebla

Ocelot (*Leopardus pardalis*)				
Community	Coordinates	Source	Vegetation Type	Comments
Huauchinango	98º 03´ 30”E 20º 10´ 25”N	Hunter	Oak forest	Has a gun shop; different hunters gather in the place
Xicotepec	97º 57´ 40”E 20º 16´ 43”N	Hunter	Tropical rain-forest	Has been living in the area for more than 30 years
La Unión	97º 53´ 03”E 20º 16´ 01”N	Hunter	Tropical rain-forest	Showed us a preserved specimen
Jopala	98º 03´ 30”E 20º 10´ 25”N	Hunter	Tropical rain-forest	Showed us a preserved specimen
Huehuetla	97º 37´30” E 20º 06´ 17”N	Researcher	Tropical rain-forest	Provided by Gerardo Tapia, Medical Veterinarian Zootechnician; individual sighted in 2007
Caxhuacan	97º 36´ 23”E 20º 03´ 52”N	Government official	Tropical rain-forest	Ecology official of the Caxhuacan municipality. He organized a meeting with several people of the municipal government to get information about felid species
Plan de Guinea	97º 19´ 45”E 20º 01´ 55”N	Picture	Tropical rain-forest	The picture was taken with camera trapping
Hueytamalco	97º 17´ 16”E 19º 56´ 27”N	Local community and picture	Tropical rain-forest	The picture was taken with camera trapping
Tlapacoyan	97º 12´ 46”E 19º 57´ 19”N	Government official and skin	Tropical rain-forest	Director of the Local Museum of Tlapacoyan. We found a skin in the local museum
Zongolica	96º 59´ 52”E 18º 39´ 59”N	Hunters	Tropical rain-forest	They reported the existence of the species along this mountain area
Tehuacán	97º 23´ 37”E 18º 27´ 43”N	Tracks	Tropical deciduous dry rainforest	We found tracks in a tropical dry deciduous rainforest patch near the city in an area known as Cerro Colorado
San Juan Teponaxtla	96º 43´ 12”E 17º 44´ 59”N	Researcher	Tropical rain-forest	Reports on the presence of ocelot, jaguars, and pumas in the area Alcántara-Salinas; personal communications (for further description of the area see Alcántara-Salinas *et al*. 2008)
Santa Ana	98º 39´ 09”E 18º 23´ 06”N	Hunters	Tropical deciduous dry rainforest	Reports on the species were received from several hunters

Castañeda 1996, CONANP 2005, López-Wilchis and López Jardines 1998) and Oaxaca (Goldman 1943, Goodwin 1969; Lira *et al*. 2005). Furthermore, the area corresponds with what is predicted for jaguar by the habitat suitability model for Puebla (Ramirez Bravo, 2009). According to our source, ocelot seems to be relatively common in the area which suggests the existence of a shared population between the states of Morelos, Puebla, Oaxaca, and Guerrero that needs further studying. Furthermore, it opens the possibility that populations in the state of Mexico (Sánchez *et al* 2002) connect through the corridor proposed for felids in northern Guerrero (Monroy-Vilchis *et al*. 2007) and extend to the states of Morelos and Puebla (Fig. 2).

The record for Tehuacán corresponds to a patch of deciduous dry rainforest, similar to that found in La Mixteca. This ocelot report is noteworthy as it was obtained relatively close to the city of Tehuacán (5 km) indicating that the species is using a relatively disturbed area. However, there are ocelot reports further south in the state of Oaxaca (Goldman 1943, Goodwin 1969; Lira *et al*. 2005). Also, the area further east in the Sierra Negra contains vegetation suitable (CONABIO 1999) for the species which leads us to believe that the ocelot is using the area continuously. On the other hand, although there is scarce information on the southern part of the state, this report could be coupled with that of La Mixteca indicating a continual distribution. It would make a connection to the state of Veracruz in the east possible (Fig. 2).

Ocelot reports in the north of Puebla relate to the tropical area along the Sierra Madre Oriental; where the species has been reported recently in the states of Guanajuato (Iglesias *et al*. 2008); Querétaro (Lopez Gonzalez and Aceves Lara 2007) and for San Luis Potosí (A.Villordo-Galván personal communication). These states are part of the

