CONTRIBUTIONS

Distribution and conservation status of the Baird's tapir in Panama

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The Baird's tapir *Tapirus bairdii*, listed as endangered on the IUCN red list (IUCN, 2013), ranges from South Eastern Mexico to the Gulf of Guayaquil in Ecuador (Reid, 2009). Within this area, the Isthmus of Panama is a key area because it connects populations of Central America and South America with each other (Webb, 2003). Tapirs may persist in some forested areas of Panama, but their presence has not been verified in most of the potential distribution areas. No studies of wild Baird's tapir have been undertaken in Panama outside of Barro Colorado Island, where the species was studied more than 30 years ago (Terwilliger, 1978). Basic information on tapirs' occurrence and distribution is necessary to evaluate the suitability of protected areas for the conservation of viable tapir populations in Panama (Moreno, 2006; Ahumada *et al*. 2011).

Here, we assess the current distribution and conservation status of Baird's tapir in Panama. We compiled occurrence data from 30 sites scattered across the forested areas of Panama, covering nine distinct regions (Table 1). The data combined camera trapping data, field surveys of tracks, dung and direct observation, and interviews with guides and local people. Previous studies have shown that robust tapir data can be obtained from non-tapir specific camera-trap surveys (Noss *et al*. 2003; Rayan *et al*. 2012).

Tapirs were confirmed at just 14 of the 30 sites, and in six of the nine areas (Table1, Fig. 1). The results reveal gaps in the distribution range of Baird's tapirs in Panama (Fig. 1). Tapirs occur mainly on the Atlantic side of Panama in relatively undisturbed forests. Populations appear healthy in the remote intact forests of Donoso, and in the forest block East of the Panama Canal, i.e. Darién and the comarcas de Guna Yala, Wargandi, Mandungandi and Embera-Wounan. These areas have low human population densities and are mainly inhabited and managed by indigenous people – the Gunas, Emberas and Wounaan – who maintain forested areas, practice subsistence hunting and only occasionally kill tapirs (Ventocilla *et al*. 1995; MICI, 2013). With the exception of Donoso, all the above mentioned forests are connected to each other forming a large continuous area where animals can move freely without major anthropomorphic barriers such as highways or cities.

Our assessment suggests that there are three parts of Panama where tapir numbers are critically low. The first is Central Panama that has been intensively monitored for decades due to the presence of the Panama Canal. In this area signs of tapir are rare or nonexistent. The Panama Canal area is the bottleneck of the Mesoamerican Biological Corridor and may present a barrier for the movements of species, due to increasing human population, habitat fragmentation, forest disturbance and high level of poaching (Wright *et al*. 2000). Although tapir is not a preferred game species in Panama, they are often killed opportunistically, because of the large quantity of meat it provides.

An intensive camera trapping survey (120 km2) took place as part of the Tropical Ecology Assessment and Monitoring program (TEAM; Ahumada *et al*. 2011) in the 3-year period from 2010-2012 in Soberania National Park (SNP), a potentially suitable area for tapirs with 225 km2 of mature secondary forest. Yet not a single tapir photo was taken (Meyer *et al*. 2013). Nevertheless, we did see tracks in 2011 and 2013 on

Table 1: Sites in Panama with information on tapir presence, with the survey method. For each site, we italicized the method that did not result in any tapir sign.

