ASSESSING THE FEASIBILITY OF ASSISTED MACROINVERTEBRATE TRANSLOCATION IN ACHIEVING ECOLOGICAL UPLIFT IN RESTORED STREAMS

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Key Research Question

Can assisted migration of benthic macroinvertebrates from reference streams be used to facilitate biodiversity recovery in restored streams?

Stream Restoration does not always achieve its goal of biodiversity uplift

Polluted Stream

Restoration

Restored Stream

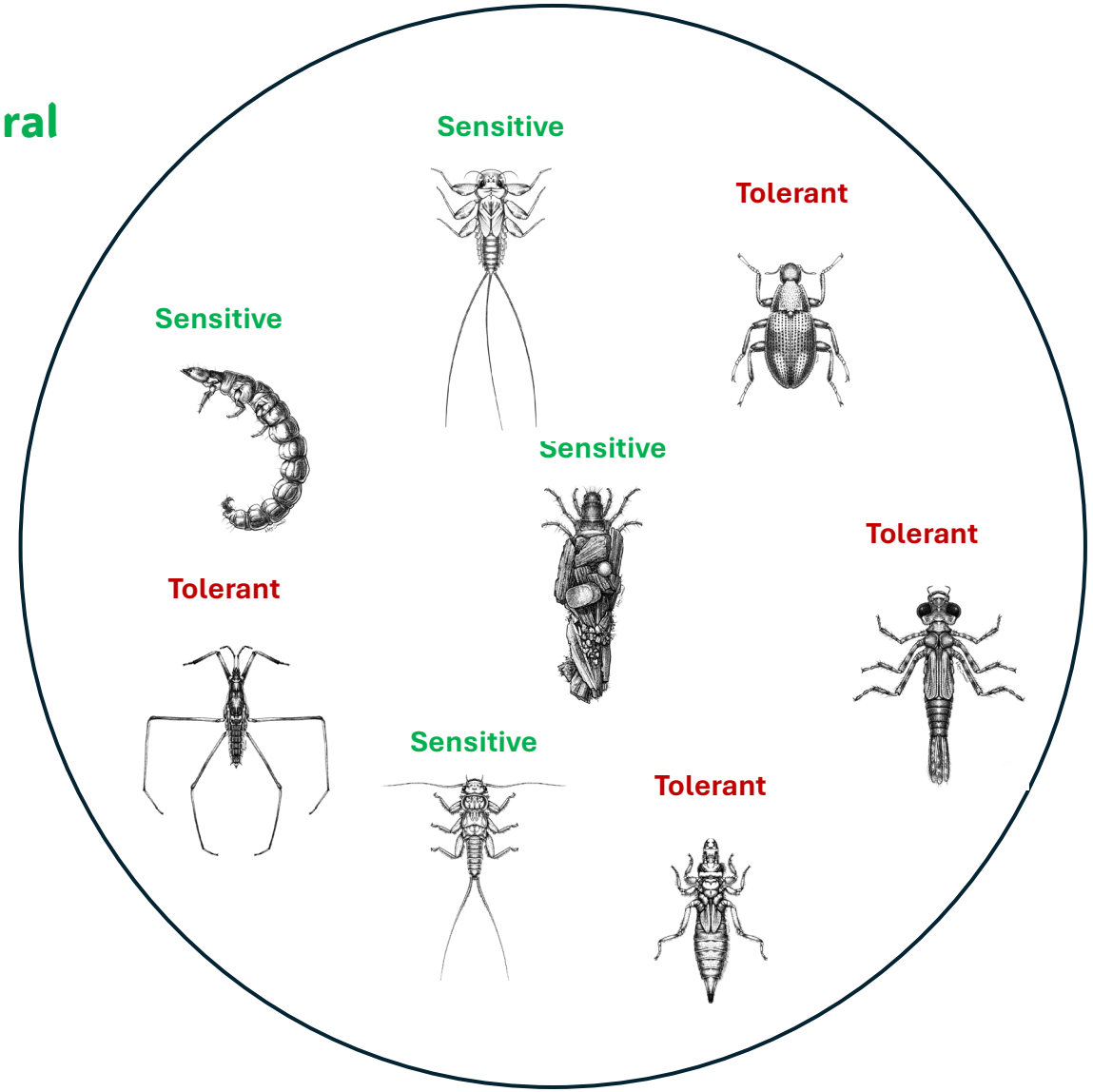
Improved Water Quality ✓

Improved Geomorphological Features ✓

Improved Biodiversity ✗

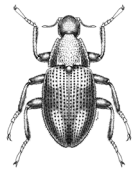
Sensitive Macroinvertebrate Taxa Fail to Recolonize Restored Reaches following Stream Restoration

