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Source: Tropical Conservation Science, 6(4) : 584-591

Published By: SAGE Publishing

URL: https://doi.org/10.1177/194008291300600409

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Short communication

Large- and medium-sized mammal survey using camera traps in the Sikre River in the Río Plátano Biosphere Reserve, Honduras

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Abstract

Large mammals are elusive, often nocturnal, and therefore difficult to study. In many parks, reserves, agriculture lands, and other human-dominated landscapes, mammalian abundance is unknown despite their importance to ecosystems. The Río Plátano Biosphere Reserve of eastern Honduras has been the site of much research, but many rivers within the reserve have not been surveyed for mammalian diversity. In this study we used camera traps to survey an area of 70 km^2 along the Sikre River for mammals in both broad-leaf forest and pine savanna. 2,040 trap-nights yielded 116 captures in total. Fourteen mammal, three bird, and one reptile species were photographed in the broad-leaf forest, while none of the four camera stations in the pine savanna captured animals on film. The tapir (*Tapirus bairdii*) was the most frequently captured species. We also captured four photographs of at least two individuals of the giant anteater (*Myrmecophaga tridactyla*), a species considered the most threatened mammal in Central America. Of the felids, *Puma concolor* and *Leopardus pardalis* were each captured on five photographs each, while *Panthera onca* was only captured once during a preliminary pilot survey in 2007. The results suggest the study site hosts a species richness of large- and medium-sized mammals that is comparable to other sites in Central and South America.

Keywords: conservation, giant anteater, Honduras, La Moskitia, *Leopardus, Myrmecophaga tridactyla, Panthera*, *Puma,* Río Plátano, *Tapirus*

Received: 19 March 2013; Accepted: 20 June 2013; Published: 30 September 2013.

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Cite this paper as: Gonthier, D. J. and Castañeda, F. E. 2013. Large- and medium-sized mammal survey using camera traps in the Sikre River in the Río Plátano Biosphere Reserve, Honduras. *Tropical Conservation Science.* Vol. 6(4):584-591. Available online: www.tropicalconservationscience.org

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Introduction

Large mammals are important ecological components of forests for their role in seed dispersal, seed predation, habitat modification, regulation of plant species populations, and mediation of forest composition and dynamics [1-2]. In areas where high hunting pressure has eliminated forest mammals, documentation of shifts in forest communities now underscores the need to conserve mammals within forests worldwide [2-3]. Unfortunately, it is difficult to observe large mammals, let alone to manage them.

Estimating population sizes and documenting the presence of large- and medium-sized mammals are difficult due to their nocturnal habits and avoidance of human presence. Researchers have used transect count and record of tracks and prints to estimate population size [3-5]. More recently, camera-traps have been used to capture photographs of large mammals as they cross in front of un-manned cameras [6-8]. This technique has served to estimate population sizes for many felid species in Asia, Africa, and the Neotropics [6-8]. Camera-traps are especially important in biosphere reserves, national parks, and multiple-use reserves where human settlement coexists within a mosaic of tropical forest and agricultural landscapes. Camera-trap techniques can be a vital tool to confirm the presence of large mammals that might be under pressure from exploitation, habitat loss, and fragmentation [1,9].

The Rio Plátano Biosphere Reserve (RPBR) covers a diverse and vast amount of land, but few studies have documented mammalian diversity in most of this landscape. The RPBR was established by the Honduran State in 1980 and it joined the UNESCO list of World Heritage Places in 1982. It is connected with other protected areas of Honduras and Nicaragua at the heart of the Mesoamerican Biological Corridor [10]. There are five indigenous groups living in the reserve: Miskitos, Pech, Tawahkas, Garifunas and Mestizos. The RPBR also has a diverse range of habitat types, including tropical lowland forest, pine savanna, coastal wetlands, and mangroves. These habitats are spread over three main river basins: the Río Patuca Basin, Río Sico Basin, and Río Plátano Basin. Within these habitats, over 127 species of mammals have been recorded, representing 56% of the 226 mammal species documented in Honduras [11-12]. All five species of wild cats known in Honduras are found, along with three primate species and the largest mammal in the Neotropics, the tapir (*Tapirus bairdii*). Thus the RPBR, covering 8,300 km^2, represents a complex political, social, and ecological landscape in which much area is undocumented for large mammals. In this study, we use a camera trap survey to explore the diversity of large mammals captured on film from the seldom-visited Sikre River Basin. We find the study site hosts a species richness of large- and medium-sized mammals that is comparable to other sites in Central and South America.

