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# Freshwater Mussels as High-Resolution Recorders of Local Climate Data: Learning from an Imperiled Species



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## Introduction

Freshwater mussels are native bivalve mollusks and an important indicator species for water quality. Over 65% of the species present in North America are imperiled

In the West, mussel populations are generally declining, and the western ridged mussel (*Gonidea angulata*), native to the Pacific Northwest, is under review by the US Fish & Wildlife Service for Endangered Species Act listing

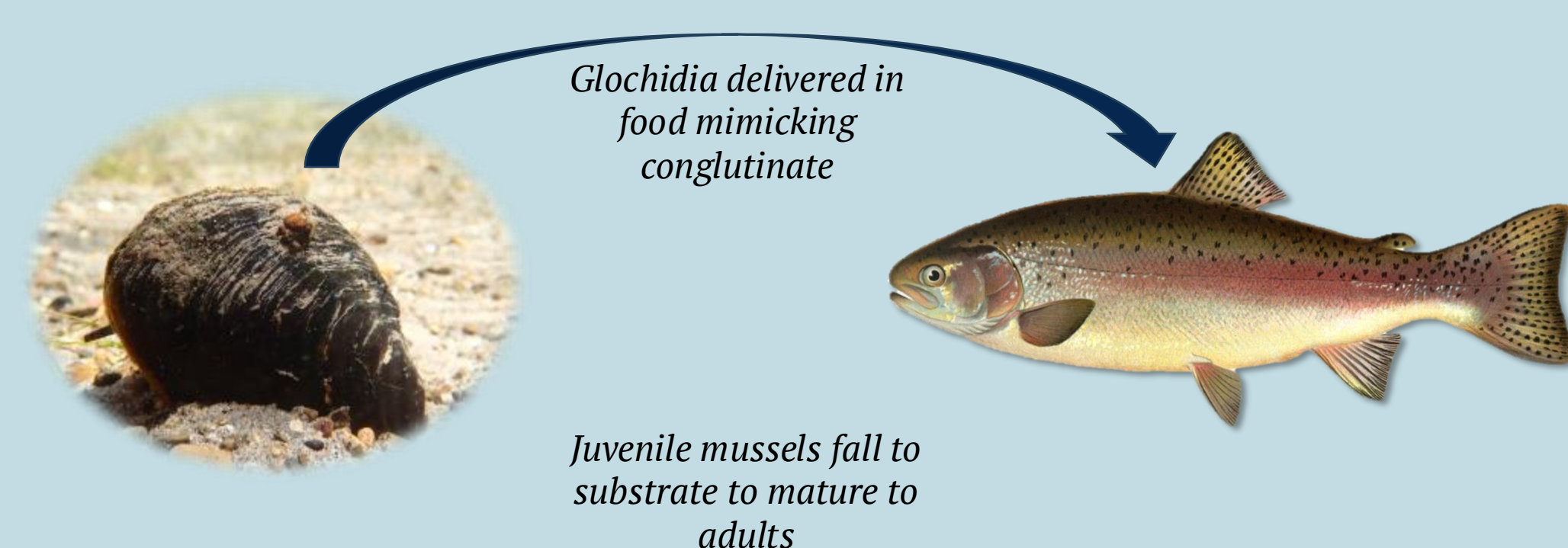
Just as scientists use dendrochronology to determine the climate conditions of a forest using tree rings, sclerochronology can be used to determine the condition of stream habitats using growth bands stored within mussel shells

