

## Background

- Ichthyochory (Ick-the-ah-cory) is the process by which fruit is consumed by fish species and viable seeds are deposited in a separate location as the fish moves in its aquatic ecosystem.
- Beginning in the 1960's Brazil has made heavy investments in hydroelectric power, with recent completion of several megadams.
- Man-made dams have adverse effects on the ecosystems of rivers, and recent political turmoil has brought the future of Brazil's dam construction into question.

## Objectives

- This project reviews the known impacts of dams on ecosystems and how they could be affecting ichthyochory in addition to examining Brazil's current and future direction regarding dams.
- This work is an expansion of a research project completed in June 2018 with the intent of better informing a manuscript intended for publication

## Methods Pt. 1

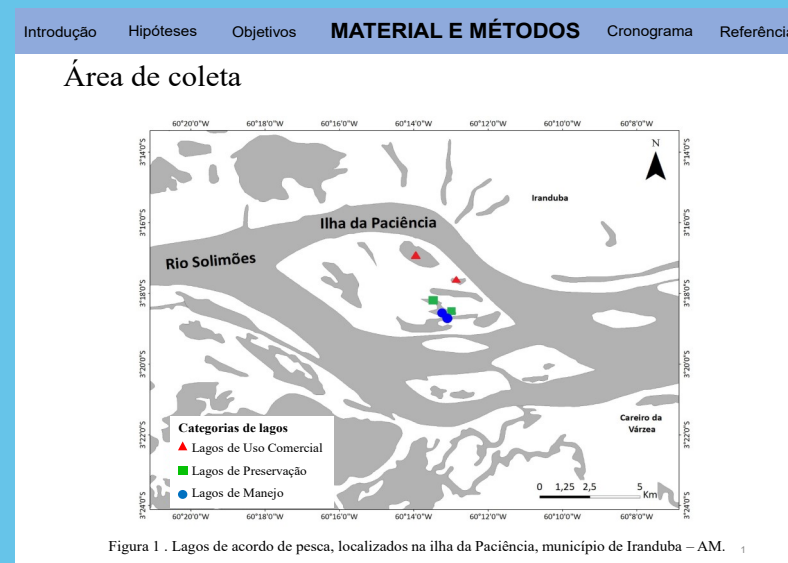
The collection period took place over 3 days in the Brazilian Amazon during the high water season in June 2018. Setting the gillnets occurred in the morning and evenings. The first two lakes listed prohibit all fishing, the two Arapaima sp. Lakes only allow locals fishing rights, and commercial lakes are open access.

### 6 Floodplain Lakes

1. Baixo (No Fishing)
2. Cacau (No Fishing)
3. Sacambu (Arapaima sp.)
4. Preto (Arapaima sp.)
5. Pacao (Commercial)
6. Piranha (Commercial)

### Field Collection Numbers

- 7 individual collections using gillnets
- 417 individual fish specimens
- 143 confirmed omnivorous fish specimens
- 26 different species of observed fruit (Identified to level of highest confidence, typically family)



## Methods Pt. 2

The literary review for my project consisted of looking through primary literature relating to:

- Dam Impacts on:
  - Flow Regime
  - Habitat Structure
  - Migration
  - Susceptibility to Invasive Species
- Current Events in Brazil on:
  - Corruption
  - Dam Construction
  - Conservation



Seeds collected from several different fish species. Note size and variety differences between specimens