Natural



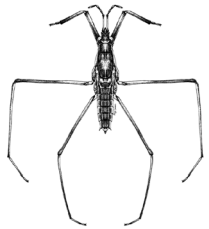
Polluted

Tolerant



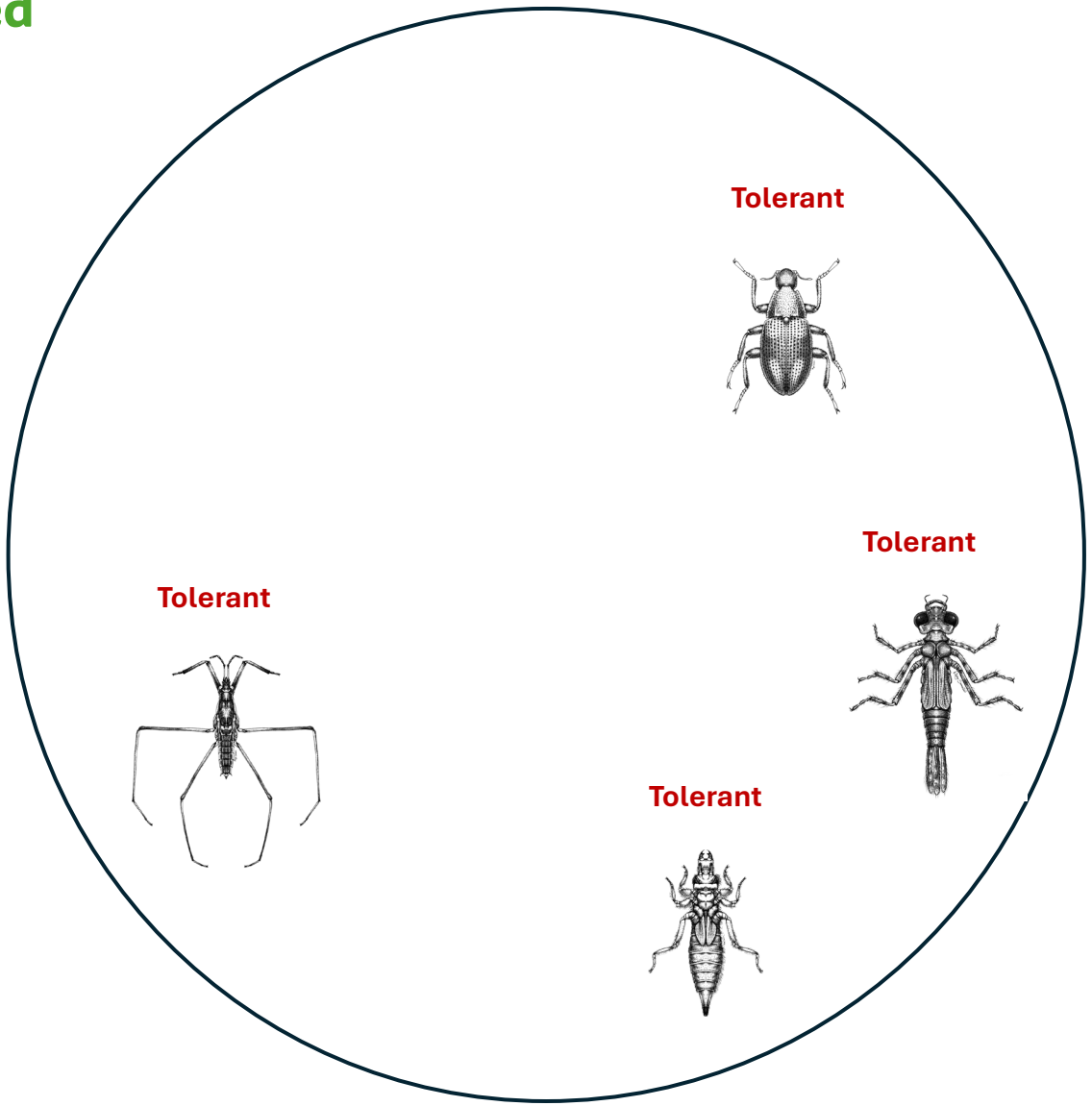
Tolerant

Tolerant

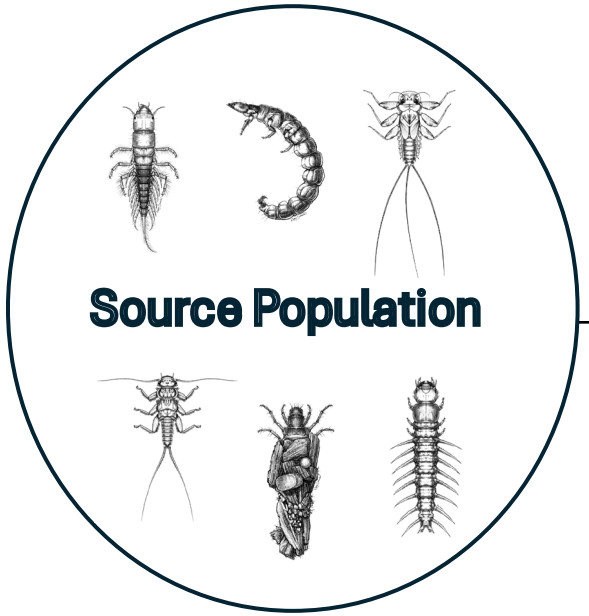


Tolerant

Restored



Why are Sensitive Macroinvertebrates unable to Colonize Restored Reaches?

