The Effect of Discharge on Leaf Litter Decomposition in Tropical Streams

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Background

Most of our knowledge about stream decomposition comes from temperate regions and perennial streams.

There is a gap in our understanding of factors that drive decomposition in tropical streams.

Questions

How do the rates of decomposition differ in a Neotropical perennial (Alondra) and intermittent (Bruja) stream?

Hypothesis

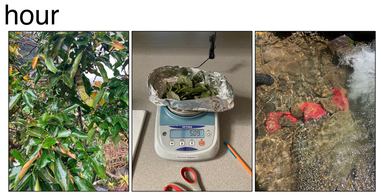
The perennial stream will have higher rates of decomposition than the intermittent stream as a function of flow.

Methods

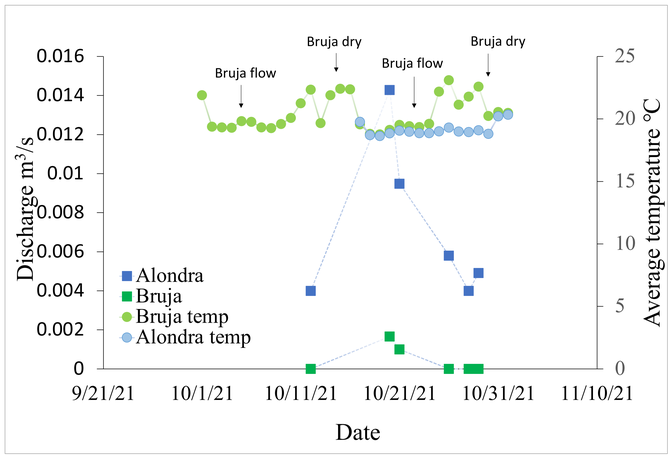
Leaf packs
- 5 grams of dried *Inga Punctata* were placed in coarse leaf packs
- Twelve packs placed in each stream, 6 upstream, 6 downstream
- Three upstream and three downstream bags taken out on day 15 and day 30
- Leaves washed, dried, and reweighed upon removal

Discharge
- Discharge was measured six times over the duration of the experiment
- Measured by multiplying cross-sectional flow and mean velocity

Stream Characteristics
- Depth at bags, wetted width of bag location and ten depths across width were measured every other day to see how the streams were changing
- Temp loggers deployed and recorded temperature every hour



Key Result #1

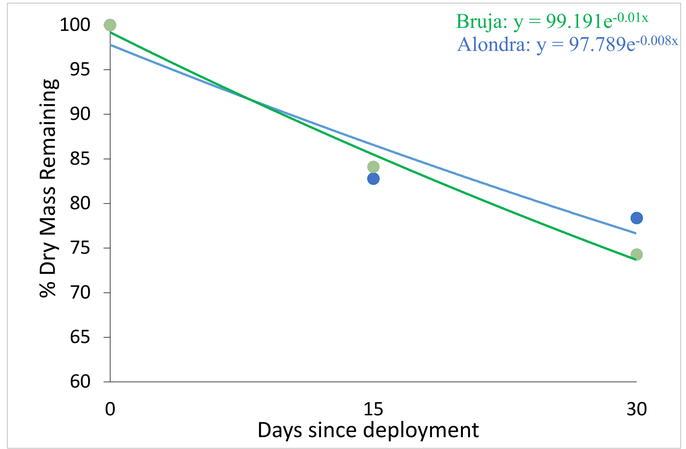


- As expected, mean discharge was significantly higher in the perennial stream. ($p < 0.001$)
- There was greater temperature variability in the intermittent stream, and a significantly higher average daily temperature (20.44 vs 19.09 C; $p < 0.001$)

SCAN ME

Watch Bruja fill after a rain event!!

Key Result #2



- Decomposition rates were slightly faster in the intermittent stream
  - Alondra $K(\text{day}^{-1}) = 0.008$
  - Bruja $K(\text{day}^{-1}) = 0.01$
- Leaf mass remaining (%) on day 30 was 78.5% for Alondra 74.3% for Bruja (t-test; $p < 0.001$). This may not be biologically significant but trends could appear over a longer study

Conclusions

- Increased fragmentation typically caused by high discharge didn't result in the perennial stream having higher leaf mass loss or decomposition rates.
- Discharge has a greater impact on softer leaves (Abelho et al. 2001), *Inga Punctata* have high lignin, low C:N and are considered tough leaves (Capps et al., 2011). This may be why we didn't see discharge play a large role in leaf fragmentation or abrasion.
- Oxygen availability and temperature may have contributed to differences in decomposition rates. Higher temperatures (as seen in Bruja) may have led to greater microbial activity.
- The importance of duration versus frequency of inundation may be switched in tropical regions where water is rarely a limiting factor in decomposition

Future Directions

- Is there a difference in the types of decomposers in each stream? Does fungi/bacteria play a bigger role in one stream than the other? Are there differences in macroinvertebrate communities associated with leaf packs between the two streams?
- Quantify leaf litter input and retention in the two streams
- How does decomposition differ along a gradient of an intermittent stream?

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