CONSERVATION

Camera-trap Records of Mountain Tapir in Puracé National Park, Colombia

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Introduction

Mountain tapir (*Tapirus pinchaque*, Roulin 1829) is one of the four species that represent the Tapiridae family in the world. It is distributed in the Ecuadorian, Peruvian and Colombian Andes (Lizcano *et al*. 2006). It is currently classified as an endangered species by the IUCN Red List (Lizcano *et al*. 2006) and gaps in population ecology and natural history still exist (Lizcano *et al*. 2005). The gathering of information contributing to the local management of mountain tapir populations is essential.

Puracé National Park (PNP) is a protected area located in a massif where the Central and Eastern Andes Mountains of Colombia merge (Lizcano *et al*. 2002). Mountain tapirs have been reported in the PNP by several studies describing footprints, browsing, scats and fortuitous sightings (Sandoval 2004, Sanchez 2005, Abud 2010, Hernández-Guzmán *et al*. 2010). Studies have described vegetation of the mountain tapir habitat and some plants found in its diet (Sanchez 2005, Acosta & Ramirez 2006, Diaz 2008, Abud 2010).

The main threats to the species are habitat loss due to livestock and agriculture (Sandoval 2004, Sanchez 2005). Through camera-trapping approach we have updated the records of the mountain tapir and reported daily activity and capture frequency for the area. Based on our observations, we proposed useful body traits for individual identification. Additional records of other mammals are also reported.

Materials and methods

The study was carried out within the PNP – Cusiyaco Lagoon (1°54'52"N - 76°37'30.90"W) in the southern part of the protected area, at an altitude between 3200 and 3400 meters (Figure 1). Temperature ranges between 3 and 18 °C and rainfall between 1200 and 2500 mm per year. The ecosystem is classified as an ecotone between high-Andean forest and paramo (Amaya *et al*. 2007).

Twelve cameras were deployed in singular-camera stations during September-December 2010 (87 days). Camera traps consisted of heat-in motion digital cameras (Cuddeback Capture model). The distance between each camera was 350 m, which is half of the radius of the mountain tapir's home range estimated by Lizcano & Cavelier (2004). Camera batteries and memory cards were changed between 20-30 days. After the first month, six cameras were moved to enlarge the sampling area (Figure 1).

Camera trap station locations were chosen based on the existence of a tapir path with footprints, scats, evidence of browsing, and the proximity to streams. The photographs were classified with the help of local mammalogists, guides and available geographical distribution for the species. Mountain tapir photographs were classified as independent events following the O'Brien *et al*. (2003) criteria. Capture frequency relative to sampling effort and daily activity were estimated using the independent events.

We selected the right flank of the mountain tapir for individual identification because of the large proportion of photos including this side of the animal.

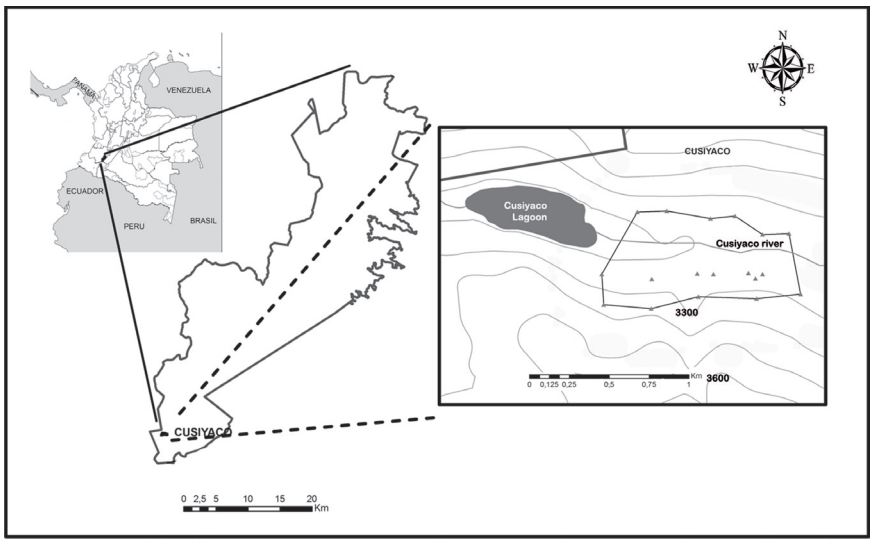

Figure 1. Puracé National Park (PNP) location in Colombia. Close up box shows the sampling area (solid black line) and the camera-trapping stations (triangles).

Figure 2. Mammals photographed by camera-traps in the Cusiyaco Lagoon, Puracé National Park. Mountain tapir (above left), cougar (above right), spectacled bear (below left) and little red brocket deer (below right).

