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# New jaguar records from montane forest at a priority site in southern Mexico

**We report here on the first camera-trap photos of jaguars *Panthera onca* in both Oaxaca and on cummunity land where community conservation areas (CCAs) have been declared. The study site was based in the Chinantla, a mountainous, hyper-humid region in the southern Sierra Madre Oriental of Mexico. We conducted camera trap surveys from June 2007-June 2008. Two jaguars were identified after 1,164 trap nights (TN) in a total sampling area, not including a buffer area, of 144 km². Human-jaguar conflict resulting from livestock depredation presents an immediate threat to jaguars in the study area. Habitat conversion is virtually non-existent and the area is very remote with a diverse prey population, of which some hunting has been regulated. Therefore we believe the Chinantla should remain a priority region for jaguar conservation in Mexico.**

Most camera-trap research on jaguars have been conducted in lowland tropical forest, which favors such studies from a logistical standpoint and also because the cats generally reach higher densities in this habitat. But jaguars occur in large tracts of other habitat types in Mexico where little is known about its ecology. As of May 2009, we were aware of published camera-trap studies on jaguars in Mexico from the following sites: northern Sonora (Lopez-González & Lorenzana Piña 2002, Rosas-Rosas 2006), El Zapatol Private Reserve in Yucatan (Faller-Menéndez et al. 2005), Selva Lacandona in Chiapas (Azuara 2005), Calakmul Biosphere Reserve in Campeche (Ceballos et al. 2005), and the Sierra Gorda Biosphere Reserve in Querétaro (Coronel-Arellano et al. 2008). With the exception of Querétaro and northern Sonora, all these sites are in lowland tropical forest.

Our study site is located in the Chinantla ethnic region in the state of Oaxaca, an area covering approximately 3,660 km². The Chinantla is characterized by a very complex topography with deep valleys, steep slopes (with elevations from 300 m to 3,200 m), and very high precipitation, (> 4,000 mm.). The camera trappings also took place on community lands in a region where six communities have together placed 26,720 ha under protection as community protected areas, with certification by Mexico's National Commission on Natural Protected Areas (CONANP) (Bray et al. 2008). About 20% of the area includes zoned agricultural areas with mosaics of agriculture and secondary succession, including siginificat areas dedicated to forest patches which will not be returned to agriculture by community agreement.

The ecology and status of jaguars in transitional forests, tropical montane cloud forests, and agricultural mosaics, the dominant habitat types found throughout the Chinantla (Velásquez et al. 2003) and among the most important forest ecosystems in the southern Sierra Madre, is virtually unknown. Pine-oak forest, another major habitat in the Sierra Madre, has an area of 460,465 km² in Mexico but as of 2002, the extent of (jaguar) knowledge was only 20% in this habitat type (Sanderson et al. 2002). The evergreen woodlands of oak, juniper, and pine forest of the Sierra Madre Oriental were noted as possibly being important jaguar foraging areas (Brown & López-González 2001). However, a recent jaguar survey in Sinaloa found only one record of jaguar from pine-oak forest; 56 of 57 total records were collected from tropical deciduous forest (Navarro-Serment et al. 2005).

In Oaxaca, the two priority areas identified for jaguar conservation are the Chimalapas and the Sierra Norte (Chávez & Ceballos 2006). Los Chimalapas, a montane tropical region in eastern Oaxaca, bordering on Chiapas, was given a priority I ranking and is perhaps the third most important area for jaguar conservation in all of Mexico after Calakmul and Selva Lacandona. The Sierra Norte, part of the Sierra Madre of Oaxaca, was one of nine priority II rankings given for jaguars in Mexico. Priority II regions were defined as areas that provide considerable habitat but where the status of the species has not been systematically evaluated (Chávez & Ceballos 2006).

This study is the first to record jaguar presence using camera traps in the state of Oaxaca and in this type of mixed forest and agricultural mosaic habitat. In the summer of 2007, 12 passive camera-traps (Deercam, 860 Park Lane, Park Falls, WI 54552), were set up at an average altitude of 1,227 meters, with a range between 414 and 2,755 meters. No jaguars were photographed during this preliminary sampling session of 285 trap nights but photographs of puma *Puma concolor*, ocelot *Leopardus pardalis*, and margay *Leopardus weidii* were obtained. All jaguar prey species were photographed as well, with the notable exception of collared peccary *Tayassu tajacu* and white-tailed deer *Odocoileus virginianus*. Collared peccary were not photo-captured until May 2008 and white-tailed deer were not photographed during the study.

Monitoring continued from August 2007 - May 2008. More cameras were placed in the study area during this time with 20 units operating in the field by May 2008. After both flanks of one jaguar were photographed simultaneously at a camera station, cameras were no longer paired, which is probably more important in areas with higher jaguar densities (J.J. Figel, pers. observ.). We thought it would be more important to cover a larger sampling area then reducing this coverage by pairing cameras.

Two jaguars were identified during the subsequent monitoring period in a 144 km² study

**Table 1.** Jaguar Camera Trapping Data During Pilot Study (SC/SA) and Monitoring (SC/SA/SP/ST)

| Study site[a] | TN | No. of camera stations[b] | Captures | Captures/1000 trap nights | Individuals |
|---|---|---|---|---|---|
| SC/SA | 285 | 12 | 0 | 0 | 0 |
| SC/SA/SP/ST | 491 | 15-20 | 7 | 14.3 | 2 |

[a]Abbreviations: SC Santa Cruz Tepetotutla; SA San Antonio del Barrio; SP San Pedro Tlatepusco; ST Santiago Tlatepusco

[b] Other than 3 locations during the monitoring period, all camera stations had only a single camera trap.

area (polygon connecting the outermost camera trap sites). Seven jaguar photographs were taken at an average elevation of 1,195 m (range 912 m – 1,428 m). A total of 491 trap nights was accumulated from August 2007 - May 2008, resulting in 14.26 jaguar captures/1,000 trap nights. A density estimate could not be calculated for several reasons: 1) There were "holes" in the study area that could fit the home range of an individual jaguar; 2) Only one of the jaguars was photographed more than once at different locations so a mean maximum distance (MMDM) could not be used to estimate the buffer zone around outermost trap sites; 3) The lengthy time frame of the monitoring session violates the "closed population" assumption; and 4) Camera stations could only be monitored sporadically resulting in many days where no data was collected.

The jaguars were photographed in zoned agricultural areas near the declared CCAs, which suggests that jaguars can adjust to land use mosaics. The communities will need further support in jaguar conservation due to problems with livestock depredation, especially pigs. They have totally banned hunting of one important prey species, the red brocket deer *Mazama americana* and allow hunting of other prey species only when they are considered as a pest in agricultural fields. Community regulations also prohibit hunting of jaguars, but they reamin vulnerable to retaliation killing by small-scale cattle ranchers in the community. More research is needed in these transitional forests to understand the degree of adaptability of jaguars to montane forests and in the Sierra Madre in general since it is one of the greatest unknown areas in jaguar range (Sanderson et al. 2002).

**Fig. 1.** First camera trapped photographs of jaguars in Oaxaca, Mexico, and in community conserved areas.



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