Examining Vertebrate Composition in a Mosaic Landscape at Batipa Peninsula

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Introduction

- Human activity tends to change the physical features of the environment. Leading to a loss of biodiversity and changes in dominant species, keystone species, ecological engineers and the interaction between them (Naeem et al., 2004)
- One strategy that has emerged to combat environmental issues such as climate change, soil erosion, and biodiversity loss through reforestation initiatives are tree plantations. However, large-scale tree plantation are not good for wildlife when compared to primary forests (Wang et al., 2022).
- The establishment of biological corridors has been proven to be a fundamental strategy for species conservation, as they connect various habitats and ensure the continuity of biological processes. These corridors serve as vital sources of biodiversity within fragmented landscapes (Canet-Desanti et.al. 2012).
- Our objective was to determine the composition vertebrates in a mosaic landscape, compose of mature forest, corridors and plantation of different ages.

Hypothesis

The older forest will exhibit greater vertebrate composition than the younger regrown areas of the mosaic landscape.

Methodology

Study Site

The Batipa Agroforestal Development is located on the Pacific slope in western Panama. It covers 4,000 hectares, including teak plantations, mature forests, corridors, pastures, and mangroves. The elevations range from 0 to 325 meters and has an average annual temperature of 27.5°C and 2767 mm of rainfall.

Camera Trapping

We set 16 camera traps as follows:

- Two in the four-year teak plantation
- four in the Mature Forest
- four in the nine-year teak plantation
- One in a corridor
- Three in the one-year teak plantation
- Two at the 19-year teak plantation

(Figure 1.).

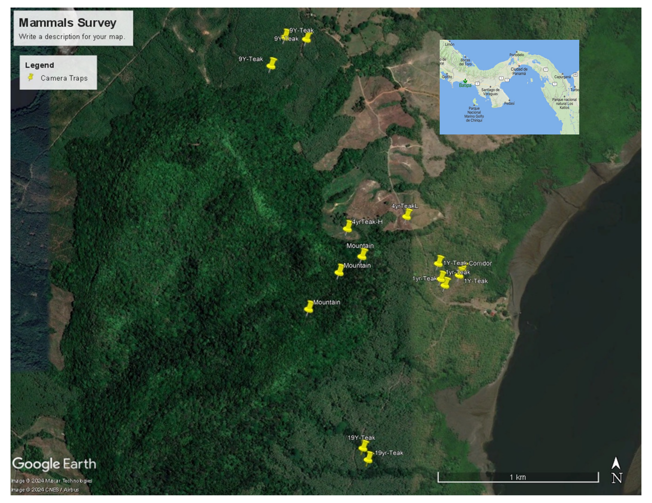

Figure 1. Camera traps distribution for vertebrate detection survey

All cameras were set at one meter high and camara models used were Meidase model SL122 (Meidase,USA) and Meidase model no.:BTC-6HD-940.

Figure 2. Research group setting up camera traps.

Bird Point Count Survey

The point count survey method was employed to estimate bird composition. The habitats studied were mature forest, nine-year-teak plantation and one-year teak plantation. At each site, three points with a 200m separation were marked using measuring tape and flagging (Figure 4). Surveys were conducted for three consecutive days from 6:00 AM to 8:00 AM. At each point, a 5-minute acclimation period was followed by a 15-minute survey. Birds were categorized by its call, and the numbers of birds calling were documented during the sampling period. In addition, to produce a list of birds, we opportunistically documented and identify birds using the Birds of Panama field guide (Angehr and Dean, 2010).

Cont. Methodology

Amphibians and Reptiles Opportunistic Observations

All amphibians and reptiles observed, over a period of four consecutive days, were documented using a Garmin Index 20 and photographs were taken to aid in identifying the species to the lowest possible taxonomic level.

Figure 3. (A) Amphibian and Reptile Observation (B) Bird Observation

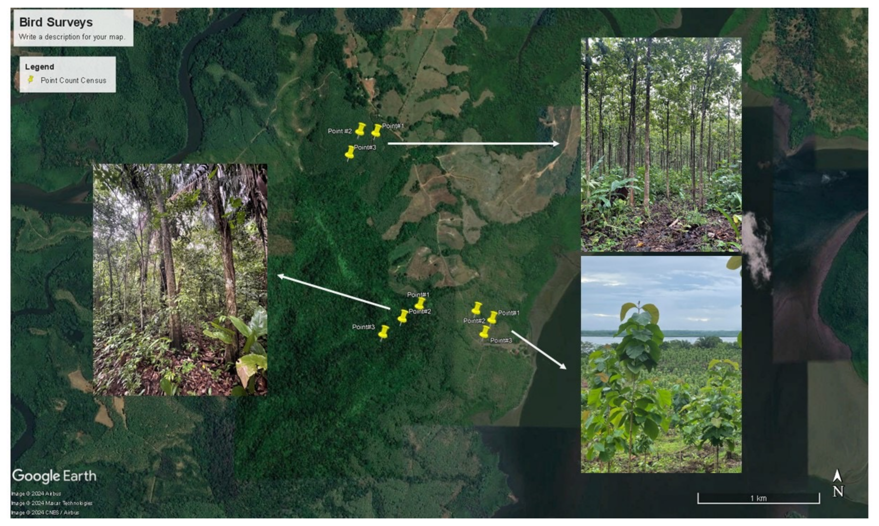

Figure 4. Distribution for point count distribution for bird surveys.

Results

Camera Trapping

A total of 120 camera hours were sampled. During this period, six photographs of three mammal species and sixteen photographs of two bird species (males and females) were documented (Figure 5).