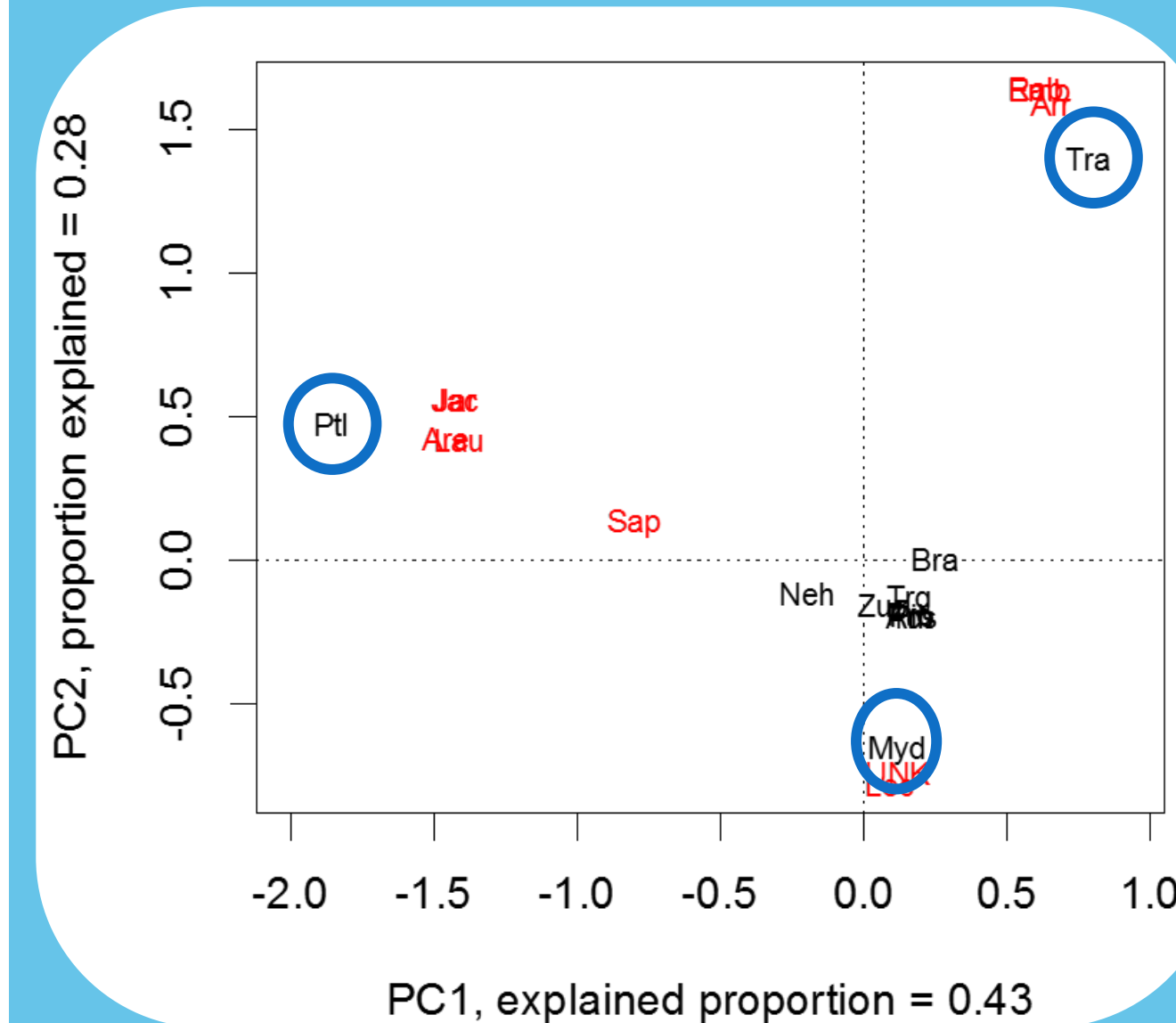


Pterodoras Lentiginosus

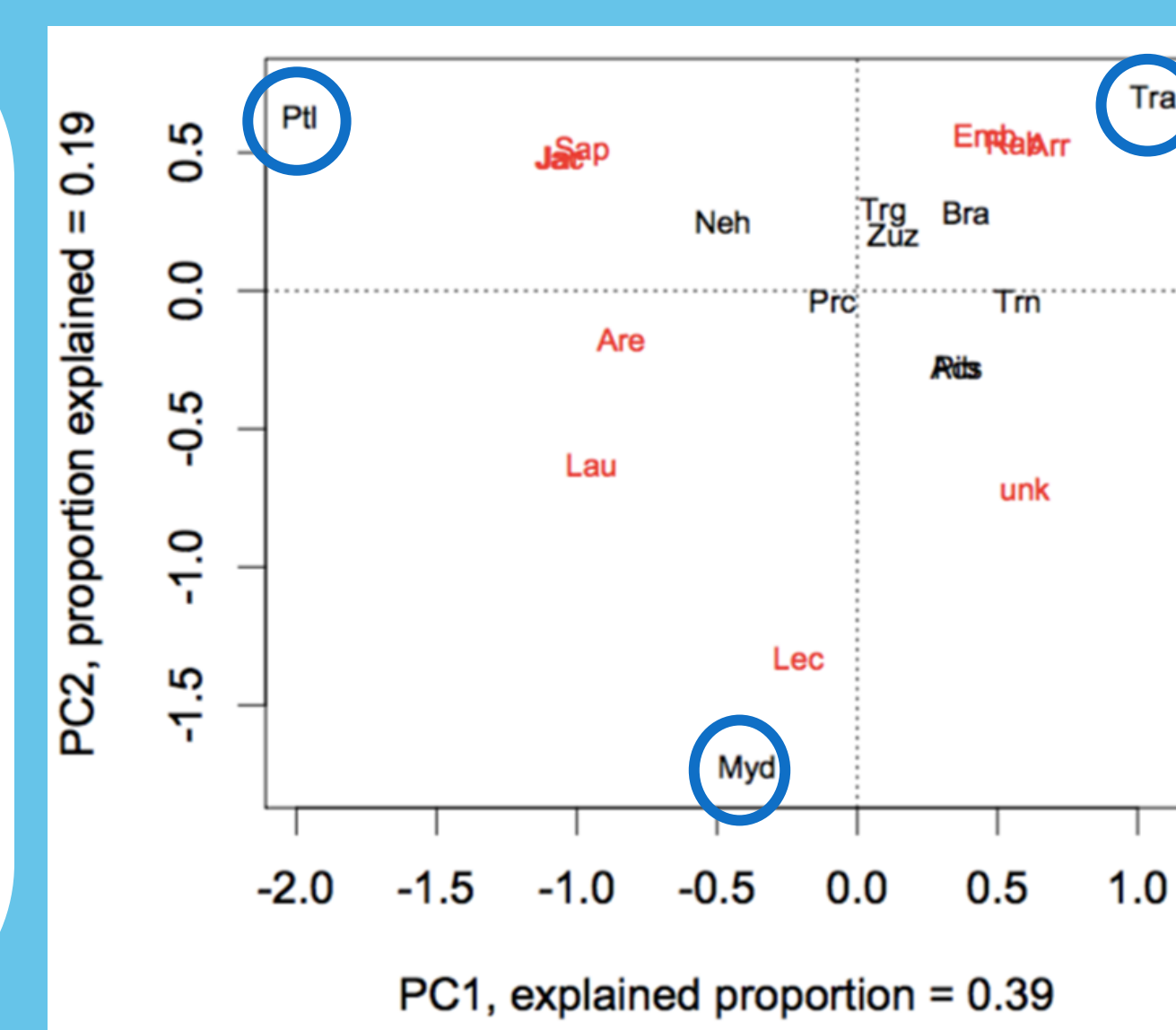
## Empirical Results

- 43 individual fish specimens were found to have fruit material in their stomachs
- Fish species *Triporthus albus* and *Mylossoma duriventre* accounted for over half of all frugivorous individuals
- *P. lentiginosus* consumed the greatest variety of seed species and accounted for the greatest amount of biomass consumed
- The majority of seeds collected from *P. lentiginosus* were found intact, contrasting with those found in *M. duriventre*.
- PCA for presence/absence showed a 71% variance explanation for PC1+PC2
- PCA for biomass yielded a 58% variance explanation for PC1+PC2

### Seed Presence/Absence PCA



### Seed Biomass PCA



Figures 1 and 2: Figure 1 depicts seed presence/absence. PC1 +PC2=71% of variation in data. Figure 2 depicts seed biomass. PC1+PC2=58% of variation in data. Seed descriptors of arecaceae, lauraceae, jacitariae and saptotaceae are all in the same quadrant for Figure 1.

## Literary Review Findings

### Belo Monte Dam



### Scandal



### Corruption scandals have wracked Brazil

- Construction company ordered to pay \$2.6 billion in fines
- Operation Car Wash has indicted 100's of politicians
- Construction company awarded large contracts to build dams

### President Jair Bolsonaro



### Focused on anti-corruption during campaign:

- Guns, Cows and Bibles

## Conclusions

### Dam construction in the Amazon could have the following effects on ichthyochory:

- Change in flood pulse dynamics, which is a process organisms have tuned life events to like migration and fruit bearing.
- The disrupted connectivity and entrainment of organisms restricts migration potential important for seed dispersal and ichthyological life cycles
- The flooded area resulting from dam construction can permanently flood areas that are either accustomed to seasonal flooding or poorly adapted to flooding at all. This can kill vast swaths of trees, many of which bear fruit that omnivorous fish rely on as a food source
- Our work suggests that ichthyochory is designated to a few key fish species. If this is the case, then any and all actions directly affecting these species is a major concern

### The current political situation of Brazil could have the following effects on ichthyochory:

- Public focus on corruption leads to viewing hydroelectric dams in a negative light, discouraging further development
- Current president Jair Bolsonaro's pro-agribusiness stance and desire for indigenous integration could further damage the remaining swaths of rainforest
- Recent dam breaks have called the structural integrity of Brazilian dams into question



## References

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## Acknowledgements

