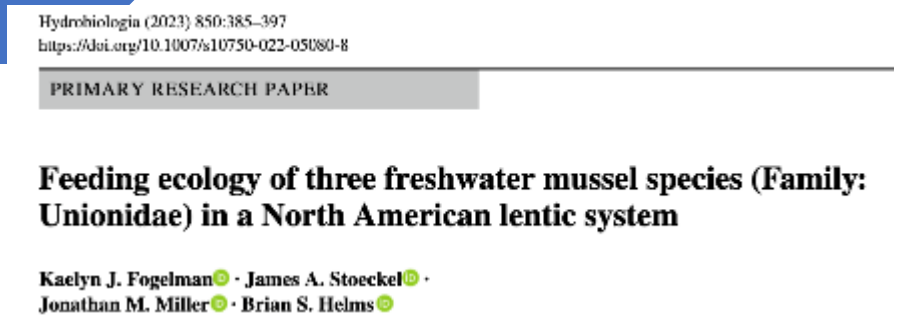
FEEDING ECOLOGY OF THREE FRESHWATER MUSSEL SPECIES (FAMILY: UNIONIDAE) IN A NORTH AMERICAN LENTIC SYSTEM

Kaelyn J. Fogelman, James A. Stoeckel, Jonathan M. Miller, and Brian S. Helms



Hydrobiologia (2023) 850:385–397
https://doi.org/10.1007/s10750-022-05080-8

PRIMARY RESEARCH PAPER

Feeding ecology of three freshwater mussel species (Family: Unionidae) in a North American lentic system