Province	Site	Method			Tapir occurrence	Source
Chiriquí	[1] Volcán Barú	*CT*	*T*	*PC*	X	ANAM-ANCON, 2004a; J. Willis, pers. com.
	[2] La Amistad NP			PC	X	ANAM-ANCON, 2004a
	[3] Fortuna		*T*	*PC*	X	A. Guevara and N. Fossatti, pers. com.
Bocas del Toro	[4] Palo Seco		T	PC	O	ANAM-ANCON, 2004b
	[5] San San - Pond Sac		T	PC	O	ANAM-ANCON, 2004b; O. Lopez and A. Santos, pers. com.
Veraguas	[6] Santa Fé	CT			O	Donoso, 2010
	[7] Cerro Hoya	*CT*	*T*	*PC*	X	Fort and Nielsen, 2012; ANAM, pers. com.
Herrera	[8] Montuoso		T	PC	X	Mendez and Santamaria, 2004. M. Arosemena, pers. com.
Coclé	[9] Donoso	CT	T	PC	O	MWH, 2013, pers. obs.
	[10] El Copé		T	PC	X	L. Martinez and J-P Rios, pers. com.
Colon	[11] San Lorenzo NP	*CT*			X	Meyer *et al*, 2013
	[12] BCI	CT	T		O	Terwilliger, 1978; Meyer *et al*, 2013; pers. obs. (RM)
	[13] BCNM Peninsulas	*CT*	*T*	*PC*	X	Wright *et al*, 2000; Meyer *et a*l, 2013; H. Esser unpub. data.; S. Valdes, pers. com.
	[14] Soberania NP	*CT*	T		O	Meyer *et al*, 2013; A. Santos, pers. com.
	[15] Agua Salud	*CT*			X	Meyer *et al*, 2013
	[16] Sierra llorona	*CT*	*T*	*PC*	X	Meyer *et al*, 2013
	[17] Santo Domingo	*CT*		*PC*	X	Meyer *et al*, 2013
	[18] Chagres NP	CT	T	PC	O	Moreno and Bustamante, 2007; I. Lopez, unpub. data.
	[19] Portobelo NP	CT	T	PC	O	Moreno and Bustamante, 2007; H. Rissanen, pers. com.
Panama	[20] Cocobolo NR	CT		PC	O	E. Espino, pers. com.; H. Esser, unpub. data.
	[21] Camino de cruces	*CT*	*T*		X	H. Esser, unpub. data; RM
	[22] Howard		*T*	*PC*	X	ANCON, 2005
Guna Yala	[23] Nusagandi	CT	T	PC	O	Brown and Moreno, 2013
	[24] Wargandi			PC	O	MICI, 2013; J. Moreno, pers. com.
	[25] Madugandi		T	PC	O	MICI, 2013; J. Moreno, pers. com.
Darién	[26] Cerro Chucanti			PC	O	G. Berguido, pers. com.
	[27] Cemaco		T	PC	O	Medina, 2013
	[28] Serrania de Bagre		T	PC	O	ANAM-ANCON, 2006
	[29] Paya		T		O	E. Campos, pers. com.
	[30] Cana	CT	T	PC	O	Moreno, 2006

[1] CT = camera trapping, T = tracks, dung and direct observation, PC = interviews and personal communication
[2] X = no tapir sign encountered, O = tapir sign encountered

the west side of Pipeline road, indicating that very few individuals persist in the area. The TEAM survey was also conducted in Barro Colorado Natural Monument (BCNM) located in the middle of the Gatun Lake and consists of Barro Colorado Island (BCI) surrounded by five peninsulas. Tapirs were only detected on BCI, but neither game wardens nor local communities have ever observed signs of tapirs outside of BCI or reported any kills. However, the small population of tapirs on BCI (8-10 individuals, J. Giacalone-Willis, pers. com.), may consist of individual migrants, or transitory individuals through BCI providing renewal of the gene pool. We also found tapir tracks on Isla Maiz, a small island between BCI and the mainland supporting this hypothesis. This suggests that there are migrating tapirs in the mainland around BCI too.

The route tapirs use to cross the canal and migrate through forests east and west of the Canal remains unknown. Several corridors have been proposed including the Filo de Santa Rita Corridor that connects Chagres NP to SNP (USAID, 2009). However, the corridor consists of small patches of forests in a matrix of cattle pastures, with a high human density and with two major roads that make this area difficult and dangerous for the tapirs to cross.

The second region of critical concern involves tapir populations of the Serrania de Maje and the Atlantic coast. These populations are isolated by the Pan-American Highway that runs across the country in East-West direction.