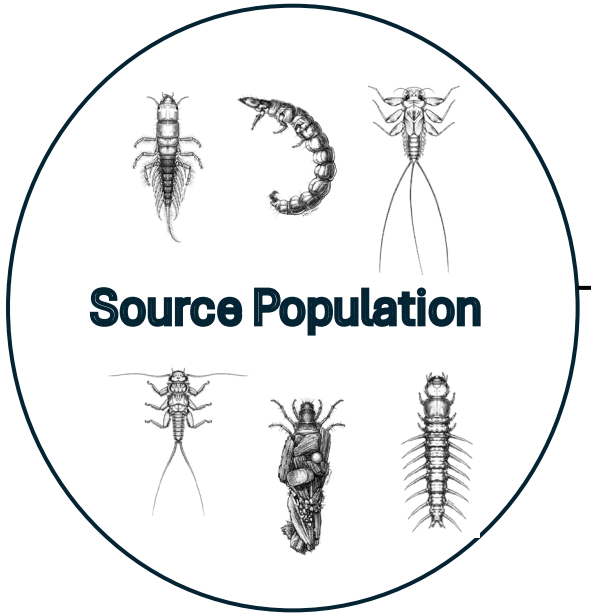


>5km

Restored Stream

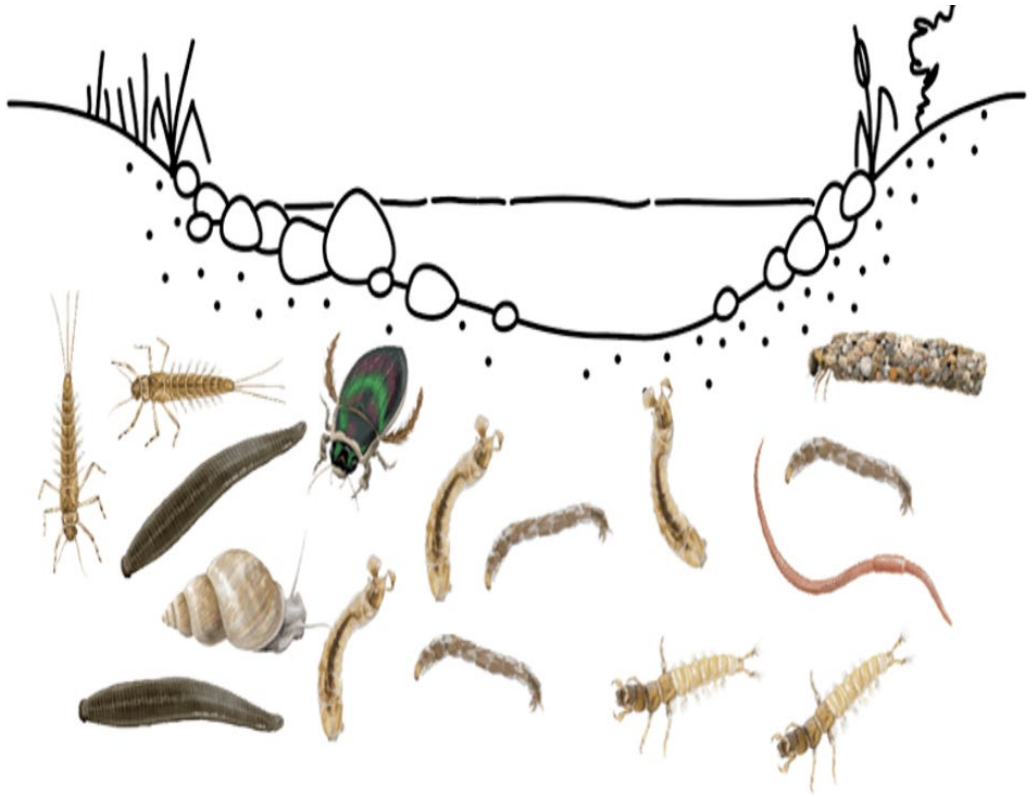
H_1: By translocating macroinvertebrate from reference streams to restored streams, we can facilitate biodiversity recovery in restored streams.

