

A long term inventory of medium and large mammals with camera-traps in Las Tablas Protected Zone, Costa Rica.

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Large mammals are a critical component of tropical ecosystems, especially for the tropics (Terborgh 1988, Cardillo et al. 2005). Nevertheless, is not until recently that with the emergence and widespread use of non-invasive techniques such as camera-traps, that we are getting a large amount of information on medium and large-size mammal assemblages (Ahumada et al. 2011, O'Connell et al. 2011). Information on the mammal assemblages occurring at different locations and ecosystem types is one of the fundamental basis for conservation planning, macroecological research and functional analyses of ecosystem status and resilience (Boitani et al. 2011, Rondinini et al. 2011). Furthermore, understanding mammal species composition can inform ecosystem management both for conservation, restoration and even human development (Ceballos et al. 2005, DeClerck et al. 2010). Here we present the first long term medium and large-size mammal's inventory in Talamanca Mountains Costa Rica with camera-traps.

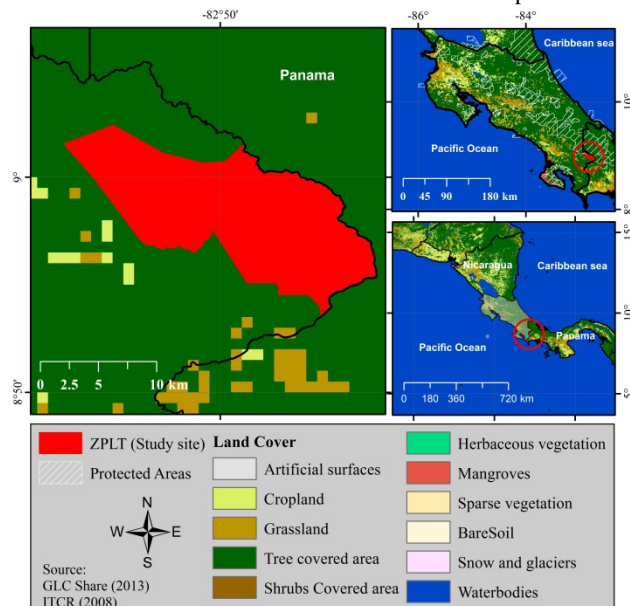


Figure 1. Location of the long-term medium and large mammal's inventory in Las Tablas Protected Zone, Southern Costa Rica

During field sampling from 2005 to 2013, we compiled all the mammals detected on camera-traps from the long-term monitoring program of mammals in Las Tablas Protected Zone (Zona Protectora Las Tablas - ZPLT; Figure 1). Las Tablas PZ is a private lands protected area considered part of the National System of Conservation Areas (SINAC), located in the southern zone of Costa Rica between 82°57'45,43" and 82°43'1,62" West and 9° 5'12,49" and 8°54'7,22" North, and ranging from ~1.200 up to ~2.100 m asl (Figure 1). During the sampling time (9 years) a total of 259 camera-stations composed of one or two cameras (Mean±SD stations per year: 28,77±18,70) were established all within the same year with a minimum distance of 1 km between stations. A total of 35.520 camera-trap days (Mean±SD camera-trap days per year: 3946,66±2257,54). We also include in the list personal observations by the authors during the monitoring, especially for arboreal species not detected by cameras, but that complete the inventory.

A total of 33 species have been detected so far in the area (Table 1), with the largest number of species been within the Carnivore order (14) while the orders Lagomorpha, Perissodactyla and Pilosa are represented only by one species each. In terms of conservation status 24 species are considered as Least Concern, followed by 4 Data Deficient species and 2 Near Threatened, while only 3 species are considered under a threat category, two species considered Endangered and one Vulnerable (Table 1). Compared with total medium and large-size mammal species confirmed for Costa Rica, the ZPLT includes approximately 64% of the total species considered present in the country, and approximately 14% of the total mammal fauna of the country (Rodríguez-H et al. 2002). Potentially, species such as *Bradypus variegatus* and *Choloepus hoffmani* (order Pilosa), *Myrmecophaga tridactyla* (order Pilosa), *Coendou mexicanus* (order Rodentia), *Sylvilagus brasiliensis* (order Lagomorpha), *Bassariscus sumichrasti*, *Mustela frenata*, *Spilogale putorius* and *Leopardus tigrinus* (order Carnivora) and *Tayassu pecari* (order Artiodactyla) could be present in the study area, however they have not been yet recorded by our sampling.