## Mussel Biology

Freshwater mussels are key players in aquatic ecosystems

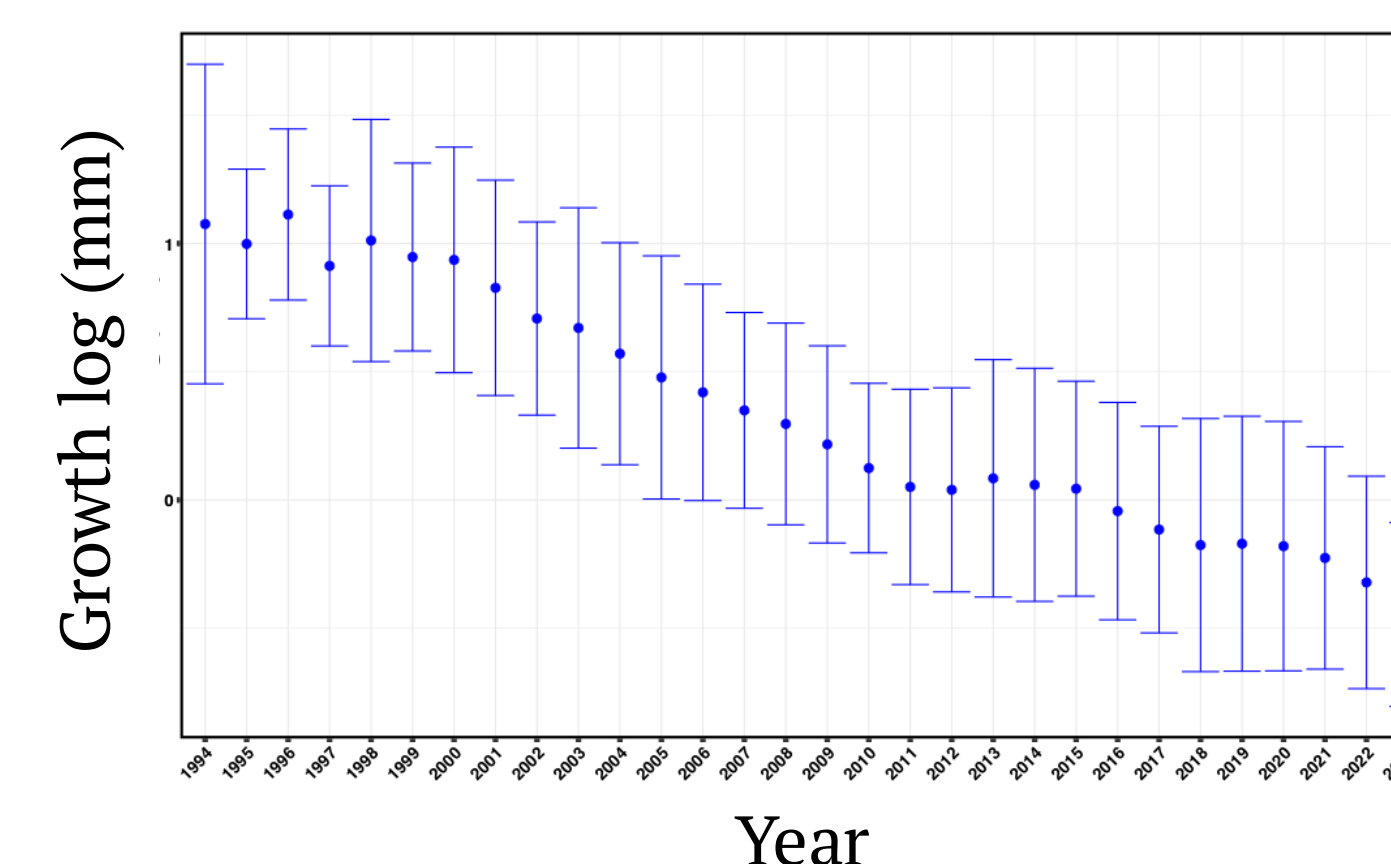
- Enhance water quality via filtration
- Nutrient fixation

