

First record of *Puma concolor* (Carnivora: Felidae) in Tortuguero National Park, Costa Rica

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(Received: April 15, 2013. Accepted: November 29, 2013)

KEY WORDS. Camera trap, Costa Rica, *Puma concolor*, sightings, Tortuguero National Park.

The puma *Puma concolor* is the second largest neotropical felid and its geographic range extends from southern Canada to Patagonia (Currier 1983, Fernández *et al.* 2012). It is considered a habitat and prey generalist (Sunquist & Sunquist 2002) and categorized on the global IUCN Red List as a species of Least Concern, with the main threats being habitat loss, habitat fragmentation, and illegal hunting of their prey (Currier 1983, Caso *et al.* 2008, Fernández *et al.* 2012). The subspecies *P. c. costaricensis* has previously been reported throughout Costa Rica (Chinchilla 1997, Ramírez 2003, Bustamante 2008, Corrales & Cardenal 2008, Sáenz 2010, Corrales-Gutiérrez *et al.* 2012, Matthey 2012) but there have been no confirmed records (e.g. photographs, carcass) of a puma in Tortuguero National Park (TNP). Herein, we document the occurrence of pumas in TNP using camera trapping and occasional sightings.

The protected area of Tortuguero is located in northwest of Costa Rica and comprises a total of 76 316 ha (37% terrestrial area and 63% marine area). Tropical Wet Forest is the predominant Life Zone (Holdridge 1967) and consists of a complex riparian system as well as a low-lying mountain range (maximum elevation 311 m). The mean annual temperature ranges from 25 °C to 30 °C and the mean annual rainfall is 6 000 mm. The park is bordered to the northeast by Barra del Colorado Wildlife Refuge and Tortuguero Protected Zone. The western and southern sectors are surrounded by rural communities dedicated predominantly to agriculture (main crops bananas and pineapple), extensive livestock (meat and milk) and to a lesser extent to forest plantations that include melina (*Gmelina arborea*) and teak (*Tectona grandis*) (Bermúdez & Hernández 2004, Mora & Román 2006, Vargas 2006) for commercial sale.

In 2012, while conducting surveys using remotely triggered camera traps, we recorded the

presence of pumas (Fig. 1). The first photographic puma occasion was capture at Sierpe Sector (10°22'27.1", 83°31'27.1"; 52 m) on October 13th at 12:59 hr on the 132nd day of sampling effort at this site (Fig. 2). This camera trap (Moultrie MFH-DGS-M100) was located in the regenerating area of the park, previously cleared for livestock activities. The second occasion took place at Lomas de Sierpe (10°24'56.8", 83°30'37.4"; 191 m) on October 30th at 19:27 hr after on the 11th day of sampling effort. This camera trap (Moultrie MFH-DGS-M100) was located in primary forest on the low slopes of the park's mountain range. The last occasion was a capture at Caño Sérvulo (10°28'29.2", 83°29'21.2"; 4 m) on November 15th at 23:02 hr on the 38th day of sampling effort at this location. This camera trap (Covert Reveal 8.0) was again in a primary forest. Both the Lomas de Sierpe and Caño Sérvulo sites are found in the core of the park. Individual pumas could not be identified from the photographs as there were no distinguishable characteristic (e.g. scars, tail-tip coloration, parasite marks).

Gender was not possible to determine due to the angle and quality of the photos. Age could be determined (all three photos were of an adult); indicating a minimum of one and a maximum of three adult pumas captured during our study period. Based on the interview data (according to the protocol of Zeller *et al.* 2011) collected at the beginning of 2013, we were able to ascertain information on the presence of pumas in the buffer zone of the park. In 1998, a puma was observed on the banks of the Sierpe River. A farmer reported that in 2008, a puma frequented a patch of forest within the boundaries of his property. Two further sightings were reported near the southwestern edge of the park in December 2012 (Fig. 1). All the interviewees were members of the local community, who have been living in the

area for at least 10 years. They provided detailed descriptions of the puma and correctly identified the animal from a set of pictures.

