

Evaluating the anthropogenic impact on spider monkeys (*Ateles geoffroyi*) in the inland area of the Riviera Maya, Mexico

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The Northeastern part of the Yucatan Peninsula in Mexico has recently turned into an important region to study the effects of shared habitats between humans and non-human primates. As the environment is undergoing rapid changes due to extreme expansion of the tourism industry and urbanization spreading from coastal regions (the “Riviera Maya”) to the inland area, Geoffroy’s spider monkeys (*Ateles geoffroyi*) are facing various forms of habitat loss, habitat fragmentation and habitat modification. My project evaluated how anthropogenic factors impact Geoffroy’s spider monkeys in this high conservation priority area.

My research was conducted in a semi-evergreen, medium-height tropical forest in the inland area of the “Riviera Maya” at the Yucatan Peninsula, Mexico. The study site stretches for about 400 km² from a developing coastal town (Puerto Morelos, 20° 51' 13" N, 86° 53' 55" W) to a rural inland village (Leona Vicario, 20° 59' 20" N, 87° 12' 10" W) (Figure 1). In between these human settlements, a lot of tourist operators provide popular activities from ziplining to ATV tours (Figure 1).

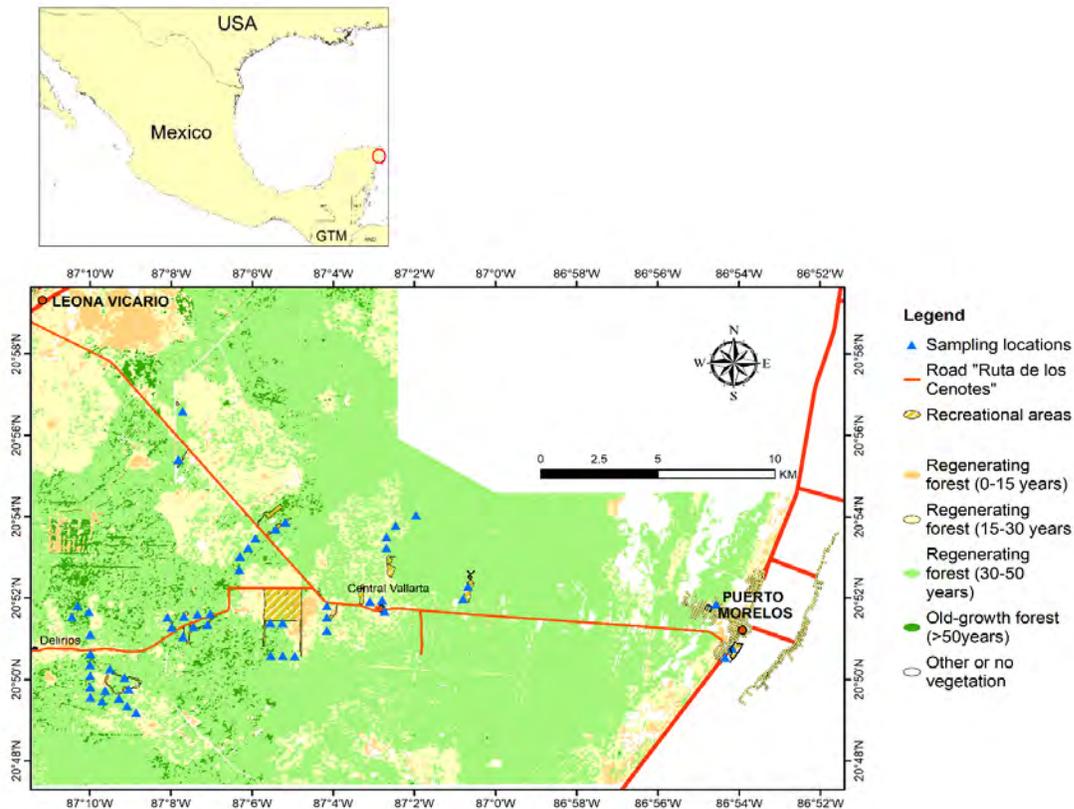


Figure 1. The study in the inland area of the Riviera Maya, Quintana Roo, Mexico. The site stretches across the municipality of Puerto Morelos between the town of Puerto Morelos and the village of Leona Vicario.