Reference/Natural/Sentinel/Donor Stream



Human assisted Migration

Restored/Recipient Stream

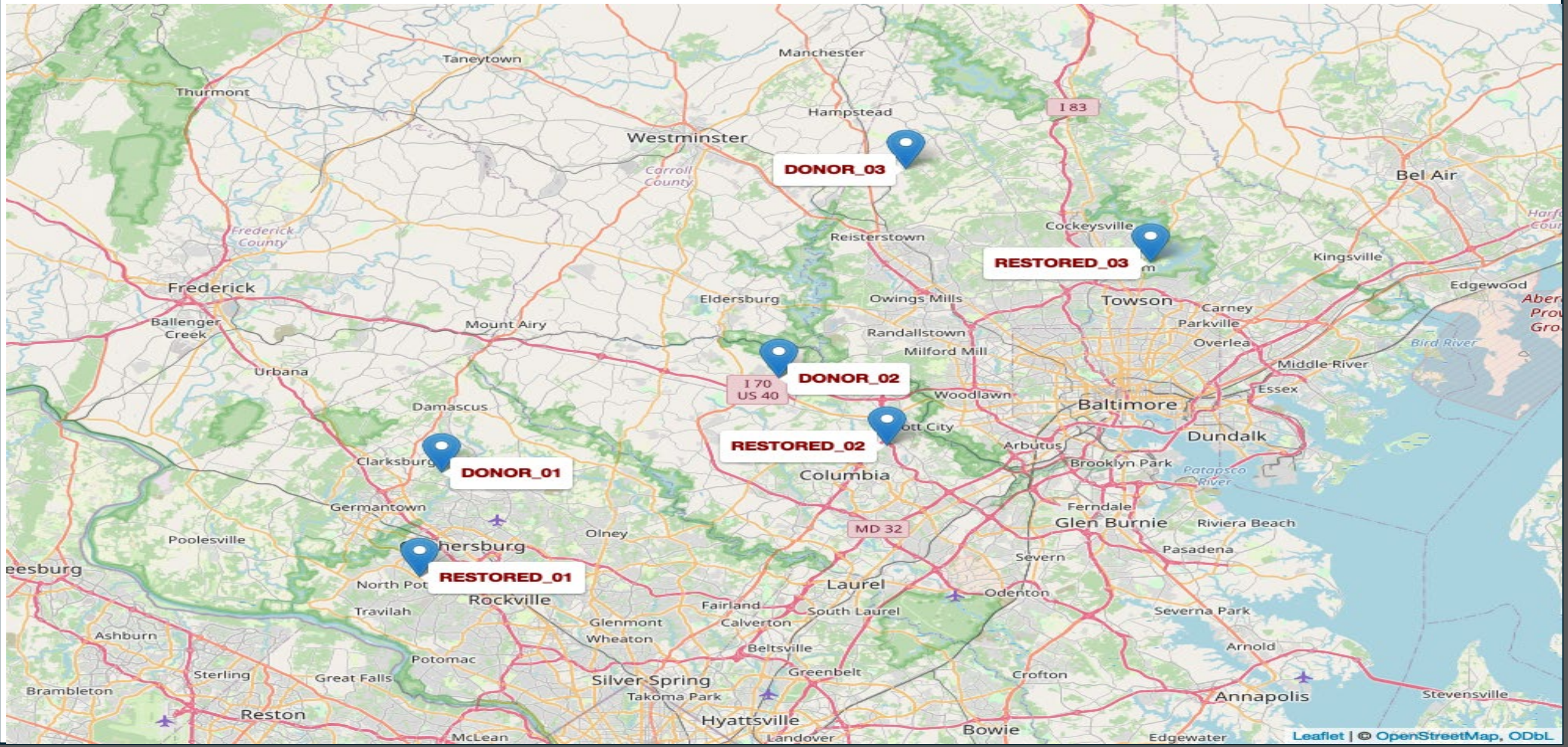


Q1: Which natural substrate is best to accumulate and transplant benthic macroinvertebrates?

Q2: Will sensitive macroinvertebrate taxa from reference streams survive in restored reaches?

Q3: How will seasonal changes influence transplant and survival of macroinvertebrates?

We selected THREE REFERENCE STREAMS and paired each of them with A RESTORED STREAM within the SAME SUB-DRAINAGE.