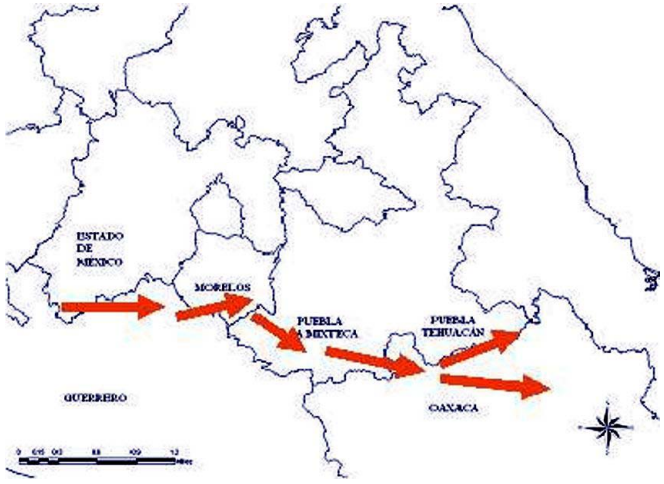

Figure 2. Proposed corridor for ocelots in Central Mexico, starting from the Sierra of Nanchititla in the State of Mexico through northern Guerrero as proposed by Monroy-Vilchis *et a.l* (2006) including more areas of the state of Morelos, Puebla, and Oaxaca.

corridor proposed for ocelots along the Sierra Madre connecting the mountain range along Hidalgo up to Nuevo León (Grigione *et al*. 2009). However, Puebla was not considered as there were not enough records. From this research, we provide evidence to consider the possibility that the state of Puebla is a corridor for felids. Even though in the state of Hidalgo there are no confirmed reports of ocelot, the vegetation is suitable for the species along the mountain range. Furthermore, local communities have informed about the presence of puma (*Puma concolor*) and margay (*Leopardus weidii*) (CONANP 2003) making the existence of ocelot more likely. It indicates that there is a continuous presence of the species along the area and a chance to have a connection between southern and northern populations. The latter comes as a surprise because some zones are highly fragmented and destined for agriculture or material extraction. The records indicate the existence of a population along the Sierra Norte that has to be studied

to determine its dynamics. On the other hand, it is interesting to compare other felid mentions obtained in the state (Ramirez Bravo, in lit.). Almost all the mentions go along the Sierra Norte, in part because the surveys were focused on the area and the habitat was suitable for the species. This information indicates that the mountain range is functioning as an important corridor for felid species.

Despite there are no records for the area of the Sierra Negra in the southwest due to the lack of sampling, the existence of the species is highly possible. First of all because there is a jaguar record for the area (Zeller, 2007), and the vegetation corresponds to similar rainforest vegetation in the Sierra Norte. With further research in the area we expect to delimit the distribution for this zone.

When we incorporated ocelot references obtained outside of the state (Table 1) we confirmed the importance of the mountain area known as Sierra Madre Oriental. There are reports in the community of Tlapacoyan and in two places on the Sierra of Zongolica in the states of Veracruz bordering the state of Puebla (SCT 2005 and this study). Further south we got a confirmed report from the community of Teponaxtla in the State of Oaxaca (for area descriptions see Alcántara-Salinas *et al.* 2008; Fig. 3). When mapping the ocelot records, it is possible to observe a pattern that can be described as a corridor going from northern Puebla to northern Oaxaca (Fig. 4). This pattern can be drawn as well for other felid species distributing along the Sierra Madre Oriental (Ramírez-Bravo unpublished). This is important because previous distribution and corridor maps for other felids indicated that the populations in northeastern Mexico were isolated from those populations in the south (Grigione *et al.* 2009, Rabinowitz and Zeller 2010). This corridor would mean that there is still a connection between northern felid populations with those in the south through the Sierra Madre Oriental and thus they deserve special protection.

With the results of this research it is possible to observe that the ocelot is more common than it was previously thought in Puebla. Being distributed in the north as well in the South, it makes it clear that the state contains more tropical elements but there is not enough information to provide effective conservation measures. We hope that

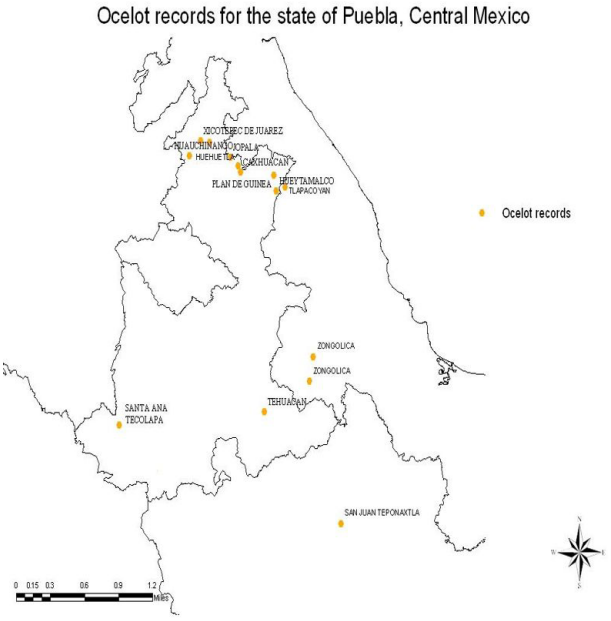

Figure 3. Ocelot reports according to table 1. As it can be seen the species distribute along the mountain area of Puebla, along the Sierra Norte. The reports from hunters about the existence of the species along the Sierra de Zongolica and the reports from the Sierra of Oaxaca show a pattern along the mountain ranges.