Kaelyn J. Fogelman · James A. Stoeckel · Jonathan M. Miller · Brian S. Helms

Unionid imperilement and knowledge gaps

Order: Unionida

302
North American Species

1/3
Global Unionid Mussels

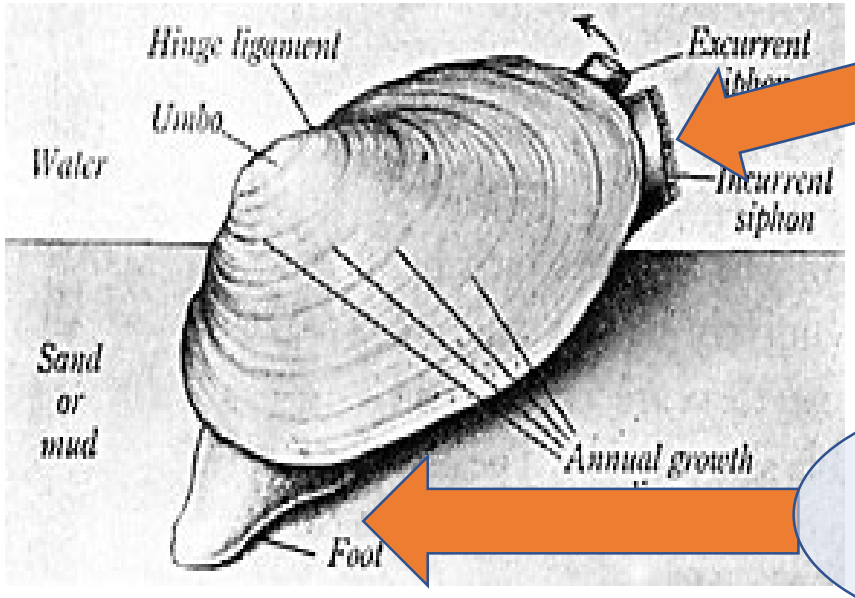
65%
Imperiled

Graf & Cummings 2021; Haag & Williams 2014

KNOWLEDGE GAPS: FEEDING ECOLOGY

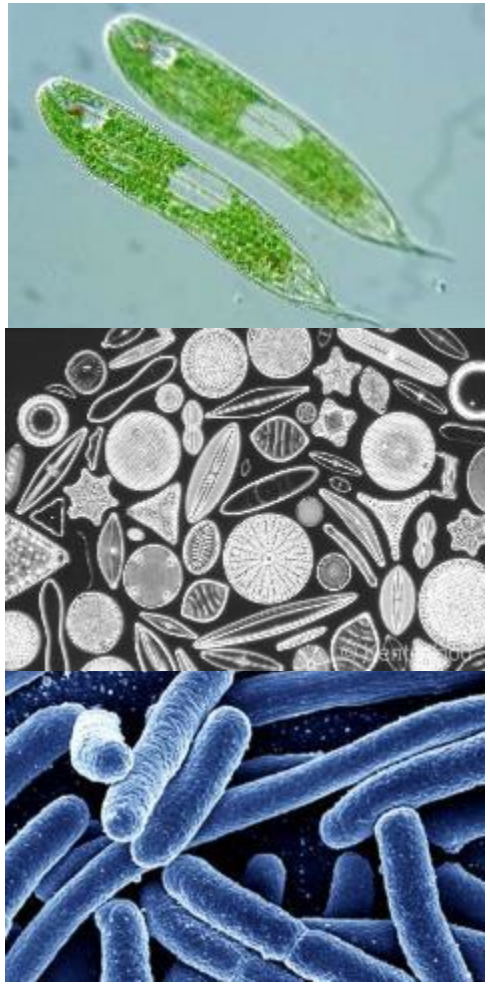
Poorly understood feeding ecology

- What do they eat?
- How do they eat it?