Methods

The study site was located in the Sikre River Basin east of the Río Plátano and west of the Río Patuca (Fig. 1). This area receives annual precipitation ranging between 2,000 and 4,000 mm, which falls in the rainy season from June to November. During May 2008 we installed 48 camera traps in 19 two-camera stations and 10 one-camera stations along wildlife trails, near creeks, other waterways, ditches, and especially in pathways with clear evidence of use by wildlife. Each station was treated as an independent sampling location. At each station with two cameras, camera pairs were placed facing one another. We set all cameras to a height of about 0.5 m above the ground, and stations were separated by 2 km. Most cameras were placed in the broadleaf lowland forest near to the river, but four two-camera stations were placed in the pine savanna, in thickets of dense palms that appeared heavily used by *Odocoileus*

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virginianus. The study site covered a minimum polygon area of 70 km^2 (Figure 1). The cameras used were Deercam and CamTracker models. Cameras were operating 24h a day and were checked approximately every two to three weeks to replace film and batteries. All fieldwork was carried out between May 12 and August 25 in 2008. To analyze capture data, we calculated the number of photos captured per 1,000 camera trap nights for each species for which at least one capture was made. This statistic allowed for comparison of mammalian trap rates reported in other studies.

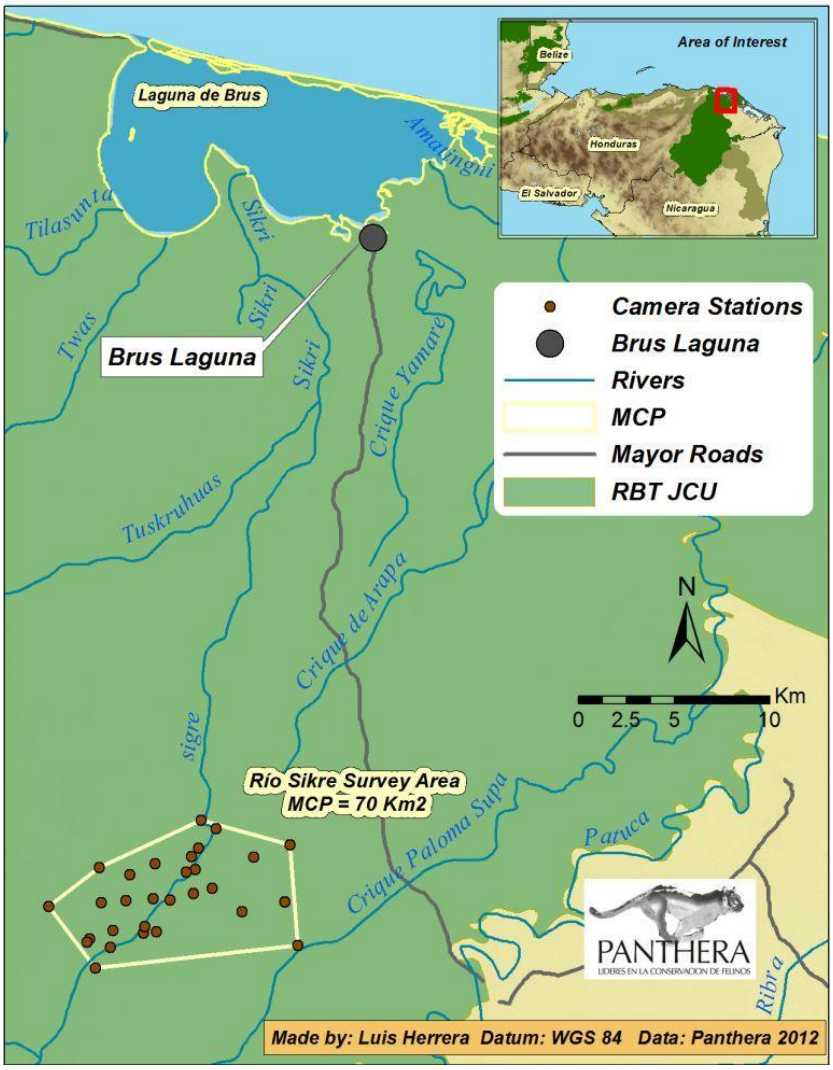


Fig. 1. Map of eastern Honduras and the study sites with the camera station locations (Credits: Luis Herrera). Minimum Convex Polygon (MCP); Reserva de Biosfera Transfronteriza Jaguar Conservation Unit (RBT JCU).

