Longitudinal patterns in hyporheic community structure of a large, low-gradient desert river

Zoey Chanin[1], Benjamin Hutchins[1], Kathryn Perez[2], Pete Diaz[3], Benjamin Schwartz[1,4]

[1]Edwards Aquifer Research and Data Center, Texas State University, San Marcos, Texas

[2]School of Integrative Biological & Chemical Sciences, The University of Texas Rio Grande Valley, Edinburg, Texas

[3]U.S. Fish and Wildlife Service, San Marcos, Texas

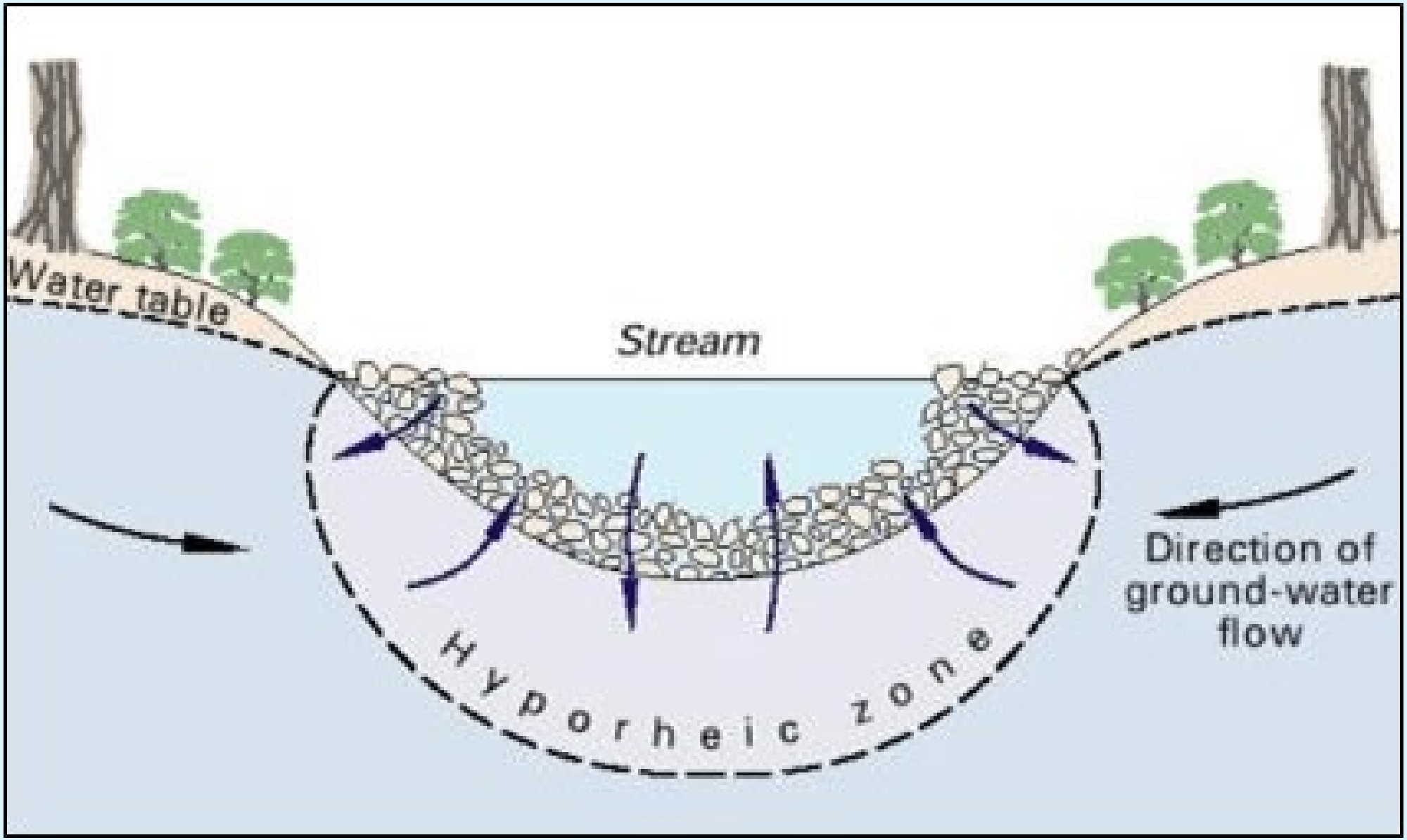
[4]Department of Biology, Texas State University, San Marcos, Texas