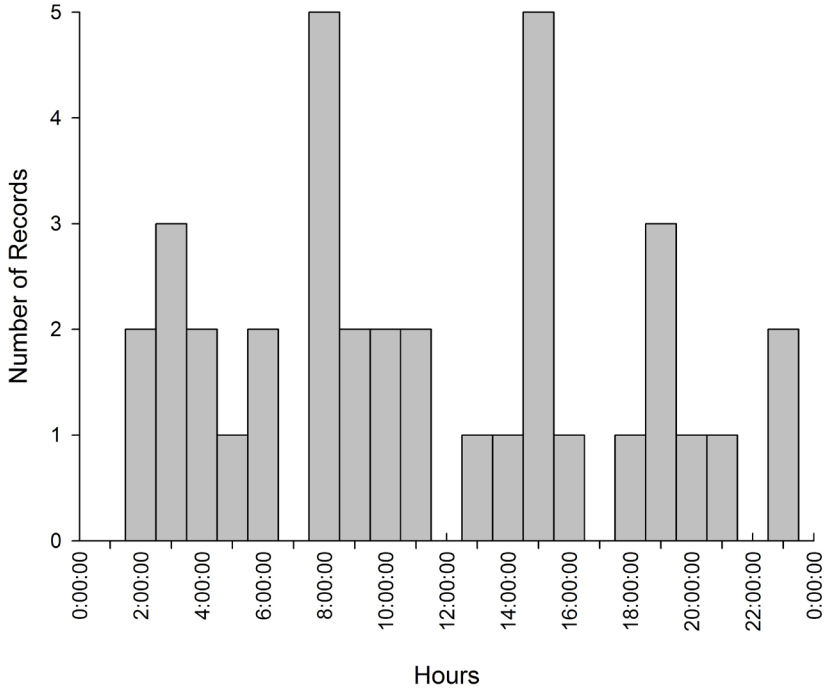

Figure 3. Frequency of mountain tapir records at different times of the day.

We compared body traits such as the swirls of hair on the snout, the presence or absence of white spots on the top of the earlobe, scars and necklines. Photographs were de-saturated and traits were overexposed as proposed by Traeholt & bin Mohamed (2009) to enhance individual identification.

Results and Discussion

A total of 100 photographs were taken from an overall effort of 982 camera nights. We found eight photos (8%) corresponding to human, eight false triggers (8%) and 84 (84%) wildlife recordings belonging to six mammal species and one unidentified species due to the bad quality of the photograph (Table 1). These records suggest an area of relatively high ecological integrity, and thus of high conservation value (Figure 2).

Paramo and Andean forests of Cusiyaco have a complex structure and composition of vegetation, making it suitable habitat for mountain tapirs and other species. The park rangers' monitoring program also reports this site as a foraging point for mountain tapirs (Amaya *et al*. 2010). Furthermore, the Cusiyaco area and its surroundings are able to provide food resources for cougars (Hernandez-Guzmán 2010). Thus, the south of the PNP could be strategic for mountain tapir conservation due to its high connectivity with other forest tracts and national parks where the species still occurs (Lizcano *et al*. 2002).

The most frequent species in our camera-traps was the mountain tapir with 57 photos (68% of the wildlife). Overall, 37 independent records of tapir were recognized, which allowed us to estimate a capture frequency of 3.7 individuals/100 cam-night. This was quite similar to Baird's tapir (*Tapirus bairdii*) in a montane site called "Valle del Silencio" within La Amistad National Park with 3.6 individuals/100 camera-nights (González-Maya *et al*. 2009). The authors of that survey associated the high frequency of tapirs at "Valle del Silencio" with the lower disturbance (poaching and tourist visits) in comparison to other accessible sampling in their study area.

We recorded mountain tapirs throughout the day. The most frequently recorded hours were 08:00 and 15:00, both with five records.

Table 1. Occurrence of wildlife from photo recordings of camera-traps.

Species	Number of Photos	Number of Stations with Photos	IUCN Category
Mountain Tapir (*Tapirus pinchaque*)	57	11	EN
Little Red Brocket Deer (*Mazama rufina*)	10	7	VU
Spectacled Bear (*Tremarctos ornatus*)	8	5	VU
Cougar (*Puma concolor*)	4	4	LC
Mountain Coati (*Nasuella olivacea*)	2	2	DD
Tapeti (*Sylvilagus brasiliensis*)	2	2	LC

At other times, we saw between one to three records per hour (Figure 3). These results were consistent with Downer (1996), who found activity peaks between 15:00 - 21:00 and 06:00 - 09:00. The data is also consistent with Lizcano & Cavelier (2004) who found that the daily activity of a male adult was related to the environmental temperature with a reduction of activity at noon and nightfall.

Identifying individuals was challenging in some pictures because they were dark or were taken under foggy conditions. When there was sufficient light, however, we found a number of useful traits to identify individuals. The tips of the earlobes were helpful because both of them are observable from the right flank. However, light reflection caused by sunbeams on the fur or the camera flash can make it challenging to identify presence/absence of the characteristic white spot.