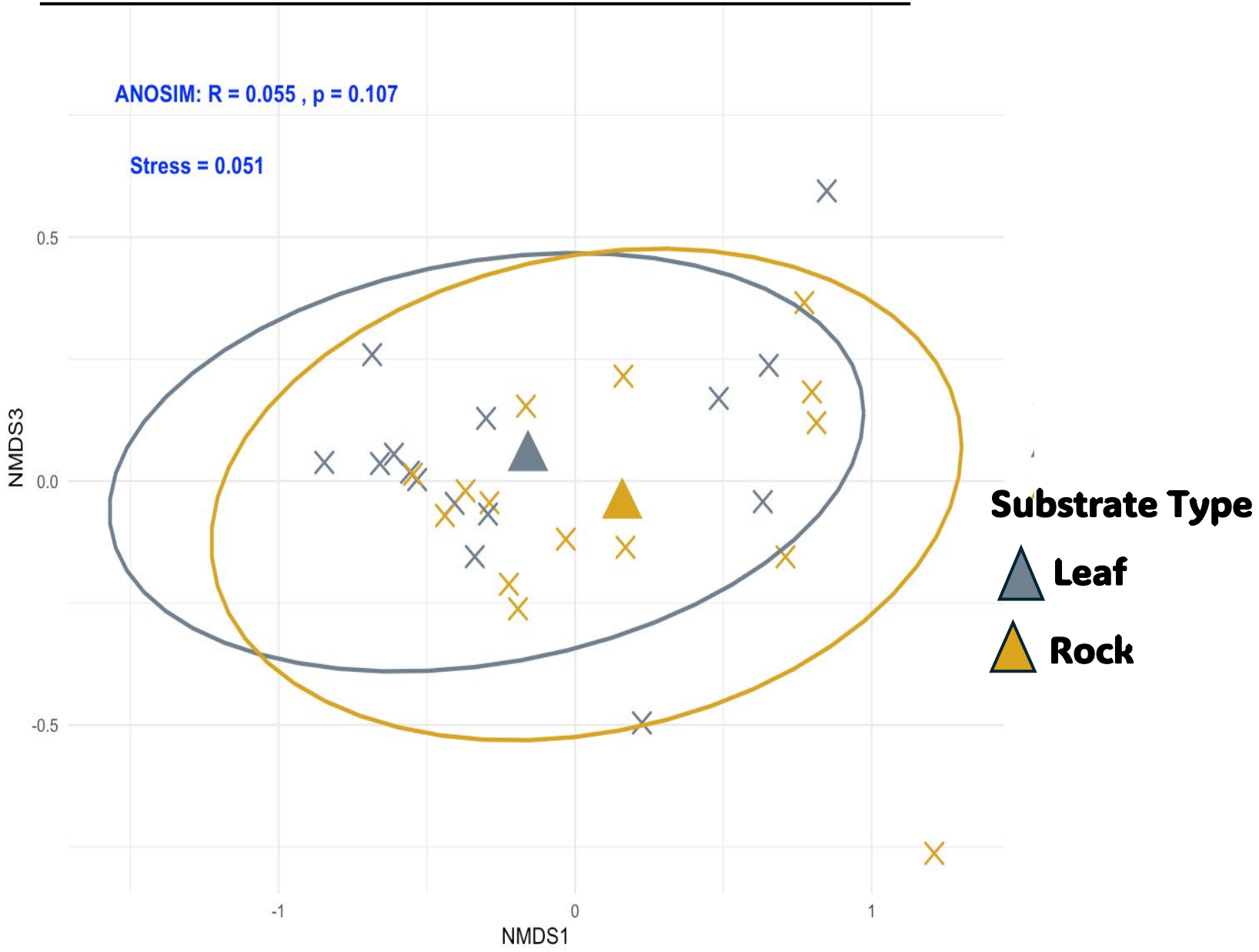


We incubated 60 macroinvertebrate cages containing leaf or rock substrates in the reference streams for FOUR WEEKS for macroinvertebrate COLONIZATION.

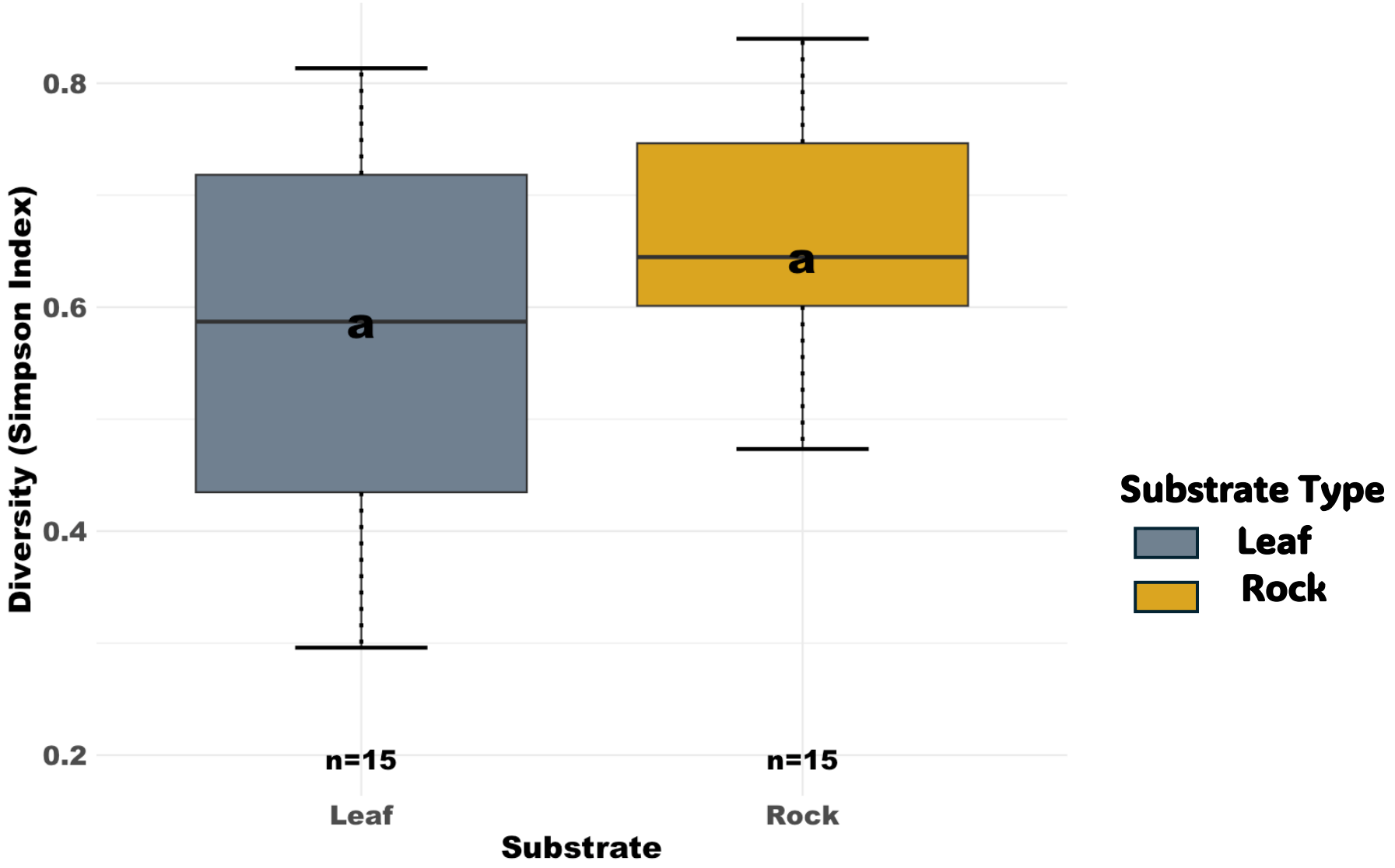
After four weeks, 30 macroinvertebrate cages were randomly selected for SAMPLING and 30 were randomly selected for TRANSPLANT

We transplanted 30 macroinvertebrate cages covered with ultrafine meshes to restored streams and left them for FOUR WEEKS to estimate survivability.