Mussels act as obligate parasites in early life stages



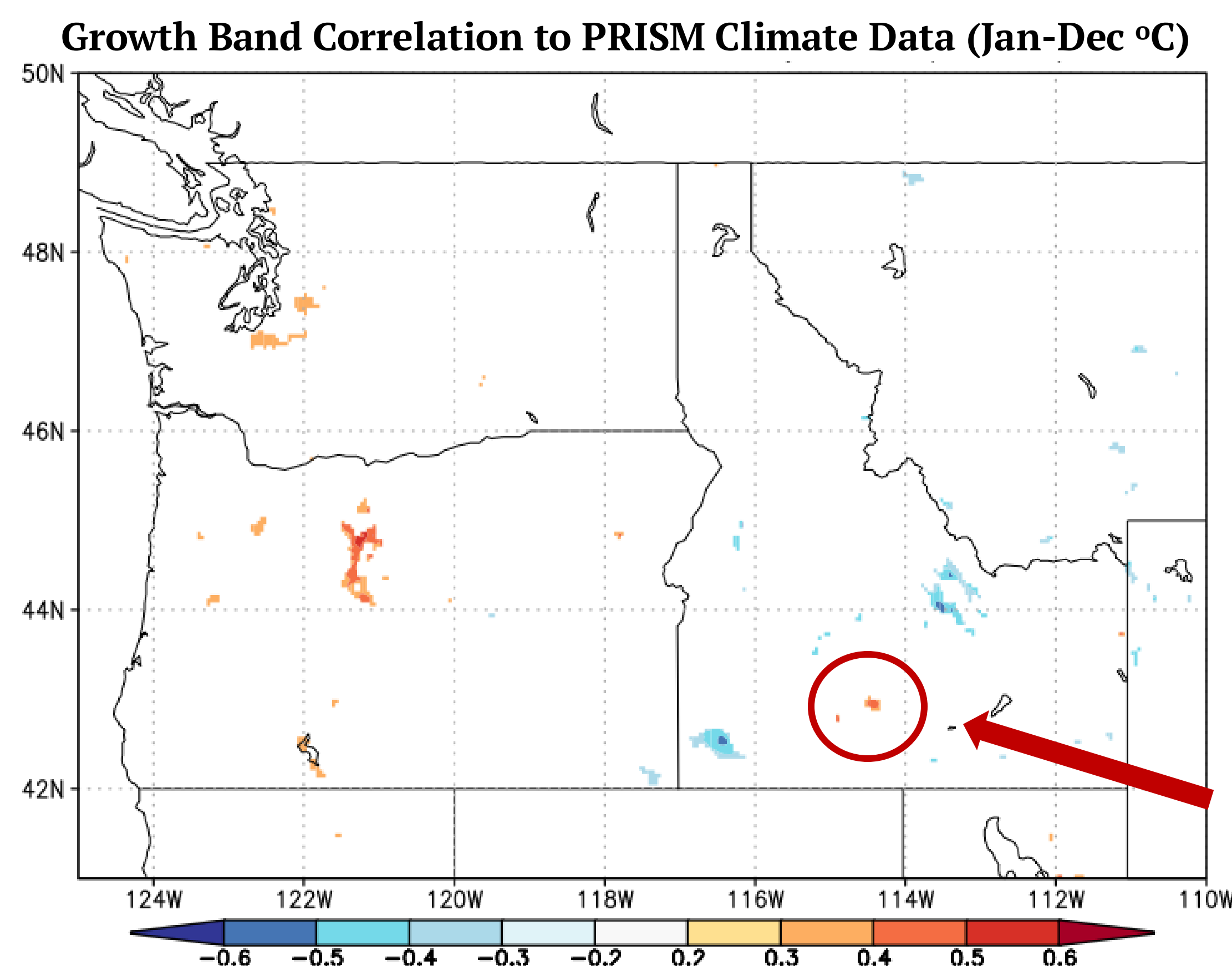
## Methods

- Mussel samples from a population of western ridged mussels in the Snake River
- Samples were thin-sectioned and growth increments were measured on ImageJ
- With the known death year of 2023, it is possible to create a growth chronology working backwards from the last growth year



**Figure 1**  
Average growth chronology of sample set. Each point is an average of growth of every mussel for each year, with the error bars representing variation in growth across the sample set