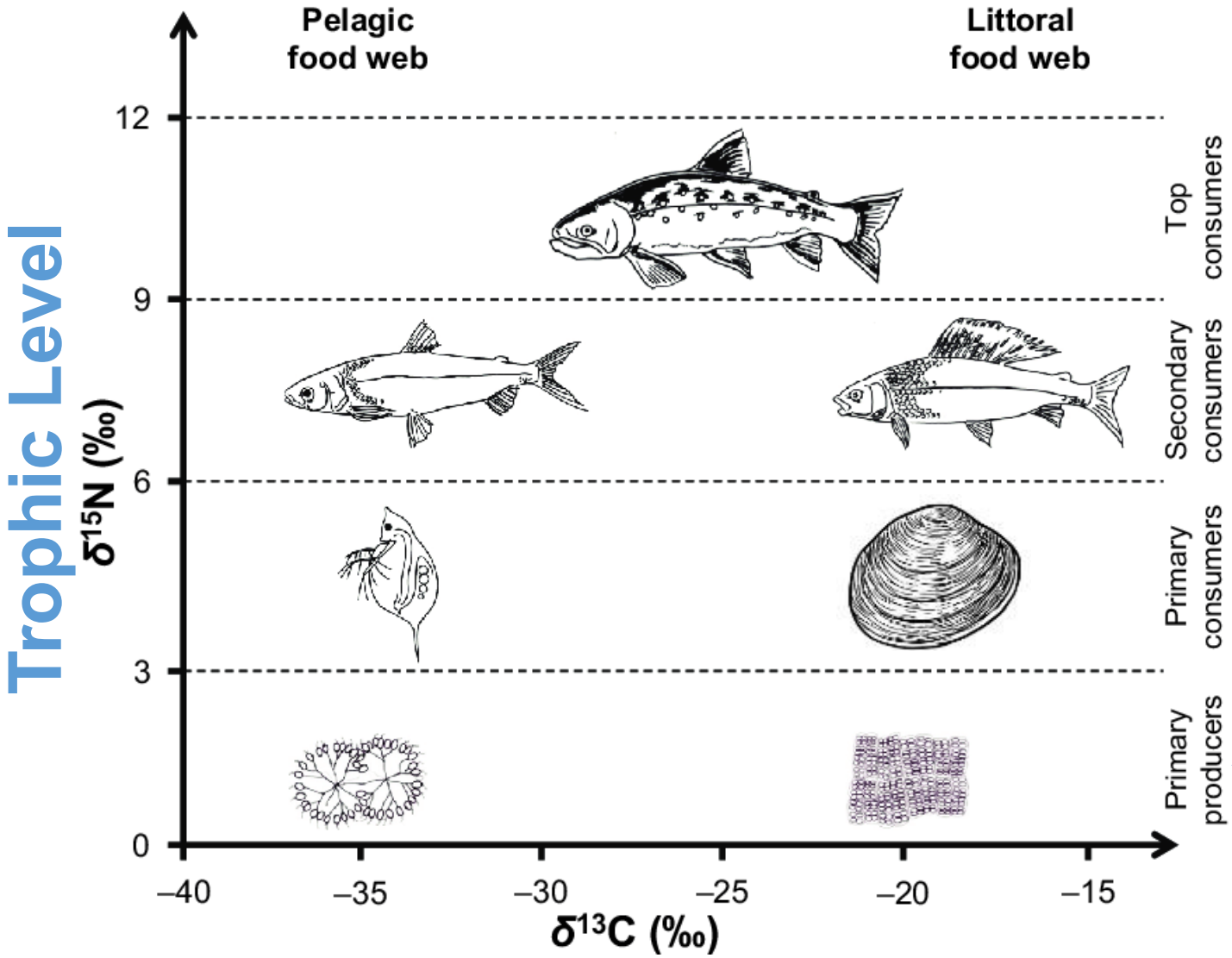


Suspended

Benthic



STABLE ISOTOPES TO UNDERSTAND FEEDING ECOLOGY



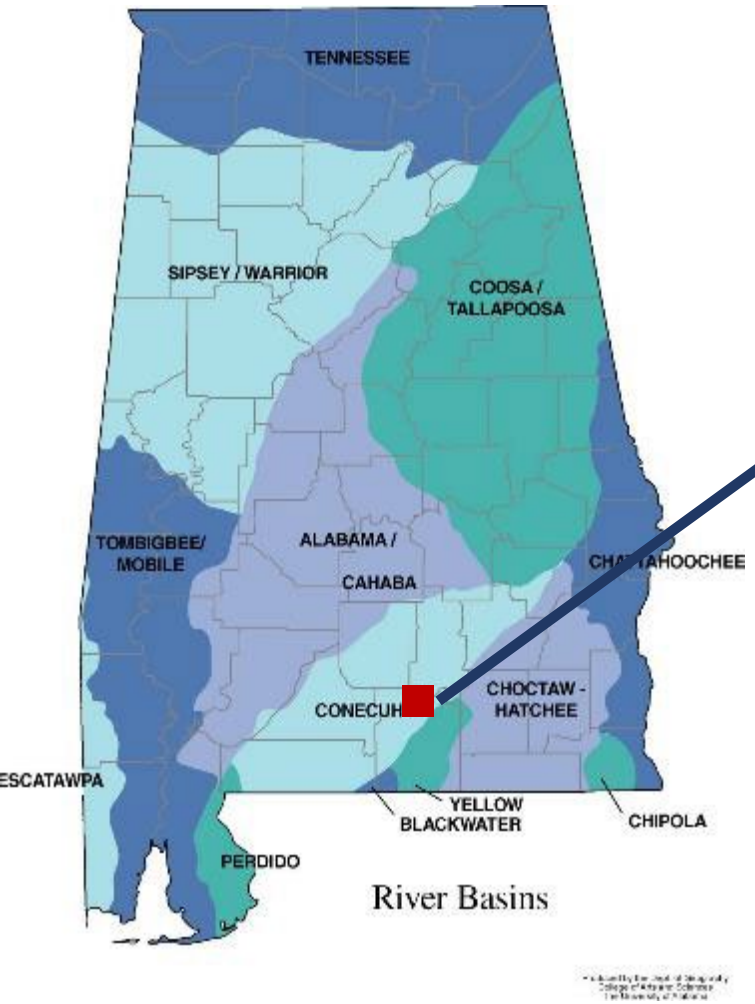
~ 3.4‰ $\delta^{15}N$ enrichment

~ 1‰ $\delta^{13}C$ enrichment

Food Source

Objective: Quantify food resources for **three species** of unionids in **a lentic system** using **stable isotope analysis**

1. Are mussels eating the same thing regardless of species?
2. Feeding mode: Benthic or suspended?
3. Does feeding change with age/size?
4. Are recently immersed mussels different from emersed mussels?