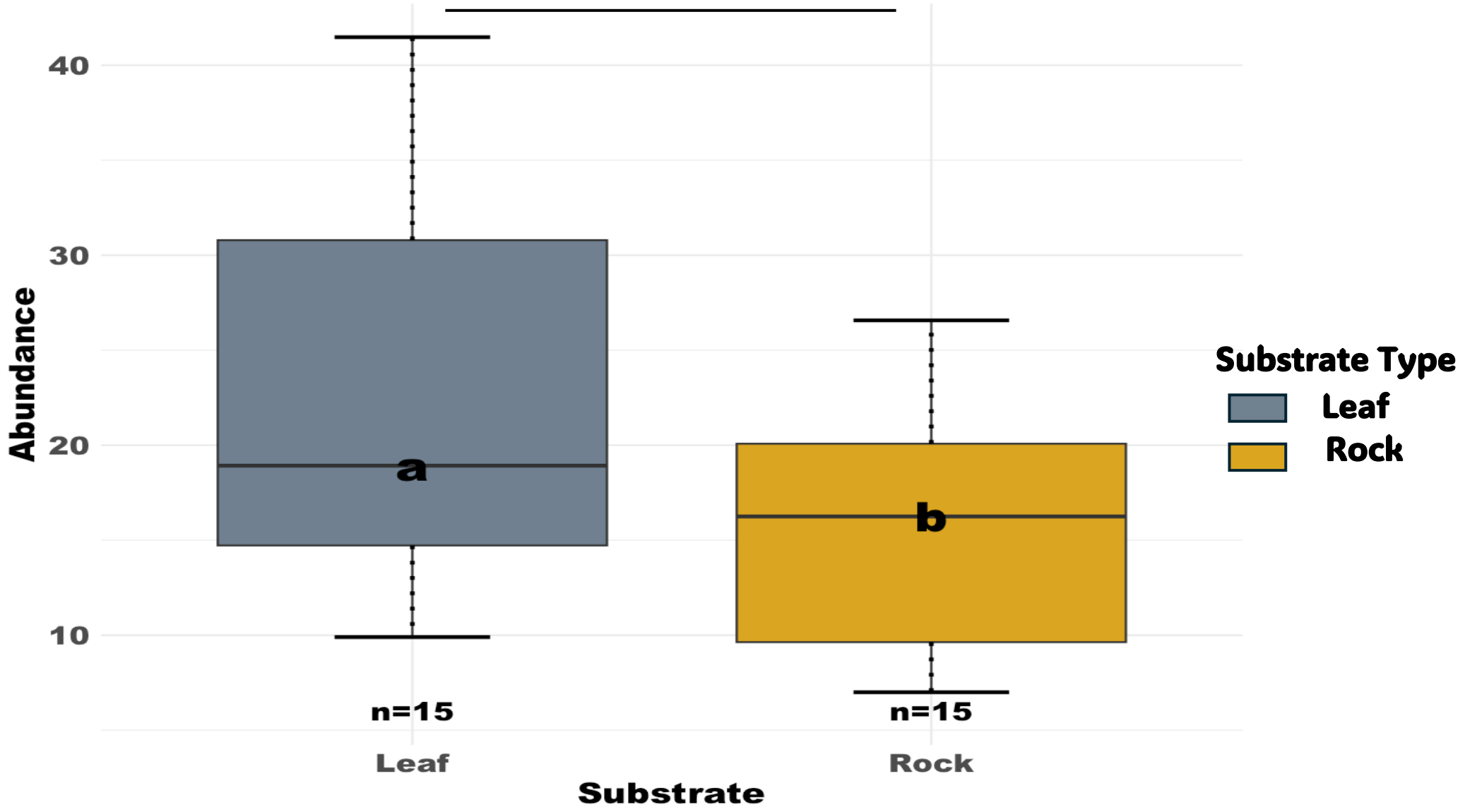
Similar Communities of Macroinvertebrate accumulated on the Leaf and Rock Substrates