Introduction

- Stygobionts and epigean animals are found in the hyporheic zone
- This study aims to understand why
- Relative importance of spatial and environmental patterns influencing community structure

Photo credit: Randy Gibson

Hyporheic Zone

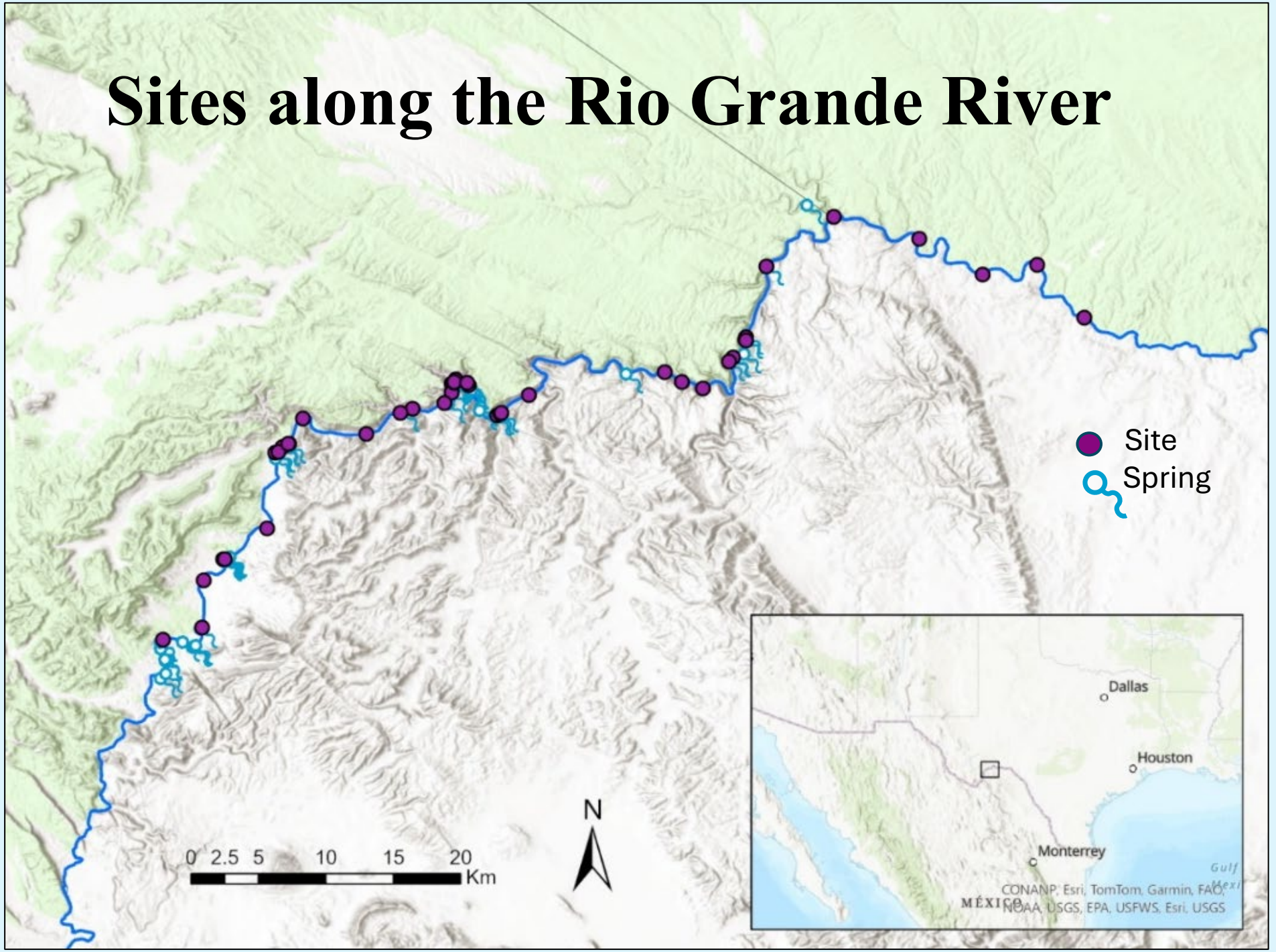