Despite we cannot confirm this as the final list of the species for the area, based on the high sampling effort to date, we believe there is a low probability numerous other species could be detected for the area. The number of species recorded for this area represents a significant proportion of the total expected known species for the country, highlighting the importance of this protected area for mammal conservation in the country (González-Maya et al. 2012a). Most of the Talamanca mountains on its pacific slope have been wiped of natural vegetation mostly for agriculture and cattle production (González-Maya et al. 2009, Gonzalez-Maya et al. 2012b), therefore this area represents one of the last refuges for large mammals in the region, and the potential source for countryside populations (Daily et al. 2003) and for an eventual corridor

between the Talamanca and the Osa Peninsula; two of the last strongholds for mammal conservation in the country and Mesoamerica (Sanchez-Azofeifa et al. 2002, Salom-Pérez et al. 2007, Gonzalez-Maya et al. 2012a).

Efforts to document mammal diversity in tropical ecosystems is one of the starting points to effectively document and protect biodiversity, thus we believe our effort can provide the necessary basis for conservation planning and informing decision making at regional and landscape scales. Continued efforts are required for further documenting Talamanca biodiversity, especially for other groups, and the information can be incorporated as the base-line data for conservation, as it should occur for other tropical ecosystems in peril. We thank ProCAT and The Sierra to Sea Institute, The Mikelberg Family Foundation and Finca Las Alturas for funding and continued support to our research.

References

AHUMADA, J. A., et al. 2011. Community structure and diversity of tropical forest mammals: data from a global camera trap network. *Philos Trans R Soc Lond B Biol Sci* 366:2703-2711.

BOITANI, L. et al. 2011. What spatial data do we need to develop global mammal conservation strategies? *Philos Trans R Soc Lond B Biol Sci* 366:2623-2632.

CARDILLO, M., et al. 2005. Multiple causes of high extinction risk in large mammal species. *Science* (New York, NY) 309:1239-1241.

CEBALLOS, G., et al. 2005. Global mammal conservation: what must we manage? *Science* 309:603-607.

DAILY, G., et al. 2003. Countryside Biogeography of Neotropical Mammals: Conservation Opportunities in Agricultural Landscapes of Costa Rica. *Conservation Biology* 17:1814-1826.

DECLERCK, F. A. J., et al. 2010. Biodiversity conservation in human-modified landscapes of Mesoamerica: Past, present and future. *Biological Conservation* 143:2301-2313.

GONZÁLEZ-MAYA, J. F., et al. 2012a. Ecología y conservación del Jaguar en Talamanca, Costa Rica: herramientas de planificación a escala regional. *Editorial Académica Española, Saarbrücken, Germany* 125.

GONZALEZ-MAYA, J. F., et al. 2012b. Baird's tapir density in high elevation forests of the Talamanca region of Costa Rica. *Integrative zoology* 7:381-388.

GONZÁLEZ-MAYA, J. F., et al. 2009. Elevational Distribution and Abundance of Baird's Tapir (*Tapirus bairdii*) at different Protection Areas in Talamanca Region of Costa Rica. *Tapir Conservation* 18:29-35.

IUCN. 2012. IUCN Red List of Threatened Species. www.iucnredlist.org.

O'CONNELL, A. F., et al. 2011. *Camera Traps in Animal Ecology: Methods and Analyses*. Springer, New York, USA 286.

RODRÍGUEZ-H, B., et al. 2002. Lista de especies, endemismo y conservación de los de mamíferos de Costa Rica. *Revista Mexicana de Mastozoología* 6:21-57.