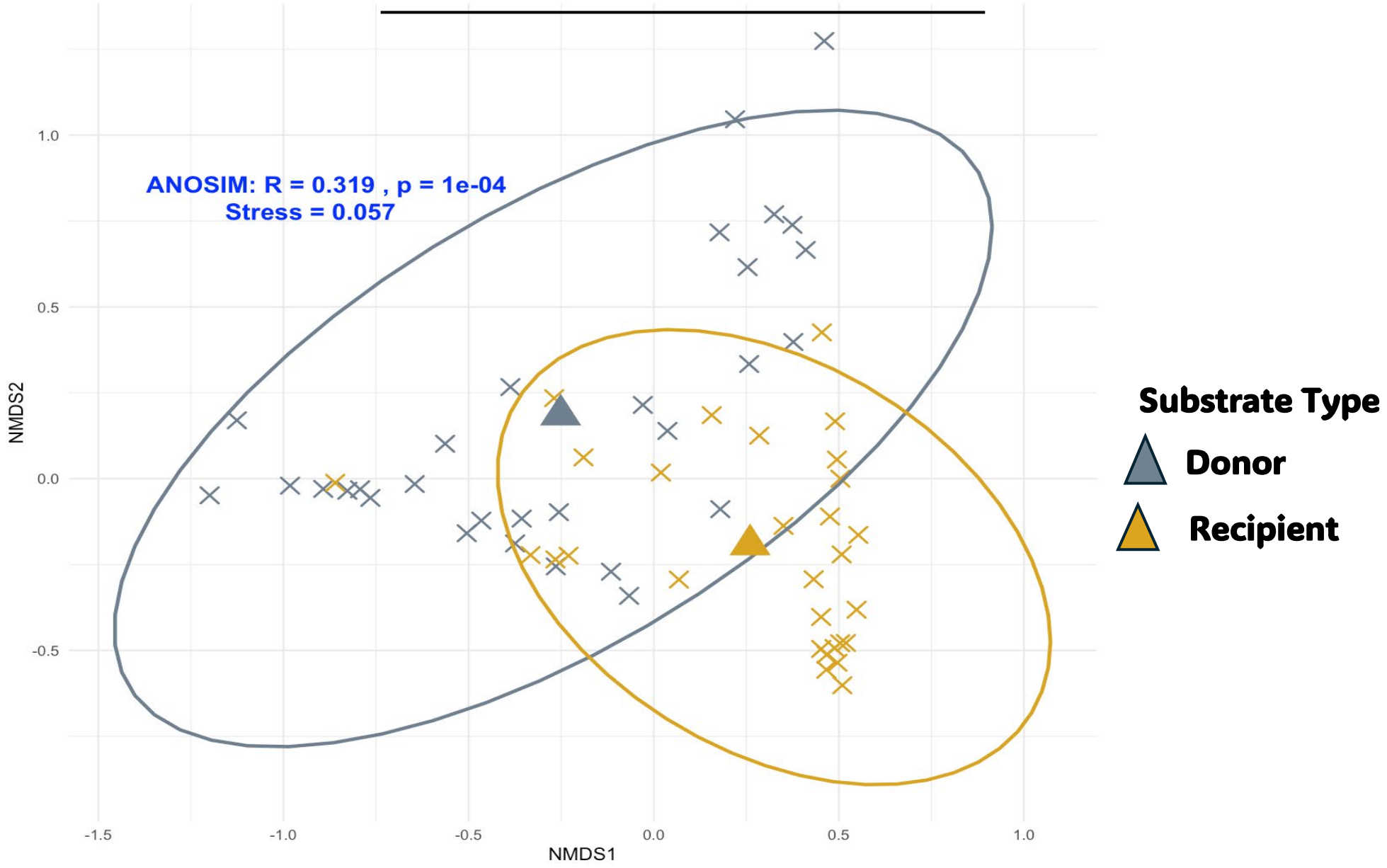
Both Rock and Leaf Substrates showed similar macroinvertebrate Diversity.