Results

The total field effort yielded 2,040 trap-nights. A total of 116 photograph captures were recorded, including fourteen mammal species (101 captures), three bird species (14 captures), and one reptile species (1 capture) (Table 1). Unfortunately, in most cases it was not possible to distinguish between captured individuals within species. All photographs were captured in the broad-leaf forest habitat along the Sikre River, with none of the 8 cameras in the pine savannas capturing photographs of animals. The species with the highest frequency were tapir (*Tapirus bairdii*) with 33 captures, followed by the Central American Agouti (*Dasyprocta punctata*) with 18 captures, and the white-nosed coati (*Nasua narica*) with

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ten captures. Interestingly, four photographs, of at least two unique individuals, of the giant anteater (*Myrmecophaga tridactyla*) were captured (Figure 2). Of all the large cats, five photographs of both puma (*Panthera concolor*) (Figure 3) and ocelot (at least two individuals; *Leopardus pardalis*) (Figure 4) were captured. We also documented scat, footprints, and visual observation of jaguar (*Panthera onca*) and visual observations of jaguarundi (*Herpailurus yaguarondi*) and margay (*Leopardus wiedi*), but these felids were not captured on film during the current study. However, during a pilot study in 2007, we captured a photograph of a jaguar; it should be noted as one of the first photographs of a jaguar filmed in the wild in Honduras (Figure 5).

Table 1. Species captured on photography using cameras traps in broad-leave forest and pine savanna near the Sikre River[†].

Scientific name	Common name	Captures	Frequency*
Didelphis sp.	Opossum sp.	7	3.4
Myrmecophaga tridactyla	Giant Anteater	4	2
Dasypus novemcinctus	Nine-banded Armadillo	1	0.5
Dasyprocta punctata	Central American Agouti	18	8.8
Agouti paca	Paca	1	0.5
Nasua narica	White-nosed Coati	10	4.9
Eira barbara	Tayra	1	0.5
Conepatus semistriatus	Striped hog-nosed skunk	1	0.5
Puma concolor	Puma	5	2.5
Leopardus pardalis	Ocelot	5	2.5
Tayassu tajacu	Collared Peccary	7	3.4
Tapirus bairdii	Baird's Tapir	33	16.2
Mazama temama	Central American Red Brocket	1	0.5
Odocoileus virginianus	White-tailed deer	7	3.4
Tigrisoma mexicanum	Bare-throated Tiger heron	2	1
Crax rubra	Great curassow	9	4.4
Aramides cajanea	Grey-necked wood-rail	3	1.5
Iguana iguana	Green iguana	1	0.5

*Frequency calculated as the number of captures per 1000 nights per camera trap.
[†]All captures were made in the broad-leaf forest.

Discussion

This study documents a species richness of large- and medium-sized mammals in the broad-leaf forest habitats of the Sikre River that is comparable to richness reported in other studies in the Neotropics [3,5,13-22] (Table 2). The 14 species captured (richness) in the current study are only just below the average richness reported in other studies (average 17.2). However, the number of photographs captured per trap-day (0.05) was low compared to the average among studies (0.224). Given the intermediate level of species richness and low capture rate of this study, the ratio of species/capture rates was the second highest of all studies. A high richness to capture ratio indicates that there may be a number of species at the study site that are un-represented in our survey. Captures per camera trap night were high for some species and low for other species compared to frequencies reported in other

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studies within Central and South America. For instance, in the Brazilian Pantanal, *P. concolor* and *L. pardalis* had very high trapping rates (per 1,000 nights) on roads, but a trapping rate of only 4.1 on trails [13], compared to those reported in this study for *P. concolor* and *L. pardalis* (2.5 trapping rate). *Dasypus novemcinctus* was captured at a much lower rate (0.5 trapping rate) in the Sikre River area than in the Pantanal, where *Dasypus* spp. had capture rates (per 1,000 nights) of 7.7 for roads and 12.3 for trails [13]. When the frequencies of camera-trappings recorded in this study are compared to those in a study of primary Amazonian rainforest in Peru, *Didelphis* spp., *Dasypus* spp., paca spp., and *T. tajacu* were all more frequently captured in the Amazon than in our study [3]. However, *M. tridactyla,* the giant anteater, was captured at more than twice the rate in our study than in the Peruvian study [3].

Table 2. Comparison of richness, captures, and effort across studies.