Hair swirls on the snout were stronger criteria for identification, showing singular patterns in every

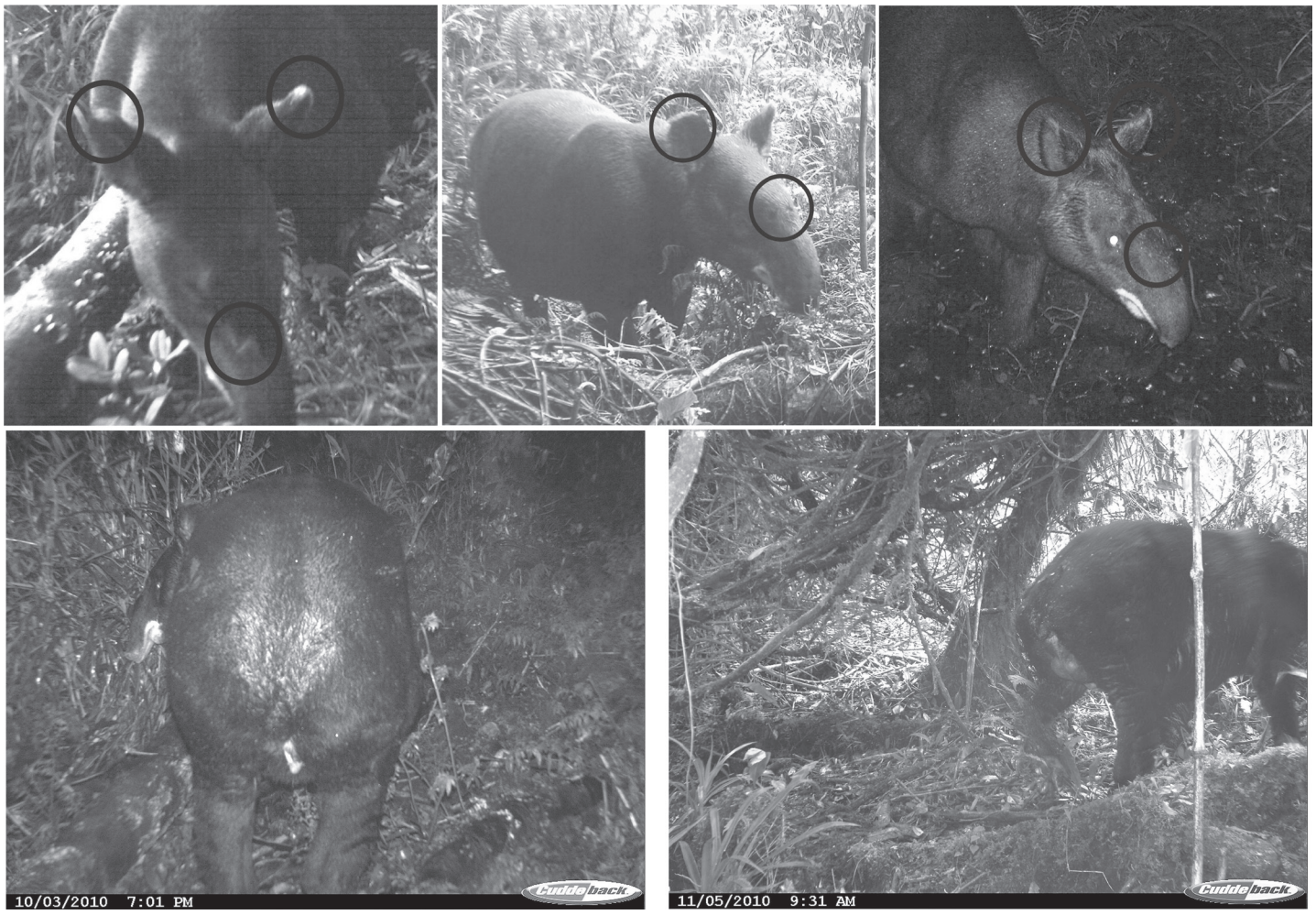

Figure 4. Top images show body traits useful for individual identification of mountain tapir in the Cusiyaco Lagoon. The left one was characterized by white tip ears and a zig-zag mark in the snout. The middle one shows black tip ears and a two circular hair swirls on the snout. The right one shows an individual identified by black tip ears and hair swirl between the eyes. Bottom images show a female (left) and a male (right).

picture, some of them consistent in various records and confirmed by earlobe tips and other marks such as scars (Figure 4). Scars, on the other hand, were difficult to observe due to the species' dense fur, especially when the animals were wet. Necklines were highly variable depending on the camera flashlight, even when the image was over-exposed.

There are no reports in the literature on useful features for recognition of mountain tapir individuals in photographs before this study. Additional characteristics such as spots on the face, stomach and on the tail were useful in the individual identification of lowland tapir (*Tapirus terrestris*) in the Chaco (Noss *et al*. 2003). However we were unable to use the same traits in mountain tapirs. Finally, we were able to identify a male and a female from photographs of the back. But we were unable to assign them back to an individual, as their right flanks were not clearly visible from this angle (Figure 4).

Our results suggest that the PNP in an important region for the conservation of mountain tapir and mammals of the Northern Andes. We strongly encourage continued research and conservation action in this area.

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