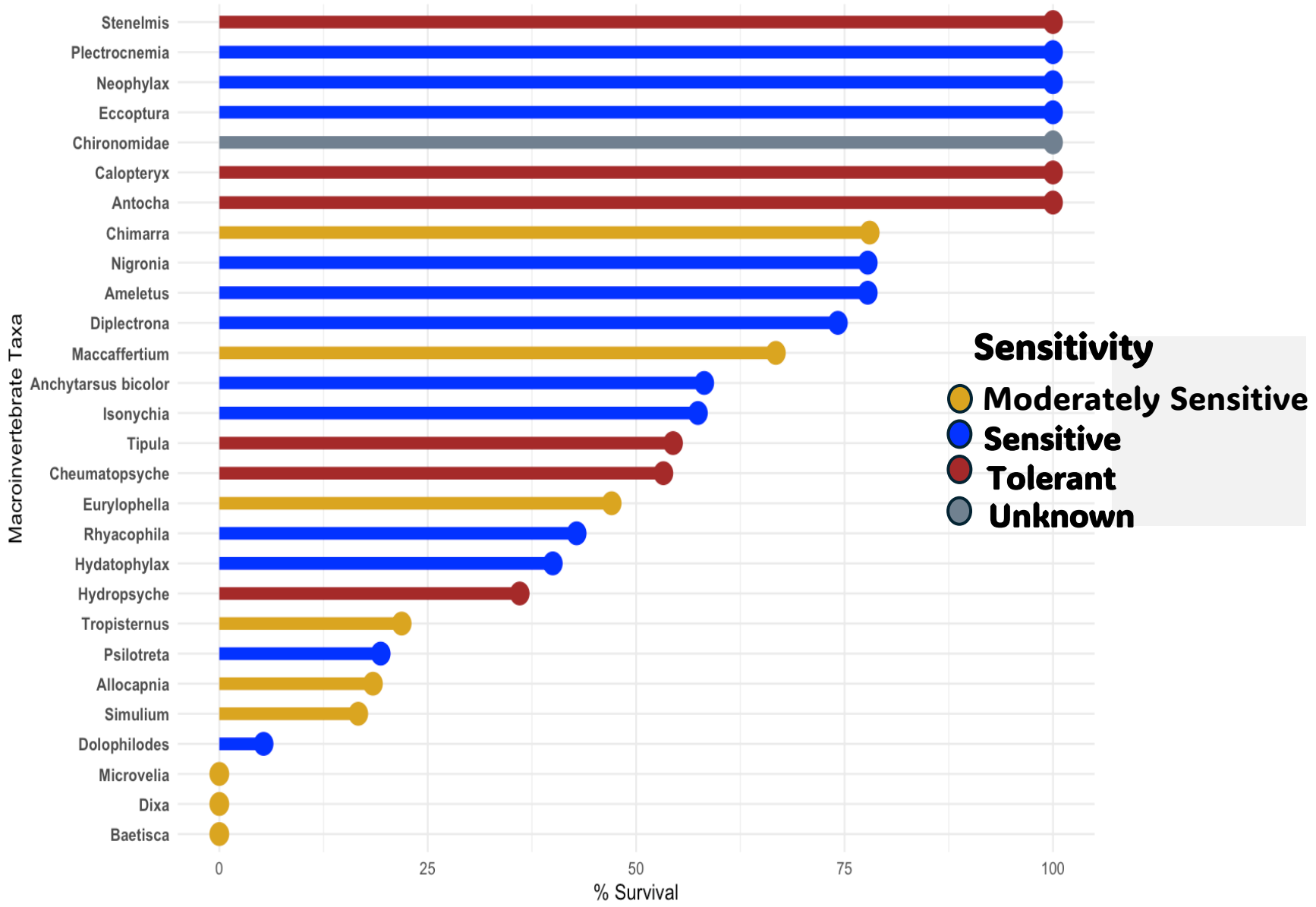
Individual Abundance of Macroinvertebrates was significantly higher on leaf substrates.



Macroinvertebrate community composition differ before and after transplant.



Several Sensitive macroinvertebrate taxa showed a high rate of survivability in the restored reaches



Argia
Baetis
Boyeria
Dubiraphia
Glossosoma
Isoperla
Lepidostoma
Leptophlebia
Molanna
Neureclipsis
Nyctiophylax
Probezzia
Ptilostomis
Rhagovelia

Excluded from the analysis because abundance in the Donor Site was < 5

Q3: How will seasonality influence macroinvertebrate transplant and survivability?

Still In the works

- **Completed Data Collection on the 9th of May 2025**
- **Samples currently under processing**
- **Expected to be completed by the end of summer.**

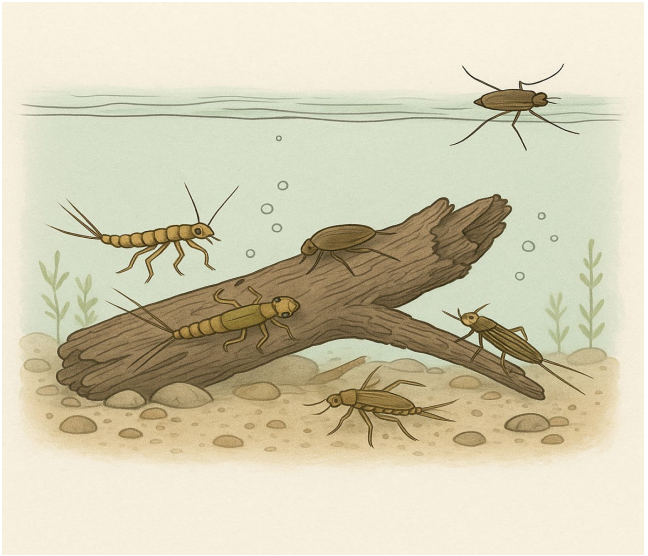
What are we expecting to see?

- **If macroinvertebrate community assemblages differ significantly across seasons?**
- **Which season will be best for a larger translocation effort?**

Final Thoughts: Assisted migration of macroinvertebrates can be used to facilitate biodiversity recovery in restored reaches

Leaf substrate is suitable for benthic macroinvertebrate accumulation and transplant.

Sensitive macroinvertebrate taxa can survive in restored reaches.



THE ALLEN LAB at The Pennsylvania State University

Thank You

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Translation Slides
by
Scott Lowe, McCormick Taylor

What does this mean for me?

- **Recolonization of macroinvertebrates has been difficult for restored stream reaches, efforts to accelerate recolonization are desirable and unclear to date**

- **The study indicates survivability of sensitive species in restored streams - suggesting that the absence of macroinvertebrates is due to poor source populations upstream of the restoration sites and not due to the restoration activity.**

What do I take from this if I am a Practitioner?

- **Design to match habitats of donor streams (mimic physical structures, energy inputs, and H&H characteristics)**

- **Determine optimal locations and densities of transfer cages, long-term recolonization trends, and approved locations of donor streams**

What do I take from this if I am a Regulator?

- **Is species relocation an activity managed by an applicant or an agency?**
- **What are comparable water quality, drainage area, and land use parameters between donor and restoration reaches?**
- **What are upstream source populations?**