## Results



**Figure 2**  
Only statistically significant spatial correlations ( $p < 0.05$ ) are shown in plot

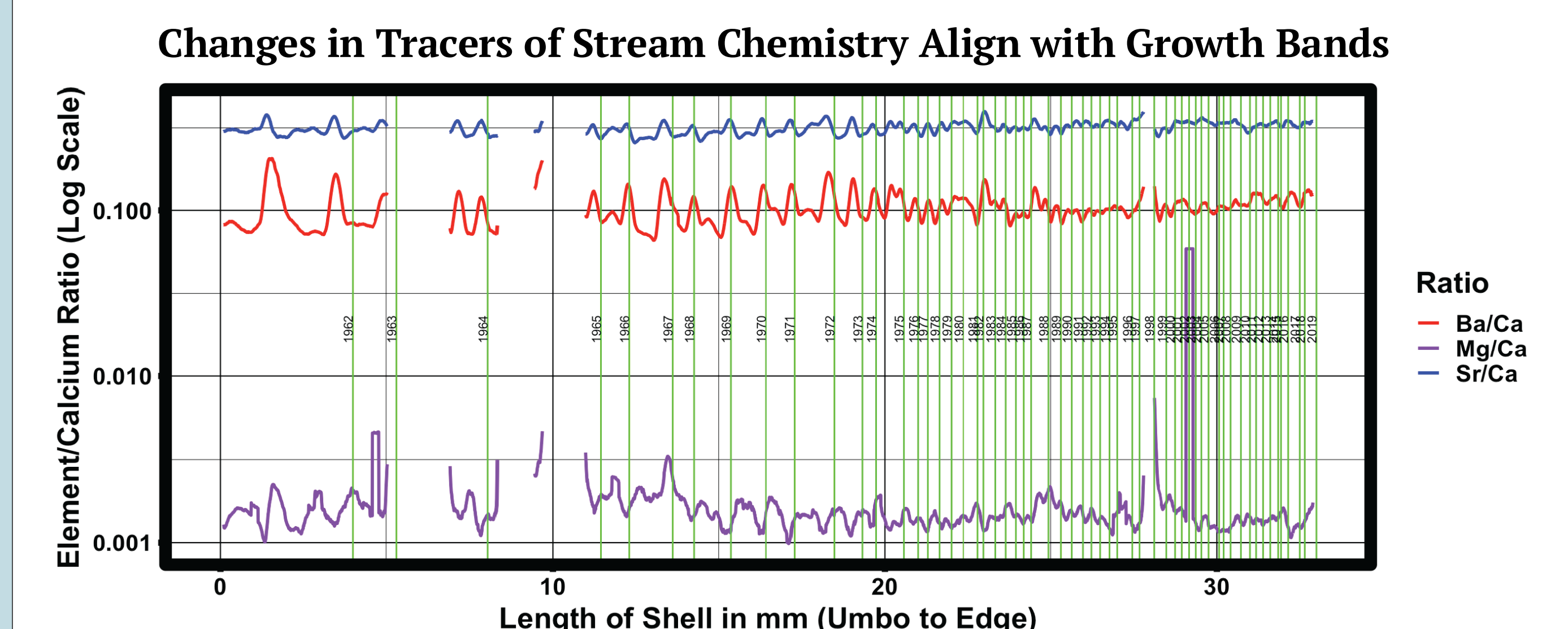
- Growth chronologies quantified in Western Ridged Mussels from the Snake River show a statistically significant spatial correlation with winter temperature over a 29-year span
- Such strong location-specific climate correlations are rare and indicate that Western Ridged mussels may be an untapped source of local climate data

## Conclusions

- Mussels record high resolution hyper-local climate information
- Mussel growth reflects local growing conditions. Paired with population information this could help determine optimal and sub-optimal growing conditions for mussels

## Future Work

- Continue to quantify the age of mussel samples and correlate growth to local climate
- Potential for chemical analysis to unlock more information



**Figure 3** - Plot of prior research in Western Pearlshell mussels with collaborators B. Frazee and B. Kennedy, University of Idaho

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