Site	Richness	Captures	Species /capture	Trap-days*	Captures/ Trap-days	Reference
Jataí Ecological Station, Brazil	6	17	0.353	100	0.170	[14]
Pagaibamba and San Lorenzo Forests, Peru	8	313	0.026	3266	0.096	[15]
Fragmented Tapiraí and Piedade Forests, Brazil	12	1702	0.007	-	-	[16]
La Moskitia Forests, Honduras	14	101	0.139	2040	0.050	Current study
Caxiuanã National Forest, Brazil	15	236	0.064	2838	0.083	[17]
Pantanal, Brazil	16	250	0.064	450	0.556	[5]
Emas National Park, Brazil	17	-	-	1035	-	[18]
Biosphere Reserve of the Sierra de Manantlán, México	17	372	0.046	1156	0.322	[19]
Urucu basin, Brazil	17	-	-	768	-	[20]
National Reserve of the Sierra Nanchititla, Mexico	19	592	0.032	4440	0.133	[21]
Amazonian moist forest, Peru	21	508	0.041	1440	0.353	[3][1]
Patanal, Brazil	24	-	-	504	-	[13]
Amazonian moist forest, Peru	27	814	0.033	2340	0.348	[3][2]
Cantão State Park, Brazil	34	1006	0.034	7929	0.127	[22]

[1]2005 survey in [3]
[2]2006 survey in [3]
*Defined as camera trap-days or -nights

Indeed, a major finding of this study is the documentation of the giant anteater; we record one of the first photographs of this animal in the wild in Honduras. This species is considered the most threatened mammal in Central America and was thought extirpated from Belize, Guatemala, and even Costa Rica [23]. The results of this study concur with the results of other studies [24-25] that suggest that the giant anteater is more common in Honduras than previously suspected. Other recent studies have also found evidence of *M. tridactyla* in the Honduran Moskitia, specifically in departments of Colon, Gracias a Dios, and Olancho [26]. Together, these studies suggest this species may be widely distributed throughout eastern Honduras.

No photographs of jaguars were captured in this study, although a photograph was captured during the pilot study [27]. Jaguar tracks, scat, and even a visual observation were recorded along the trails and muddy banks. One possible reason we did not capture a jaguar on film could be that jaguar have low density on this particular river, therefore the probability of capturing an individual on film was low.

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Another reason could be that this particular region of the river also lacked man-made trails, which are features commonly used by jaguars in much of the region (Castañeda Personal Observation).

We expected that the pine savanna would yield richness and capture rates of mammals lower than the forest, but the absence of any captures was unexpected, given the presence of deer tracks and paths throughout the palm thickets where the camera stations were mounted. The lack of captures was probably largely due to the small sample size of cameras placed in the savannas.



Fig. 2. Giant anteater (*Myrmecophaga tridactyla*) captured on film in broad-leaf forest near the Sikre River. Photo credits: Franklin E. Castañeda.



Fig. 3. Puma (*Panthera concolor*) captured on film in broad-leaf forest near the Sikre River. Photo credits: Franklin E. Castañeda.



Fig. 4. Ocelot (*Leopardus pardalis*) captured on film in broad-leaf forest near the Sikre River. Photo credits: Franklin E. Castañeda.



Fig. 5. Jaguar (*Panthera onca*) captured on film in broad-leaf forest near the Sikre River during a pilot study in 2007. Photo credits: Franklin E. Castañeda.

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Implications for conservation

This study documents a species richness of large- and medium-sized mammals in the broad-leaf forest habitats of the Sikre River that is comparable to richness found in other studies in the Neotropics [3,5,13-22]. Some of the species captured, particularly the giant anteater, are rare and vulnerable in Central America [23]. The conservation of populations on this river is not only important in maintaining local sub-populations of species, but also meta-populations throughout the larger RPBR and the Meso-American Corridor. However, monitoring and maintaining mammalian biodiversity in multi-use Biosphere preserves, like the RPBR, is a central challenge for conservation. Indeed, a large number of hunting rafts and camps were observed in the study site during the study. How to prevent over-exploitation of natural resources while still allowing hunting access to the river will be a difficult balance. This study provides a first inventory of the large- and medium-sized mammalian species captured on film. Future studies should use this inventory to evaluate human impacts on mammalian biodiversity at this location.

Acknowledgments

We thank the personnel of WCS including J. Polisar, R. Salom, L. Maffei, and L. Herrera for their support in the logistics and technical issues. We also thank our local guide Lenin Guardado and the National University student Mario Solis for field assistance, and Ing. Ivonne Oviedo from AFE-COHDEFOR for her logistical support in this research. We thank A. Jacobson for comments and critiques of earlier versions of this manuscript. Finally we thank the communities of Brus Laguna and Wawina for valuable discussion and permission to work within their forests. Funding for this research was provided by the Wildlife Conservation Society.

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