Figure 5. (A) Lanced-tailed Manikin, *Chiroxiphia lanceolata*; (B) *Dasyprocta sp.*; (C) White-tailed deer, *Odocoileus virginianus*; (D) Unknown species of mammal.

In addition, we documented opportunistically some species of mammals (Figure 6).

Figure 6. (A) White-faced monkeys, *Cebus imitator*; (B) Howler monkeys, *Alouatta palliata*; (C) Deer tracks (White-tailed deer, *Odocoileus virginianus*).

Bird Point Count Survey

The mature forest habitat exhibited the highest number of bird calls, with an average of 9.67 and the one-year plantation showed the lowest with 0.2 (Figure 7). We compare the number of different calls detected during the census and the mature forests was the one with the highest representation of different calls (One-way Anova, F=45.58,df=2 p=6.173E-09). A Tukey test was used to identify the groups that were different (Table 1). In addition, we compare the number of birds counted during the surveys and the mature forest was the one with significant numbers (One-way Anova, F=26,28,df=2 p=8.94E-07).

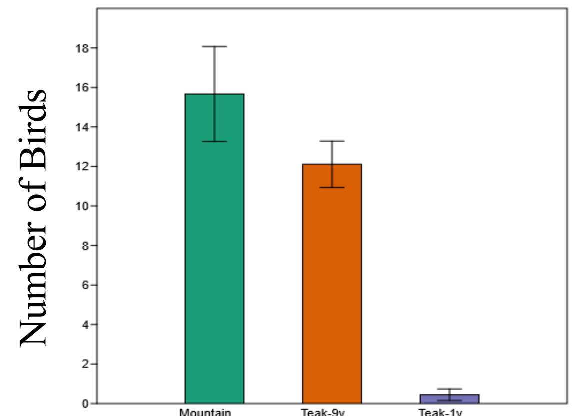

Figure 7. Number of Birds per Site

	Bird calls-Mou	Bird calls-9Year	Bird calls-1Year
Bird calls-Mou		0.01351	5.115E-09
Bird calls-9Year	4.364		4.987E-06
Bird calls-1Year	13.25	8.884	

Table 1. Tukey test results for the One-way ANOVA, pink color = significant results

Amphibians and Reptiles Opportunistic Observations

Over the course of 18 hours of opportunistic observations, we documented three species of amphibians and eight species of reptiles (Figure 8 and 9).

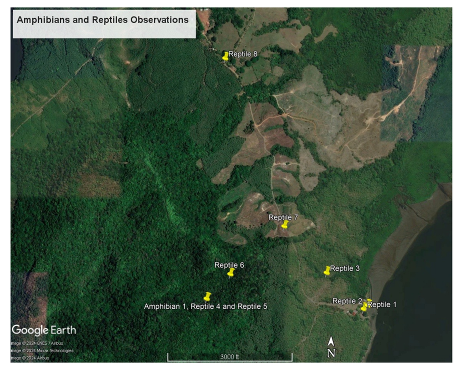

Figure 8. Distribution of observations of amphibians and reptiles

Cont. Results

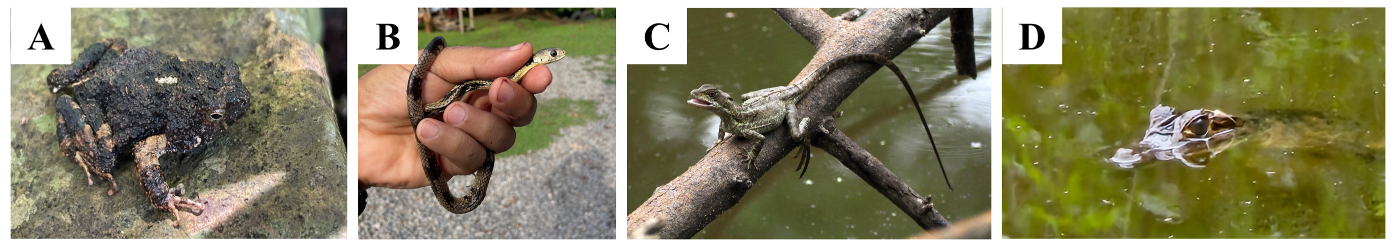

Figure 9. (A) *Bufo sp.*; (B) *Spilotes pullatus; (C) Basiliscus basiliscus;* (D) *Caiman crocodilus*

Discussion

The comparison between the 2017 camera trapping study and our survey at Batipa Peninsula, provides valuable insights into the region's biodiversity dynamics. In 2017, utilizing six cameras over a year sampling period, researchers documented nine different species, while our survey, employing 16 cameras outside the previously sample sites documented 30% of the species previously known. This findings may suggest the presence of temporal changes indicating shifts in habitat quality or ecological factors.

Our results showed that the 1-year teak plantation is not used by birds. We were able to observe an average of 26.9 birds using the areas around the plantation. Previous studies have documented that the properties of a matrix in the landscape may influence the resources available and the connectivity (dispersal) of different bird species (Watson et. al 2005).

Conclusions

- We can conclude that although our camera traps did not detect many species the study expands the distribution records for the ones detected.
- Within the fragmented landscape birds were more detected at the areas with mature forest.
- For amphibians and reptiles our study provides the baseline group of locations for the distribution of the species
- In conclusion, older forest exhibits greater vertebrate composition within the mosaic landscape

Future Work

- Increase the number of cameras deployed in each area, include baiting and expand the sampling period
- Establish permanent bird census plots and implement the use of mist nest.
- Use a combination of methos for amphibians and reptile surveys

Work Cited

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