Winter, et. al. (1998)

Location

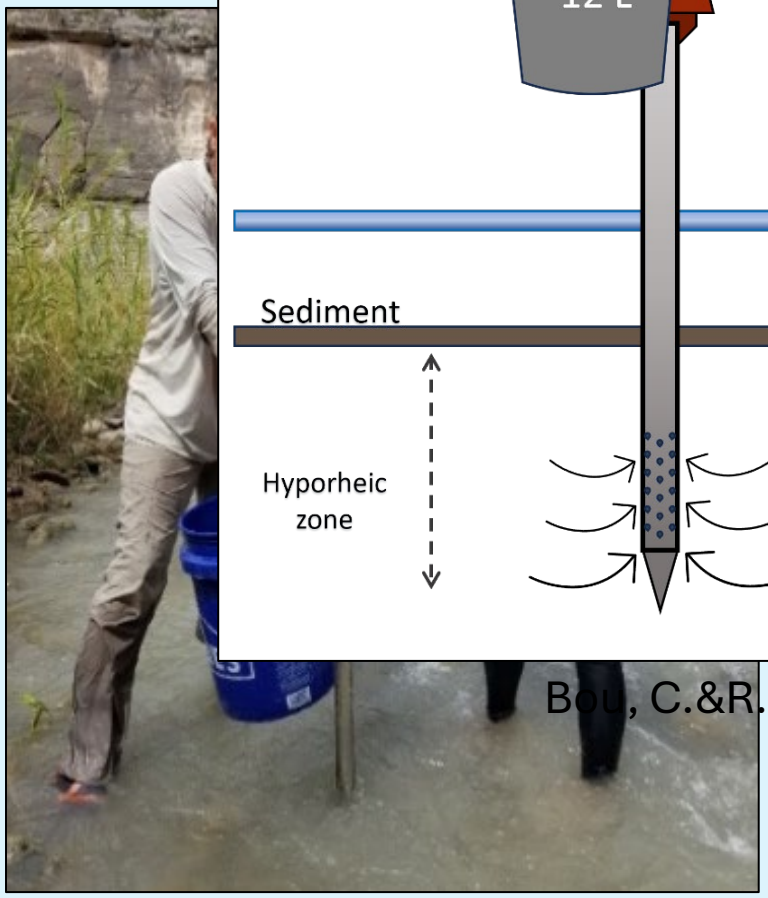
- 109 km Lower Canyons Segment of the Rio Grande, Chihuahuan Desert[7]
- Karst springs provide up to 60% of base flow
- Temperature mostly >25°C[7]
- Geology: Cretaceous limestone & Quaternary alluvium[7]