further development of this project will define ocelot distribution and help to generate management plans for its conservation as there is no current information. Also, with the information obtained in this research, it is possible to propose Puebla as an important

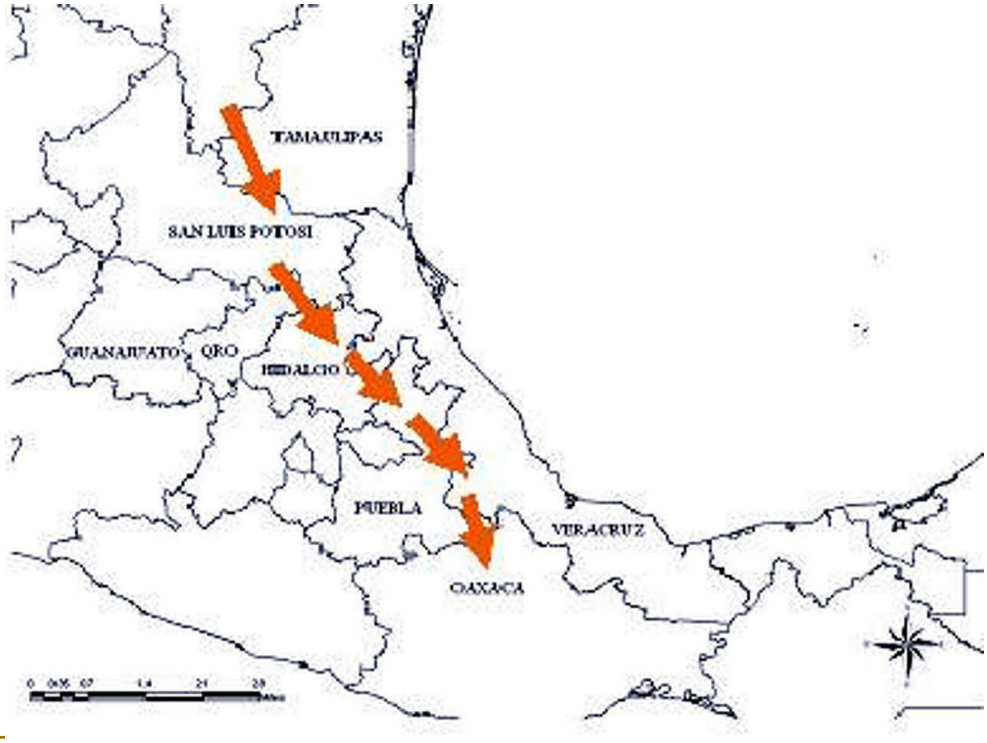

Figure 4. Proposed corridor for ocelots in the Sierra Madre Oriental area following Grigione *et al*. (2009) and including more areas of the state of Hidalgo, Puebla, Veracruz, and Oaxaca. Despite some areas had not been surveyed in depth, it is thought that there is a population along all the mountain range of the Sierra Norte in Puebla, Sierra de Zongolica in Veracruz, Sierra Negra in Puebla, and the area known as La Cañada in Oaxaca.

state for conservation as it is the one that shows more characteristics of the ne-artic and neo-tropical fusion present in Mexico. Also, it can be considered as a keystone state as it has two important corridors for tropical species in Central Mexico.

Acknowledgements

I would like to thank to the National Geographic Society that supported us with the grant NGS YE Grant #EC0390-08 to start this project, to Durrell Wildlife Conservation Trust for their support to buy materials for field work in the area of Tehuacán, to the Universidad de las Americas for the facilities provided, the Tourism office of Hueytamalco, the Biosphere Reserve of Tehuacán- Cuicatlan, ARS of the Mixteca, A.C., ANP Cuenca Río Necaxa, and the private reserve Kolijke for all its support.

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Sometido: 9 enero 2010
Revisado: 1 marzo 2010
Aceptado: 15 junio 2010
Editor asociado Sergio Ticul Alvarez-Castañeda