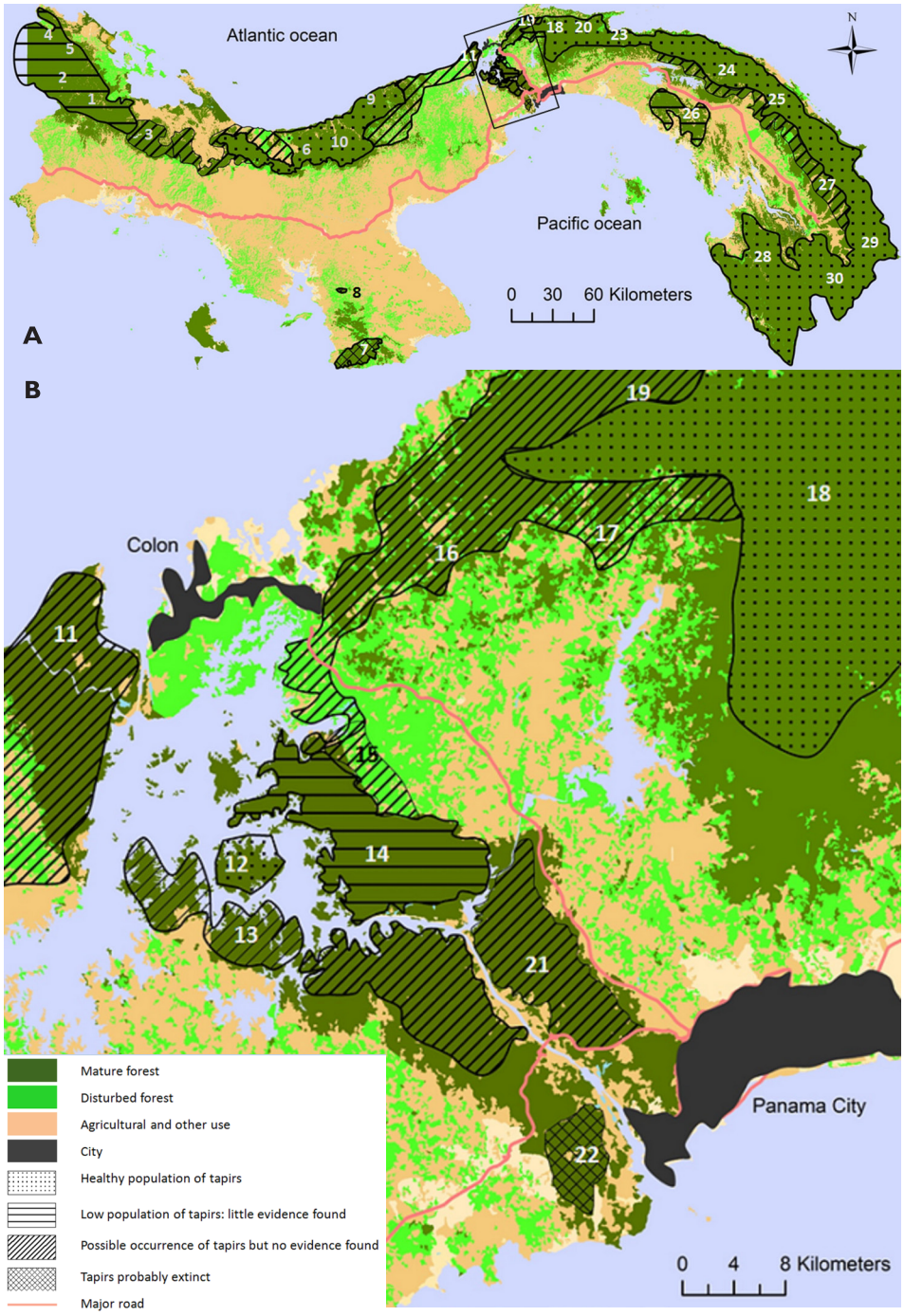

Figure 1: Distribution map of *Tapirus bairdii* in Panama (A) and an inset of Central Panama (B). The numbers correspond with the sites listed in table 1.