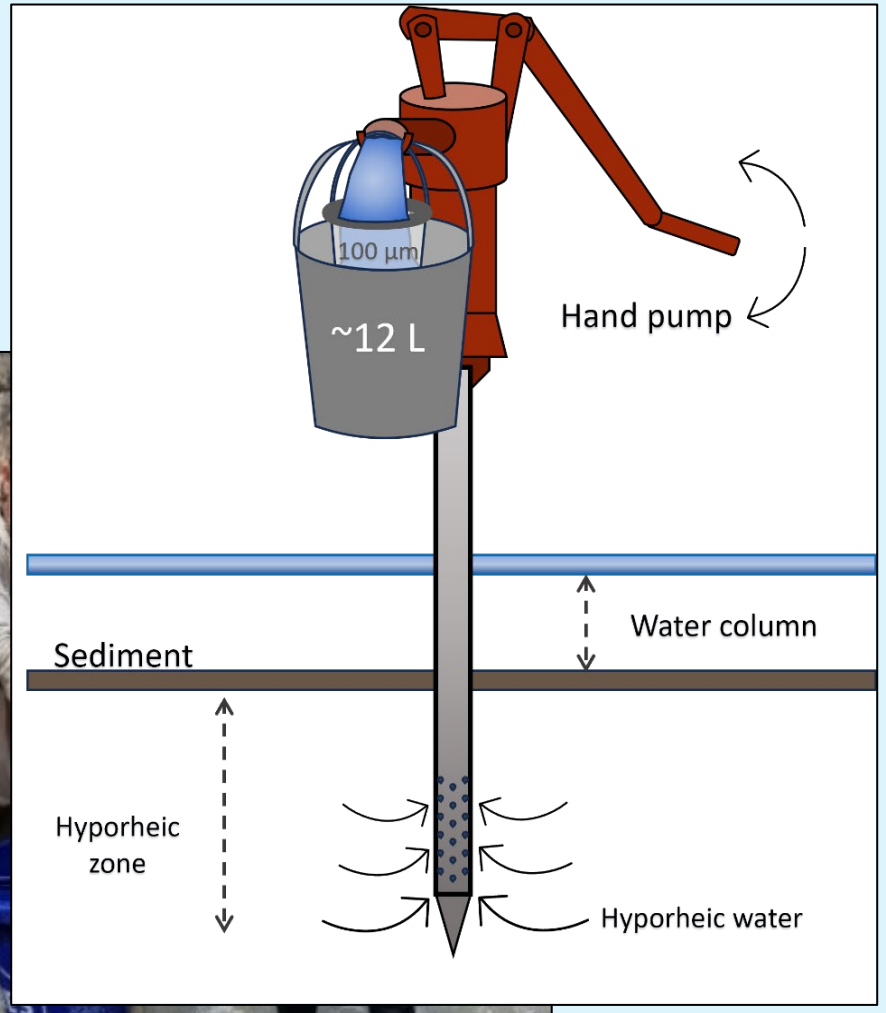
Photos: Ben Hutchins


Sites along the Rio Grande River
Site
Spring
0 2.5 5 10 15 20
Km
N
Dallas
Houston
Monterrey
MÉXICO
CONANP, Esri, TomTom, Garmin, FAO, NOAA, USGS, EPA, USFWS, Esri, USGS

Data Collection

- 28 hyporheic sites
- 80 samples collected using Bou-Rouch pump





Bou, C.&R. Rouch. (1967)