RONDININI, C., et al. 2011. Global habitat suitability models of terrestrial mammals. *Philosophical transactions of the Royal Society of London Series B, Biological sciences* 366:2633-2641.

SALOM-PÉREZ, R., et al. 2007. Critical condition of the jaguar *Panthera onca* population in Corcovado National Park, Costa Rica. *Oryx* 41:51.

SANCHEZ-AZOFEIFA, G. A., et al. 2002. Dynamics of Tropical Deforestation Around National Parks: Remote Sensing of Forest Change on the Osa Peninsula of Costa Rica. *Mountain Research and Development* 22:352-358.

TERBORGH, J. 1988. The Big Things that Run The World-A Sequel to E. O. Wilson. *Conservation Biology* 2:402-403.

Table 1. List of medium and large-size mammal species and its conservation status detected on a long term monitoring in Las Tablas Protected Zone, Talamanca Mountains, Costa Rica. *Conservation status according to IUCN (2012), order names were abbreviated for space purposes.

Order	Family	Species	Cons. status*	No. Sp.
Art.	Cervidae	<i>Odocoileus virginianus</i> (Zimmermann, 1780)	LC	3
		<i>Mazama temama</i> (Erxleben, 1777)	DD	
	Tayassuidae	<i>Pecari tajacu</i> (Linnaeus, 1758)	LC	
Canidae		<i>Canis latrans</i> Say, 1823	LC	
		<i>Urocyon cinereoargenteus</i> (Schreber, 1775)	LC	
	Felidae		<i>Leopardus pardalis</i> (Linnaeus, 1758)	LC
		<i>Leopardus wiedii</i> (Schinz, 1821)	NT	
		<i>Panthera onca</i> (Linnaeus, 1758)	NT	
		<i>Puma concolor</i> (Linnaeus, 1771)	LC	
Car.	Mephitidae	<i>Puma yaguarondi</i> (Lacepede, 1809)	LC	
		<i>Conepatus semistriatus</i> (Boddaert, 1784)	LC	
		<i>Eira barbara</i> (Linnaeus, 1758)	LC	
Mustelidae		<i>Gallictis vittata</i> (Schreber, 1776)	LC	
		<i>Lontra longicaudis</i> (Olfers, 1818)	DD	
		<i>Bassaricyon gabpii</i> J.A. Allen, 1876	LC	
Procyonidae		<i>Nasua narica</i> (Linnaeus, 1776)	LC	
		<i>Potos flavus</i> (Schreber, 1774)	LC	
		<i>Procyon lotor</i> (Linnaeus, 1758)	LC	
Cin.	Dasypodidae	<i>Cabassous centralis</i> (Miller, 1899)	DD	
		<i>Dasybus novemcinctus</i> Linnaeus, 1758	LC	
Did.	Didelphidae	<i>Chironectes minimus</i> (Zimmermann, 1780)	LC	
		<i>Didelphis marsupialis</i> Linnaeus, 1757	LC	
		<i>Philander opossum</i> (Linnaeus, 1758)	LC	
Lag.	Leporidae	<i>Sylvilagus dicei</i> Harris, 1932	DD	1
Per.	Tapiridae	<i>Tapirus bairdii</i> (Gill, 1865)	EN	1
Pil.	Myrmecoph.	<i>Tamandua mexicana</i> (Saussure, 1860)	LC	1
Prim.	Cebidae	<i>Cebus capucinus</i> (Linnaeus, 1758)	LC	
		<i>Saimiri oerstedii</i> (Voigt, 1831)	VU	
	Atelidae	<i>Ateles geoffroyi</i> Kuhl, 1820	EN	
<i>Alouatta palliata</i> (Gray, 1849)		LC		
Rod.	Cuniculidae	<i>Cuniculus paca</i> (Linnaeus, 1766)	LC	
	Dasyproctidae	<i>Dasyprocta punctata</i> Gray, 1842	LC	
	Sciuridae	<i>Sciurus granatensis</i> Humboldt, 1811	LC	