Non-human primate surveys

Point-count sampling and passive acoustic monitoring (PAM) were used to determine the absence or presence of Geoffroy's spider monkeys during repeated surveys which took place between August 2018 and January 2020. A total of 53 sampling locations were placed systematically in areas which showed different combinations of anthropogenic and environmental characteristics.

The survey effort totaled 106 hours of point-transect sampling and 7,632 hours of PAM. We calculated an average abundance of $\mu = 0.86$ spider monkeys per sampling location

using Royle-Nichols models and an occupancy probability of $\Psi = 0.53$ using single-season occupancy models.

Vegetation survey

Vegetation plots were set up as a circular area of 20 m radius around each point-count centre. All trees within these plots with a diameter at breast height (DBH) greater than 20 cm were measured and identified at the species level.

The mean density was 124.6 trees/ha (range 7.9 – 294.4) for food trees and 22.1 trees/ha (range 0.0 – 63.6) for potential sleeping trees.

Spatial assessment of further variables

The amount of forest loss, the overall size of recreational areas and the length of roads was calculated within buffer zones of 100m, 500m and 1000m around each point-count center. The mean forest loss was 3-4 % for all buffer zones. Recreational areas with low tourist abundance covered more area than recreational areas with high tourist abundance throughout all buffer zones (mean 3,299.5 m² versus 178.4 m² within 100m-buffer zones; 38,913.6 m² versus 4478.2 m² within 500m-buffer zones; 108,463.6 m² versus 20,983.1 m² within 1000m-buffer zones). Unpaved roads covered more length than paved roads within 100m-buffer zones (mean 43.3m versus 8.7m) and within 1000m-buffer zones (1,313.5m versus 932.3m), but not within 500m-buffer zones (443.2m versus 454.4m).

Anthropogenic noise pollution

Wildlife Acoustic SM4 recording devices were used to record the sound of the environment during six continuous 24-hour periods at each point-count location. Noise intensities were averaged across recording periods for each sampling location. Noise intensities positively correlated with the length of paved roads within buffer zones around the sampling locations ($r = 0.77$; $p < 0.001$ for 100 m buffers, $r = 0.49$; $p < 0.001$ for 500 m buffers, $r = 0.46$; $p < 0.001$ for 1000 m buffers).

Conclusions

The overall few detections of monkeys during point-count surveys and during the passive acoustic monitoring across the study site suggest a low density of Geoffroy's spider monkeys in the inland area of the Riviera Maya of the Yucatan Peninsula of Mexico. My preliminary results indicate that the presence of paved roads and areas for recreational activities with a high tourist abundance affect spider monkey abundance, but that these effects are not explained by the anthropogenic noise pollution.

The complete preservation of continuous mature forest as a conservation strategy might not always be a realistic approach, especially in regions where the economic benefit of modifying natural landscapes is as great as in the inland area of the Riviera Maya. Therefore, detailed knowledge on how different types of anthropogenic disturbance impact animal populations is necessary to find ways of combining primate conservation efforts and economic interests. This study aimed to gather such detailed knowledge. Once preliminary results are confirmed, appropriate conservation strategies will be developed and recommended to ensure the viability of Geoffroy's spider monkey in the inland area of the Riviera Maya.



Spider monkeys live high up in the tree canopy of the tropical forests between Mexico and Bolivia. Geoffroy's spider monkey is the northernmost of them.



Some of the main threats to Geoffroy's spider monkeys at the Yucatan Peninsula include deforestation, forest fragmentation and forest degradation. Often, areas are clear-cut or burned for the expansion of settlements or the constructions of road.

By the use of passive acoustic monitoring we estimated the occupancy and relative abundance of Geoffroy's spider monkeys and the anthropogenic noise pollution in the forests of the inland area of the "Riviera Maya".



Sometimes, we would find signs of illegal activities such as hunting or logging on our way to point-count locations.



Whenever I had the chance, I informed the local people about the conservation state of spider monkeys in the region. For example, in an interview at the local radio station.

Over the project period, I had the pleasure to work with many amazing people who helped me to find monkeys, identify trees, create vegetation maps and who made field work a whole lot of fun.



Thank you PSGB for supporting the conservation of Geoffroy's spider monkeys at the Yucatan Peninsula of Mexico!