The third area where poaching, deforestation and resulting habitat fragmentation make it difficult for tapirs to persist (Brooks *et al.* 1997), is in the Comarca de Ngöbe-Bugle between the forests of Santa Fé - El Copé - Donoso and La Amistad International Park (PILA).

Few tapir data are available for the forested area of Chiriquí in Western Panama. Tracks of tapirs have been found in some places and photos taken in the highlands of Costa Rica (Gonzalez-Maya *et al.* 2009) that are part of the cross boundary continuous forests between Costa Rica and Panama. Poaching levels remain high in some parts of Chiriquí and Western Panama which contributes to the extinction process (Smith, 2008; J. Giacalone-Willis, pers. com.).

The lack of evidence of tapir in the two last remaining forests of the Peninsula de Azuero over the past decades leads us to believe that tapirs are extinct in those areas.

The information compiled in this assessment is an important addition to the existing knowledge about tapirs in Panama. A key point is the importance of restoring the connectivity between forest fragments in Panama thereby allowing for gene flow between tapir populations (Norton & Ashley, 2004). This is especially true for the region in Central Panama, a key area for the species, and where a small population size may reduce the genetic viability of this population. Special attention should also be paid to conserve the corridor between the Comarca de Ngöbe-Bugle to avoid the same problem as in Central Panama. To improve conservation intervention more research is needed regarding tapir population density and habitat requirements in Panama.

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References

Ahumada J.A., Silva C.E.F., Gajapersad K., Hallam C., Hurtado J., Martin E., McWilliam A., Mugerwa B., O'Brien T. & Rovero F. (2011). Community structure and diversity of tropical forest mammals: data from a global camera trap network. *Philosophical Transactions of the Royal Society B: Biological Sciences* 366: 2703-2711.

ANAM (Autoridad Nacional del Ambiente)-ANCON (Asociación Nacional para la Conservación de la Naturaleza). (2006). Plan integral de consolidación del corredor biológico Serranía el Bagre, Distrito de Chepigana, Provincia de Darién. Unpublished report.

ANAM (Autoridad Nacional del Ambiente)-ANCON (Asociación Nacional para la Conservación de la Naturaleza) (a). (2004). Elaboración de Planes de Manejo del Parque Internacional La Amistad y el Parque Nacional Volcán Barú. Unpublished report.

ANAM (Autoridad Nacional del Ambiente)-ANCON (Asociación Nacional para la Conservación de la Naturaleza) (b). (2004). Elaboración de Planes de Manejo del Bosque Protector Palo Seco y el Humedal de Importancia Internacional San San – Pond Sak: Diagnostico Biológico y Sociocultural del Bosque Protector Palo Seco. Unpublished report.

ANCON (Asociación Nacional para la Conservación de la Naturaleza). (2005). Evaluación de la Línea Base del Área Económica Especial Panamá-pacifico. Unpublished report.

Brooks, D.M., Bodmer, R.E. & Matola, S. (compilers). (1997). Tapirs- Status Survey and Conservation Action Plan. IUCN/SSC Tapir Specialist Group, IUCN, Gland, Switzerland and Cambridge, UK, viii + 164 pp.

Donoso, E. (2010). Ecología, comportamiento y conservación del ocelote *Leopardus pardalis* (Carnivora: Felidae), en el bosque nuboso del Parque Nacional Santa Fe, provincia de Veraguas. Tesis de Licenciatura. Centro regional Universitario de Veraguas, Universidad de Panamá, Panamá.

Fort, J. & Nielsen, C. (2012). Descripción del estudio piloto de vida Silvestre en Cerro Hoya mediante el uso de cámaras trampa. Unpublished report, Cooperative Wildlife Research Lab. Southern Illinois University Carbondale, USA.

