EEB313 Project Proposal

Kasturi Bhatt (1009090877) and Anna Whitehouse (1009011837)
Department of Ecology and Evolutionary Biology, University of Toronto
EEB313: Quantitative Methods in R for Biology
Mete Yuksel and Zoë Humphries
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Introduction

We are interested in looking at functional feeding groups, which piqued our interest when we learned about them in EEB240. Green et al. generated a data set in 2022 which explores benthic macroinvertebrate abundances in river-stream networks, which we can use to explore the presence of functional feeding groups. We are particularly interested in the River Continuum Concept, and looking at how the abundances of functional feeding groups change along the river because of trophic interactions and input of biomatter and food sources.

Hypotheses and Predictions

Question 1: Do functional groups of macroinvertebrates exist in lake-stream networks in accordance with the River Continuum Concept?

Hypotheses:

- H_0: There is no change in relative macroinvertebrate group abundance along river gradients.
- H_1: There is a statistically significant change in relative macroinvertebrate group abundance along river gradients.
- H_2: There is a statistically significant change in relative macroinvertebrate group abundance along river gradients, which corresponds with the predictions of the River Continuum Concept.

Predictions:
Abundances of functional feeding groups will change from headwater downstream, in relation to the expected abundances in the River Continuum Concept (see Figure 1).

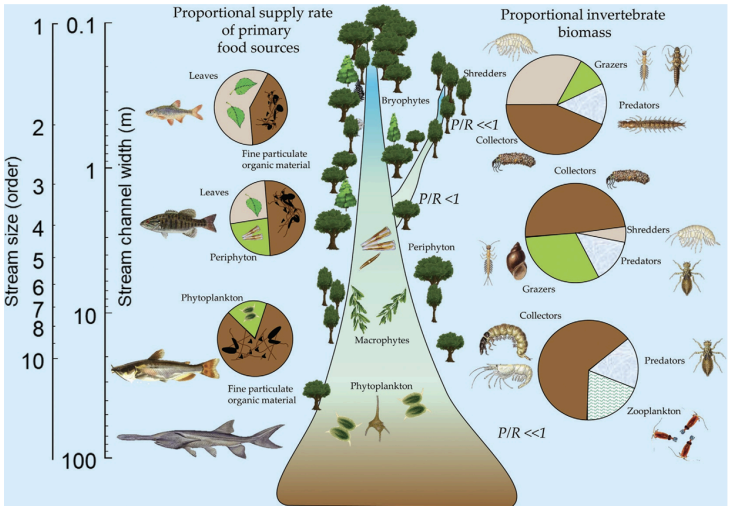

Fig.1 - River Continuum Concept. Source: Dodds and Maasri, 2022

Question 2: Do trophic interactions affect the distribution of benthic macroinvertebrate functional groups in lake-stream networks?

Hypotheses:

- H_0: There is no correlation between water chlorophyll levels and the abundance of higher trophic groups.
- H_1: There is a statistically significant correlation between water chlorophyll levels and the abundance of higher trophic groups.

Predictions:

Locations with higher water chlorophyll levels will have increased abundances of grazers, which will result in a trophic cascade to other groups.

About our Data

Collection Methods:

The researchers sampled five distinct lake-stream networks in Sierra-Nevada, California. They sampled along spatial gradients within each network. They took water quality measurements and macroinvertebrate samples at each sampling location. This included identifying species, counting species abundances, and mapping the sampling sites along the networks (see Figure 2).

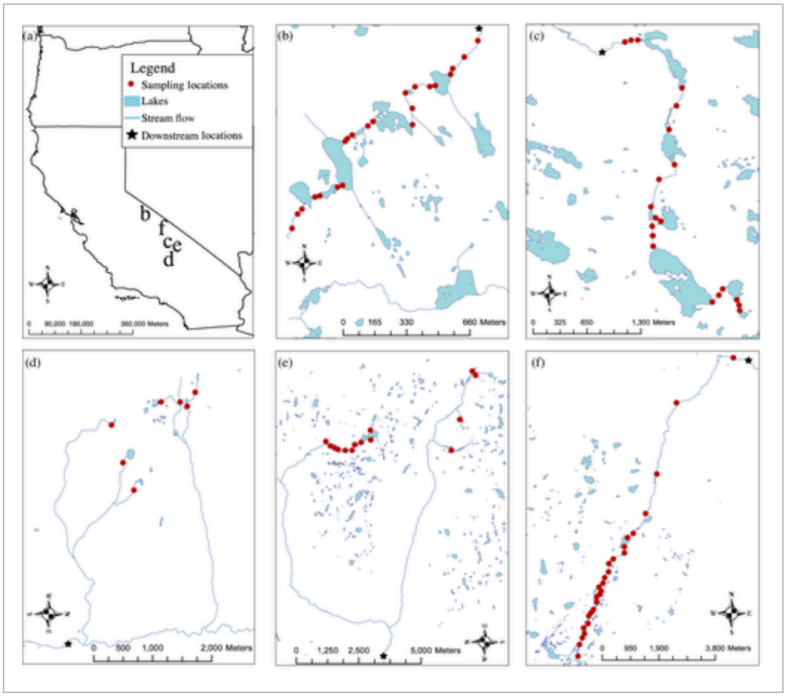

Fig.2 - Map of the 5 stream-river networks and sampling sites. Source: Green et.al, 2022a.

Our Use of the Data:

There are two different data files:

(1) Species density file (includes species and abundances at each sampling site)
(2) Water quality file (includes measurements of various water quality metrics at each sampling site)

Our variables of interest:

data file	variables of interest
Species density file	- sampling site - species - abundances *Note: we plan to group species and abundances by functional feeding group*

Water quality file	- sampling site
	- geographic variables (*for mapping*)
	  - latitude
	  - longitude
	  - river distance lake
	  - head river distance
	  - up lake area
	- chlorophyll
	- possibly other environmental metrics (e.g. DO, pH, chloride)

Data Citation:

Green, MD, Anderson KE, Herbst DB, Spasojevic MJ. 2022a. Rethinking biodiversity patterns and processes in stream ecosystems. Ecological Monographs. 92(3). doi:10.1002/ecm.1520. https://doi.org/10.1002/ecm.1520.

Green MD, Anderson KE, Herbst DB, Spasojevic, MJ. 2022b. Species and environmental datasets from Sierra Nevada, CA (USA) streams in lake-stream networks [Dataset]. Dryad. https://doi.org/10.5061/dryad.2fqz612qw

P.S. sadly we had to abandon the pidgin pathway :(

References

Dodds W, Maasri A. 2022. The River Continuum Concept. In: Encyclopedia of Inland Waters. Vol. 2. 2nd ed. Elsevier. p. 237–243.