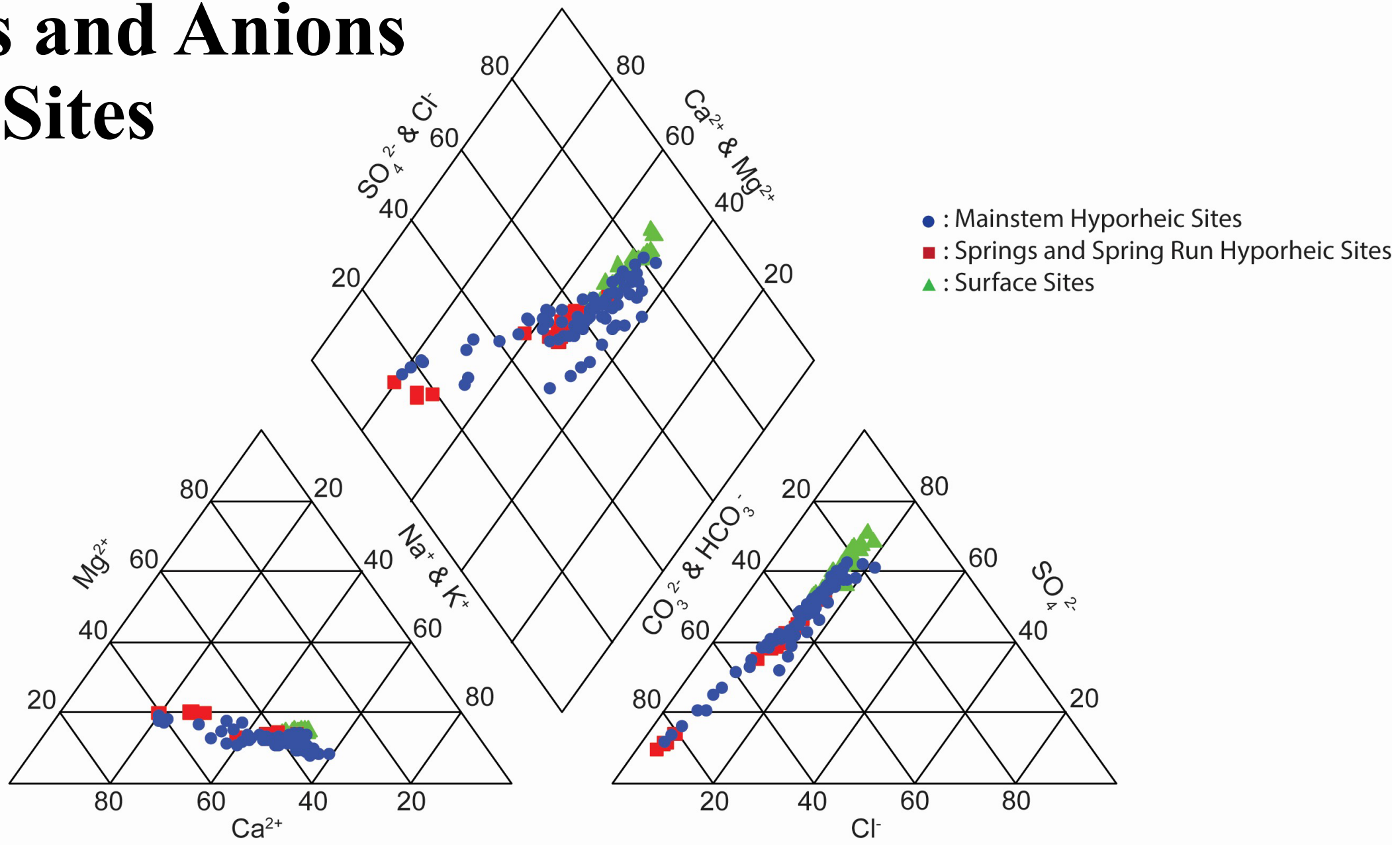
Photos: Ben Hutchins

Data Analysis

- Geochemical analysis
- Taxa collected
- Taxa concordance
- Environmental and spatial effects