Gonzalez-Maya, J.F., Schipper, J. & Rojas-Jiménez, K. (2009). Elevational Distribution and Abundance of Baird's Tapir (*Tapirus bairdii*) at different Protection Areas in Talamanca Region of Costa Rica. Tapir Conservation 25: 29-35.

IUCN (2012). *The IUCN Red List of Threatened Species. Version 2012.2*. www.iucnredlist.org. Downloaded on 19 April 2013.

Méndez-Carvajal, P.G. & Santamaría, E. 2004. Mamíferos del Montuoso. In: Diversidad biológica y servicios ambientales de los fragmentos de bosque de la reserva forestal El Montuoso, Panamá. Ed. Cristina Garibaldi. Imprenta de la Universidad de Panamá. 210 pp.

Meyer, N., Moreno, R., Van Langeveld, F., Esser, H.J., Ros-Oller, D., Vogels, C.B.F., Liefting, Y., Bustamante, A., Lazaro, C., Wennekes, P. & Jansen, P.A. (2013). An assessment of the terrestrial vertebrate community of forests in Central Panama, bottleneck of the Mesoamerican Biological Corridor. Environmental Monitoring and Assessment, submitted.

MICI (Ministerio de Comercio e Industria). (2013). Proyecto Salvaguardia del Patrimonio Cultural Inmaterial de Panamá. Base de datos. Unpublished report.

Moreno, R. (2006). Parámetros poblacionales y aspectos ecológicos de los felinos y sus presas en Cana, Parque Nacional Darien, Panamá. M.S. Thesis. Universidad Nacional, Heredia, Costa Rica.

Moreno, R., & Bustamante, A. (2007). Proyecto del Alto Chagres, Densidad de Jaguares. Unpublished report, Sociedad Mastozoológica de Panamá, Panama.

Norton, J.E. & Ashley, M.V. (2004). Genetic variability and population structure among wild Baird's tapirs. Animal Conservation 7: 211-220.

Noss, A.J., Cuellar, R.L., Barrientos, J., Maffei, L., Cuellar, E., Arispe, R., Rumiz, D. & Rivero, K. (2003). A camera trapping and radio telemetry study of lowland tapir (*Tapirus terrestris*) in Bolivian dry forests. Tapir Conservation 12: 24-32.

Rayan, D.M., Mohamad, S.W., Dorward, L., AZIZ, S.A., Clements, G.R., Christopher, W.C.T., Traeholt, C. & Magintan, D. (2012). Estimating the population density of the Asian tapir (*Tapirus indicus*) in a selectively logged forest in Peninsular Malaysia. Integrative Zoology 7: 373-380.

Reid, F. (2009). *A Field Guide to the Mammals of Central and Southeast Mexico*. Second edition. Oxford University Press, Inc., Oxford, United Kingdom.

Smith, D.A. (2008). The spatial patterns of indigenous wildlife use in western Panama: Implications for conservation management. Biological Conservation 141: 925-937.

Terwilliger, V.J. (1978). Natural History of Baird's Tapir on Barro Colorado Island, Panama Canal Zone. Biotropica 10: 211-220.

USAID (United States Agency of Internation Development). (2009). Marco conceptual y planes de acción de los corredores biológicos del Filo de Santa Rita y Campo Chagres para la conectividad de los Parques Nacionales Soberania y Chagres. Proyecto Conservación de la Biodiversidad en la Cuenca del Canal. Unpublished report.

Ventocilla J., Herrera, H. & Núñez, V. (1995). Plants and animals in the life of the Kuna. University of Texas Press, Austin, USA.

Webb, D. (2003). El gran intercambio americano de fauna. p. 127-136. En: Coates, A. (compilador). Paseo Panthera: Una historia de la naturaleza y cultura de Centroamérica. Instituto Smithsonian de Investigaciones Tropicales. Panamá.

Wright, S.J., Zeballos, H., Dominguez, I., Gallardo, M., Moreno, M.C. & Ibanez, R. (2000). Poachers alter mammal abundance, seed dispersal and seed predation in a neotropical forest. Conservation Biology 14: 227-239.