EVIDENCE OF ALBINISM IN THE WHITE-FACED MONKEY *CEBUS CAPUCINUS IMITATOR* ON COIBA ISLAND, REPUBLIC OF PANAMA

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Introduction

Increased rates of abnormal coloration (Fortes et al., 2008), including albinism (Camargo et al., 2014), have been linked to low genetic diversity resulting from isolation, inbreeding depression, and high density of populations. Other potential determinant characteristics for albinism include: 1) low-quality habitat and diet, 2) pollution, or 3) follicular damage (Camargo et al., 2014). Albinism is caused by a single genetic mutation that inhibits melanocyte production of melanin compounds, which are transported via melanosomes into keratinocytes of the epidermis and hair follicles (Caro, 2005; Prado-Martínez et al., 2013). Albinism is differentiated from leucism by a total absence of pigmentation in the whole body (white to yellowish color) and eyes with red or pink coloration (Abreu et al., 2013). Albinism has been documented in numerous mammals (Peles et al., 1995; Ramírez and Arana, 2005; Abreu et al., 2013), including human and non-human primates (Hu et al. 1980, Veiga 1994, and Prado-Martínez et al., 2013). Albinism is considered rare in nature (McCardle, 2012) due to the low rate survivorship of albinos (Caro, 2005), possibly due to greater risk of predation (Owen and Shimmings, 1992). However, there is trivial support for differences in fitness of albino and normal colored mammals (Owen and Shimmings, 1992; Brewer et al., 1993). Hence, documentation of albino animals is important to provide indirect evidence of underlying genetic variability (Jehl 1985) and implications for viability of those populations (Prado-Martínez et al., 2013).

White-faced monkeys *Cebus capucinus* are medium-sized (3–4 kg) omnivorous primates found throughout a variety of forest types in Central America and the coastal areas of Colombia and Ecuador (Rylands et al., 2006). Normal phenotypic characteristics of the species include black pelage on the main body, with yellow-cream fur on the head, chest and shoulders (Rylands et al., 2006). The subspecies *C. c. imitator* is common across its range, from Nicaragua, Costa Rica, to the west part of the Panama Canal (Boubli et al. 2012), as well as on Coiba Island, Panama (Figure 1; Hershkovitz, 1949), which has around 600 individuals (1.3 ind/km², 10.8 ind/group; Méndez-Carvajal, 2012).

Methods

From 12 Mar–3 Jul 2015 we deployed 32 Bushnell® HD eight megapixel cameras equipped with an infrared sensor in three general areas across Coiba Island, Panama (Fig. 1). We deployed each camera facing a trail or area with conspicuous wildlife activity. The objective of the survey was to estimate the diversity and density of terrestrial mammals on the island.

Results

On 25 Mar and 3 Apr 2015, an albino white-faced monkey (*C. c. imitator*) was photographed (Fig. 2) by a camera deployed in the central-western region of the island (Fig.1). These were the only photographs of an abnormally-colored monkey during the survey. In each photograph, the albino white-faced monkey was observed with one other white-faced monkey with normal pigmentation, as seen in the lower right corner of Figure 2. We suggest this monkey exhibits evidence of albinism based on a lack of pigment across the entire body. Although the photograph limits detection of red or pink eye color, lack of pigmentation in the hands and feet indicate this monkey was albino and not leucistic (Abreu et al., 2013).

Discussion

This evidence of albinism in *C. c. imitator* is the only record for this species and of the first documented occurrence of albinism in wild populations of Cebidae. Veiga (1994)

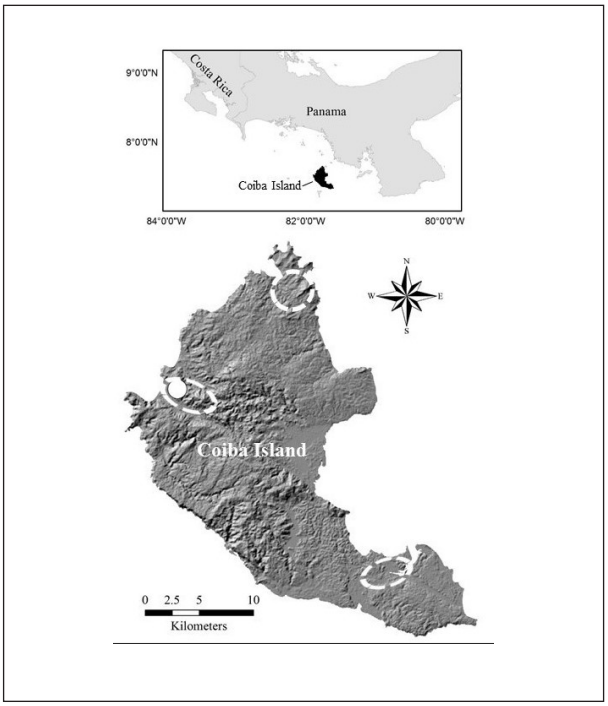

Figure 1. Photograph location (white dot) where an albino white-faced monkey *C. c. imitator* was photographed within a camera survey area (dashed ovals) on Coiba Island, Panama. April 2015.