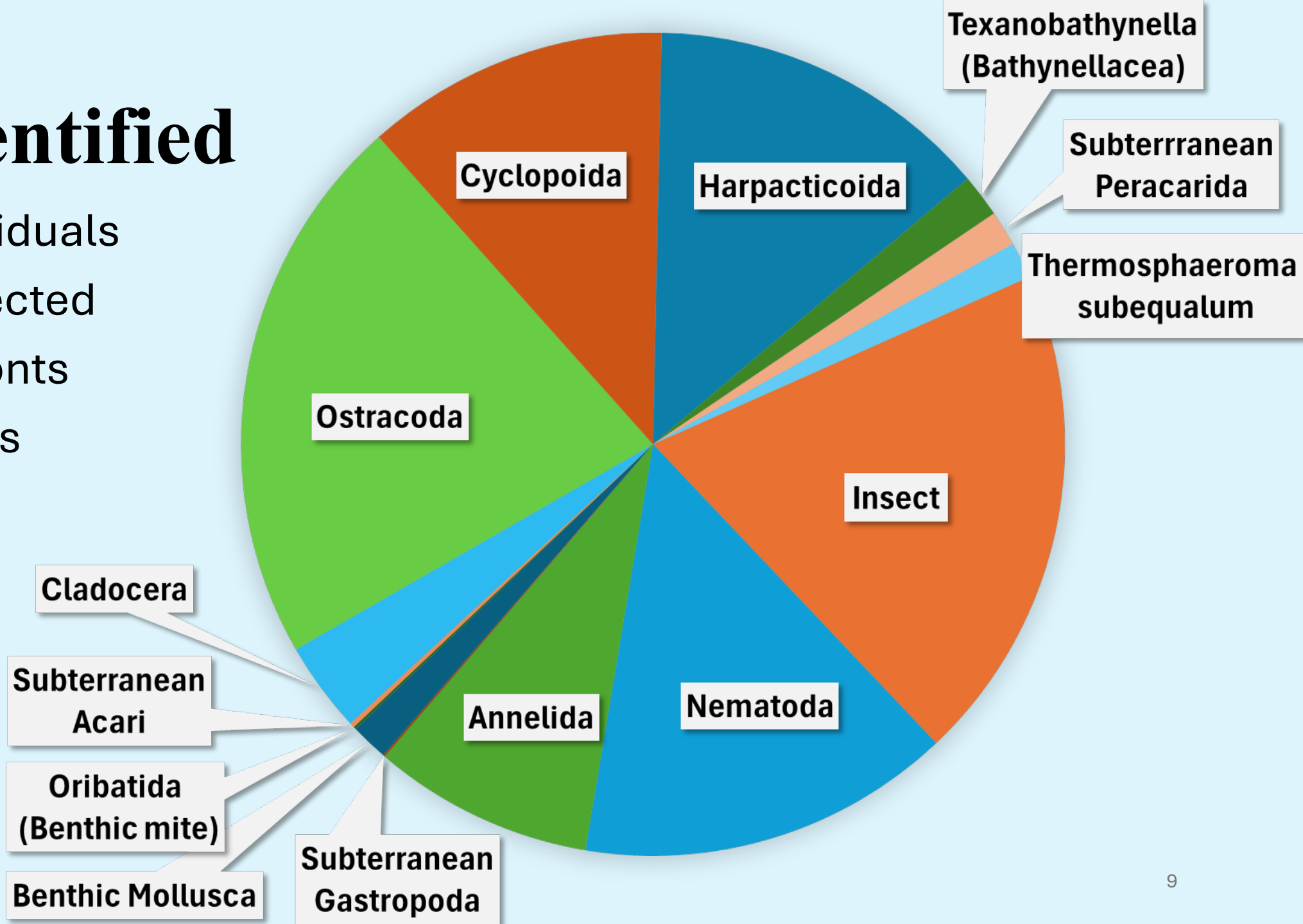
Photo: Ben Hutchins

Cations and Anions Across Sites

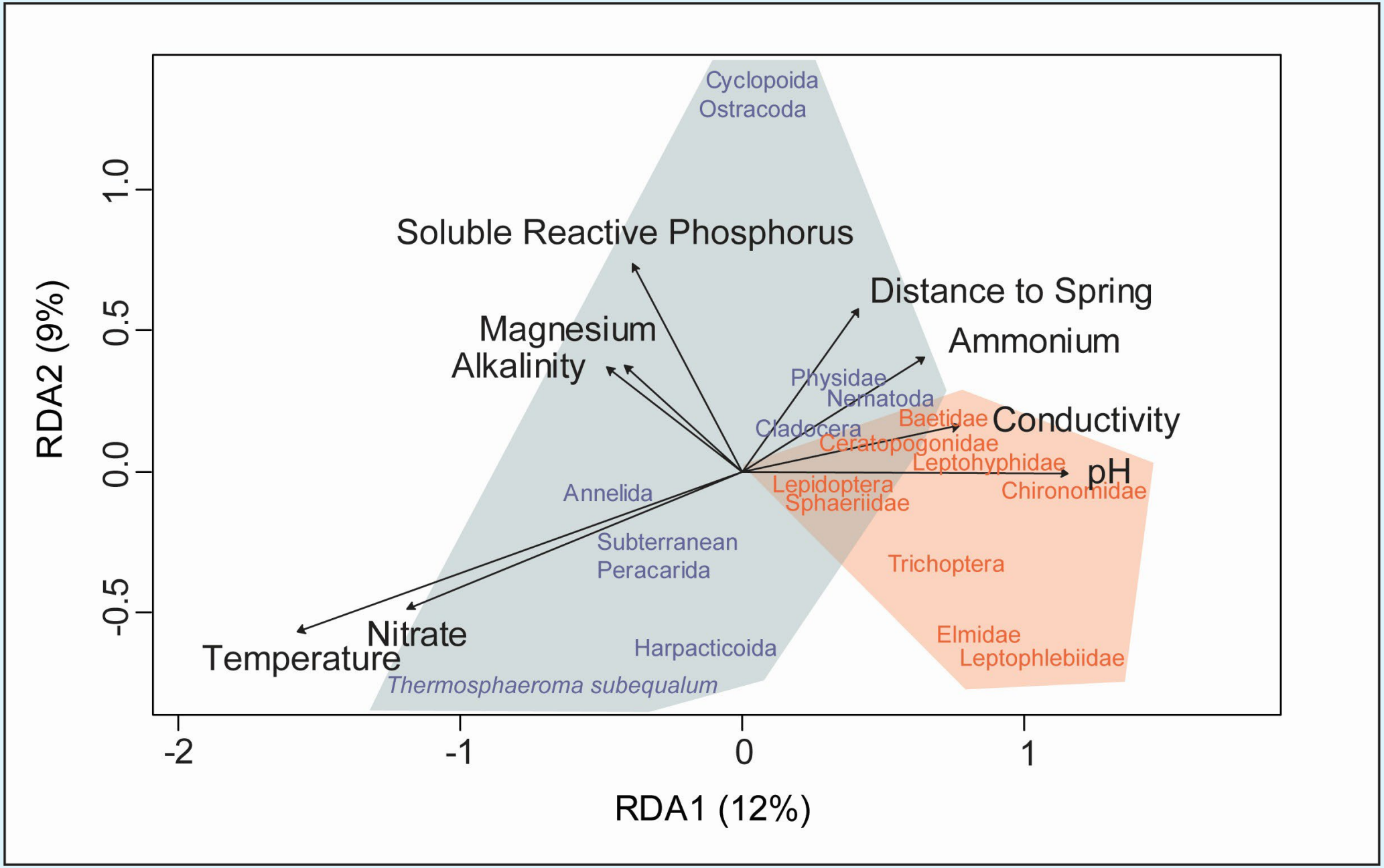


Taxa Identified

- 15,606 individuals
- 82 taxa collected
- 521 stygobionts
- 3,059 Insects



Animal Groupings and Environmental Effects



Spatial & Environmental Effects on Community Structure

	Stygobionts	Insects
Richness	• + Nitrate Concentration • - Distance to Spring • + River position & Nitrate Concentration	• - Alkalinity • - Temperature • + Dissolved Oxygen
Abundance	• + Nitrate Concentration • - Distance to Spring	• + pH • - Temperature

Photos: Ben Schwartz, Ben Hutchins

Discussion

- Geochemical variance
- Both epigean and hypogean taxa found
- Animals partitioned into two distinct groups
- Subterranean and epigean taxa respond to different variables
- Dispersal limitation
- Environmental filtering