The scarcity of historical evidence of pumas in TNP could be related to the higher abundance of jaguars found in the area (Arroyo-Arce 2013). Previous studies in Brazil (Schaller & Crawshaw 1980) and Belize (Rabinowitz & Nottingham 1986) have suggested pumas avoid areas densely populated by jaguars. The habitat of TNP (e.g. permanent watercourses, marshes, floodplains) could also explain the low frequency of puma sightings; pumas are less abundant in wet habitats in comparison to dry habitats (Schaller & Crawshaw 1980, Emmons 1987, Sunquist & Sunquist 2002). This is in contrast to the jaguar, which shows a preference toward riparian habitats, marshlands or areas associated with water sources (Emmons 1987, Crawshaw & Quigley 1991, Cullen 2006, Astete *et al.* 2008). This trend could suggest that jaguars and pumas differ in habitat use (Gittleman 1989).

The existence of a population of pumas in TNP has conservation implications that need to be addressed in order to secure the long-term survival of the species. The main threat faced by Tortugueros' pumas is likely to be the illegal hunting of small and medium-sized mammals such as pacas (*Cuniculus paca*), red brocket deer (*Mazama Americana*) and white-lipped peccary (*Tayassu pecari*) (Arroyo-Arce 2013) which have all been identified as important components in the pumas' diet (Chinchilla 1997, Estrada 2006, Moreno 2008).

ACKNOWLEDGEMENTS

Funding was provided by Liz Claiborne Art Ortenberg Jaguar Research Grant Program at Panthera, The Rufford Small Grants Foundation, Idea Wild and U.S. Fish & Wildlife Service. We gratefully acknowledge all the staff and volunteers of Global Vision International for their support throughout the execution of this investigation. We also thank the Área de Conservación Tortuguero/SINAC for giving us permission to work in Tortuguero National Park and for their logistical support. Thanks to H. Quigley for their valuable comments on this paper and to J. Guilder for reviewing the English version.

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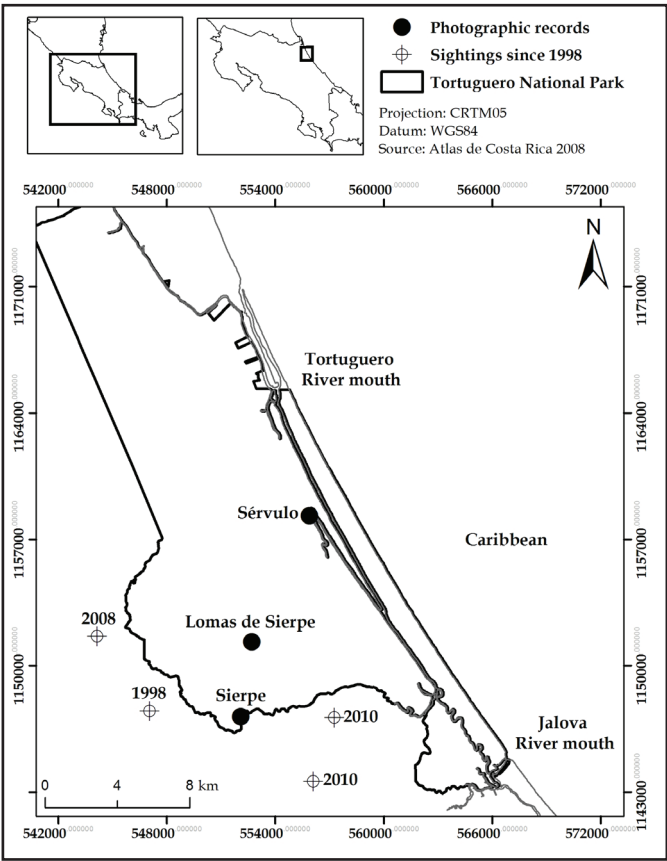


Figure 1. Localities where puma (*Puma concolor*) was reported in Tortuguero National Park, Costa Rica.



Figure 2. Camera trap photograph of puma (*Puma concolor*) in Sierpe Sector, Tortuguero National Park, Costa Rica.