Figure 2. Albino white-faced monkey (*C. c. imitator*) photographed by a remote camera on Coiba Island, Panama, April 2015.

suggested albinism in the brown capuchin monkey, *C. apella*, but her record is speculative because it was based on a second-hand report. Bicca-Marques (1988) stated an albino *C. apella* was obtained from the Roca Sales region of Brazil for transfer to a zoo, but did not state if the monkey was of captive or wild origin. Although our observation may be an anomalous case of albinism, there is a possibility that *C. c. imitator* on Coiba Island may be experiencing reduced gene flow, as suggested for other mammals (Fortes et al., 2008; Camargo et al., 2014). Coiba Island retains mostly pristine forest and is relatively large compared to most Pacific islands, but it has been isolated from the mainland of Panama for about 10,000 to 12,000 years (ANAM, 2009). This span of isolation may have led to a loss of gene flow for *C. c. imitator*, possibly leading to greater occurrence of albinism, as shown in the lowland gorilla *Gorilla gorilla gorilla* (Prado-Martinez et al., 2013). Also, primates on Coiba Island have fewer predators (only raptors) than populations on the mainland, which could decrease risk of albino individuals being removed from the population by predation (Owen and Shimmings, 1992).

Beside population density estimates of Milton and Mittermeier (1977) and Méndez-Carvajal (2012), little is known about the ecology and genetic structure of *C. c. imitator* on Coiba Island. Their low density (Méndez-Carvajal 2012) combined with presence of albinism on Coiba Island emphasizes that further research is needed to understand the genetic structure of this population. Genetic research is especially needed to assess the long-term viability of this population and build upon ongoing primate monitoring on Coiba Island (Méndez-Carvajal, 2012). Research on this population could also increase overall knowledge of the prevalence, causes, and fitness consequences of albinism in wild animal populations.

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3ER SIMPOSIO "PRIMATOLOGÍA EN EL PERÚ"

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El gran éxito del 1° y 2° simposio "Primatología en el Perú", realizados en 2011 en Lima (Cornejo & Heymann 2011) y en 2013 en Iquitos nos motivó a organizar otro simposio, que se realizó del 20 al 23 octubre 2015 en las instalaciones de la Universidad Nacional Amazónica de Madre de Dios (UNAMAD) en Puerto Maldonado, ciudad ubicada en una región (Madre de Dios) que es un "hotspot" de biodiversidad en general y de primates en particular; era el lugar indicado para llevar a cabo el 3er simposio. Así como en los simposios anteriores, este no solo atrajo científicos y estudiantes peruanos, sino también de Colombia, Ecuador, México, EE.UU., España, Inglaterra, Italia y Alemania, y contó con más de 200 participantes.

El simposio fue inaugurado el 20 de octubre con palabras de bienvenida del Dr. Miguel Nicolás Peralta Rosario, rector de la UNAMAD, y los organizadores principales, Fanny M. Cornejo Fernández y Eckhard W. Heymann. En un discurso de bienvenida, Patricia C. Wright (Stony Brook University, New York, EE.UU.) recapituló sus experiencias cuando realizó uno de los primeros estudios primatológicos de campo en el Perú y el primero sobre monos nocturnos, en 1980-1982 en la Estación Biológica Cocha Cashu, y compartió sus experiencas en establecer un programa de investigación y conservación de primates en Madagascar. La inauguración fue completada con una conferencia magistral a cargo de Anthony B. Rylands (Conservation International, New York, EE.UU.) sobre la importancia de la taxonomía para la conservación de los primates neotropicales.

Como en los simposios anteriores, contamos con invitados científicos de reconocimiento internacional para impartir las conferencias magistrales. Leandro Jerusalinsky (Centro Nacional de Pesquisa e Conservação de Primates Brasileiros, João Pessoa, Brasil) expusó sobre los avances y desafíos en la conservación de primates en Brasil. Varun Swamy (San Diego Global Institute for Conservation Research, San Diego, EE.UU.) enfatizó la importancia de los primates en la regeneración de bosques amazónicos y reseñó los impactos negativos de la caza de primates para la regeneración. Liliana Cortés-Ortiz (University of Michigan, Ann Arbor, EE.UU.) presentó resultados de los primeros estudios sobre la diversidad genética en los monos aulladores rojos del Perú. Laura K. Marsh (Global Conservation Institute, Santa Fé, EE.UU.) actualizó el estado de conocimiento sobre los efectos de fragmentación sobre poblaciones de primates. Andrés Link (Universidad de Los Andes, Bogotá, Colombia) resumió e integró los conocimientos sobre competencia y cooperación en monos arañas.

Durante del simposio se hicieron 20 presentaciones orales y 23 en posters. Las mejores presentaciones orales ("Premio Pekka Soini") y posters ("Premio Jaime Moro Sommo") de estudiantes y científicos jóvenes fueron premiadas con los libros "Primates in Fragments" de Laura K. Marsh, donados por Springer Science+Business Media, y "The Smallest Anthropoids" de Susan M. Ford, Leila M. Porter y Lesa C. Davis, donados por Leila M. Porter. Además, el primer puesto en posters fue premiado con un viaje de 4 días al Refugio Amazonas, y el de presentaciones orales, con un