Photos: Ben Hutchins, Randy Gibson

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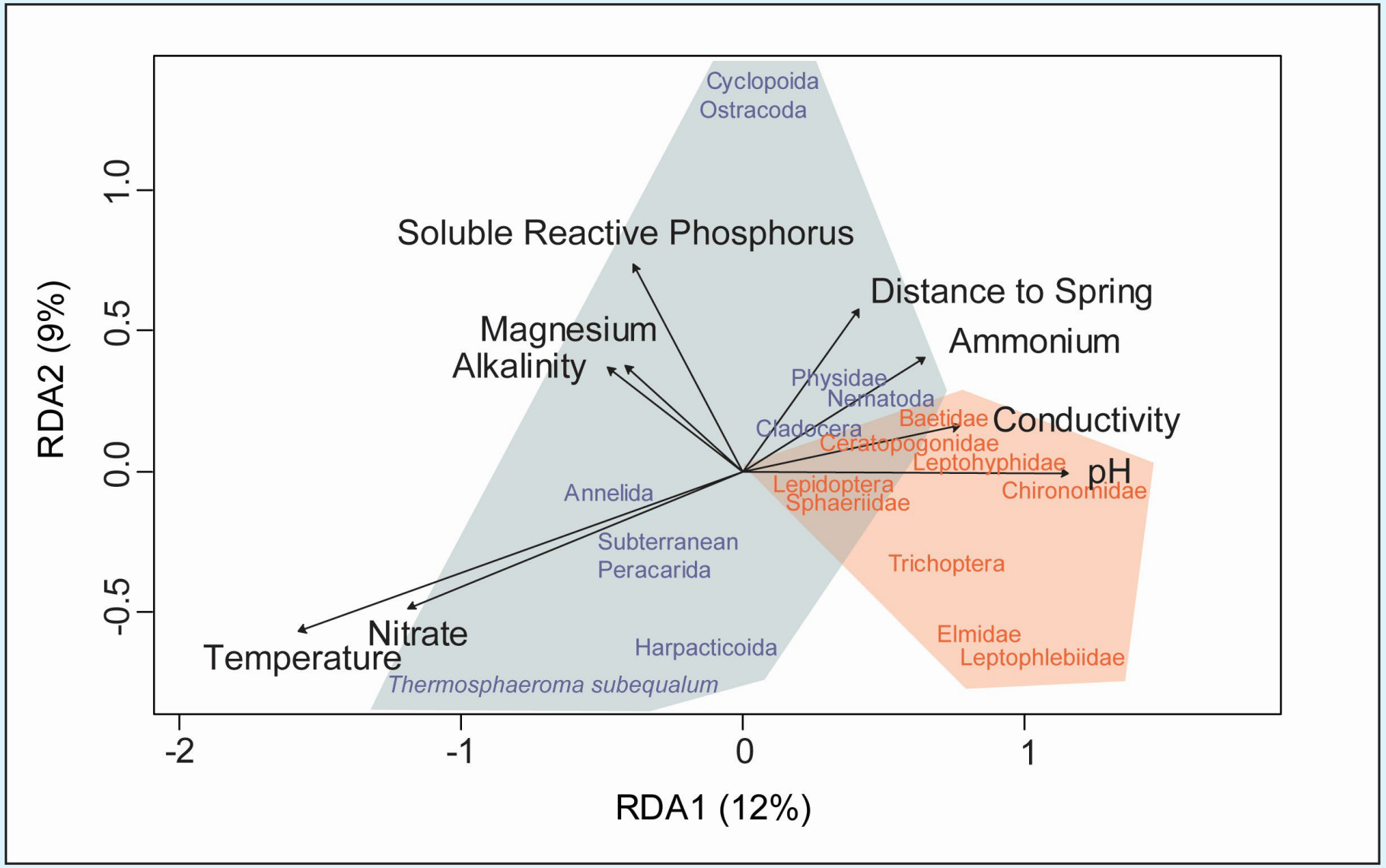
Questions?


Cyclopoida
Ostracoda
Soluble Reactive Phosphorus
Distance to Spring
Ammonium
Magnesium
Alkalinity
Physidae
Nematoda
Baetidae
Conductivity
Cladocera
Ceratopogonidae
Leptohyphidae
pH
Annelida
Lepidoptera
Sphaeriidae
Chironomidae
Subterranean
Peracarida
Trichoptera
Nitrate
Temperature
Harpacticoida
Elmidae
Leptophlebiidae
Thermosphaeroma subequalum
RDA2 (9%)
1.0
0.5
0.0
-0.5
-2
-1
0
1
RDA1 (12%)