Gantt Lake

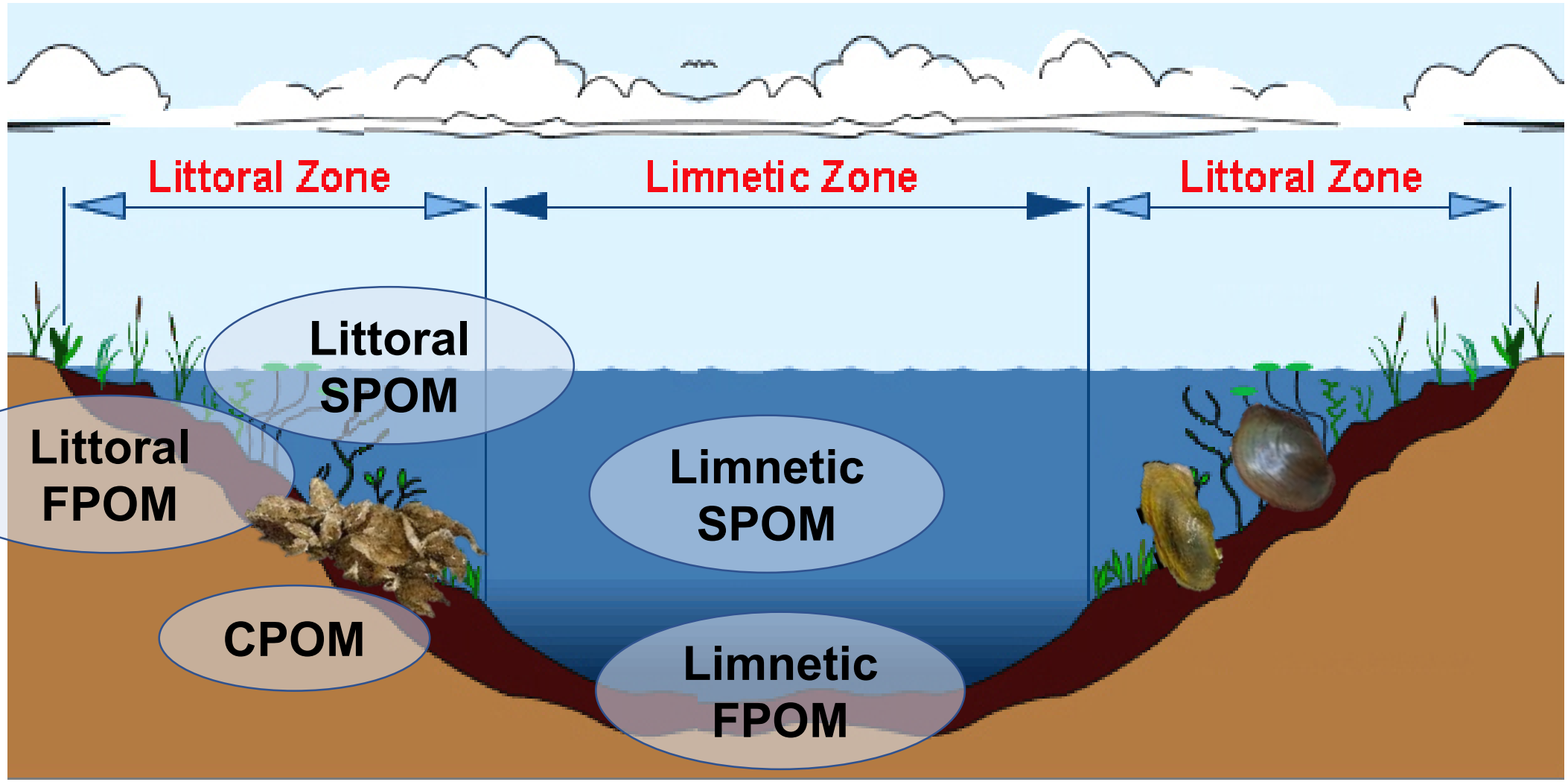
Elliptio pullata

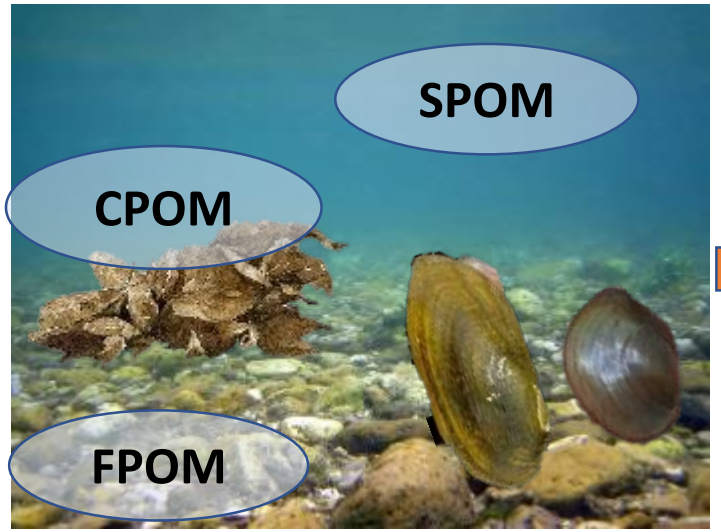
Fusconaia escambia

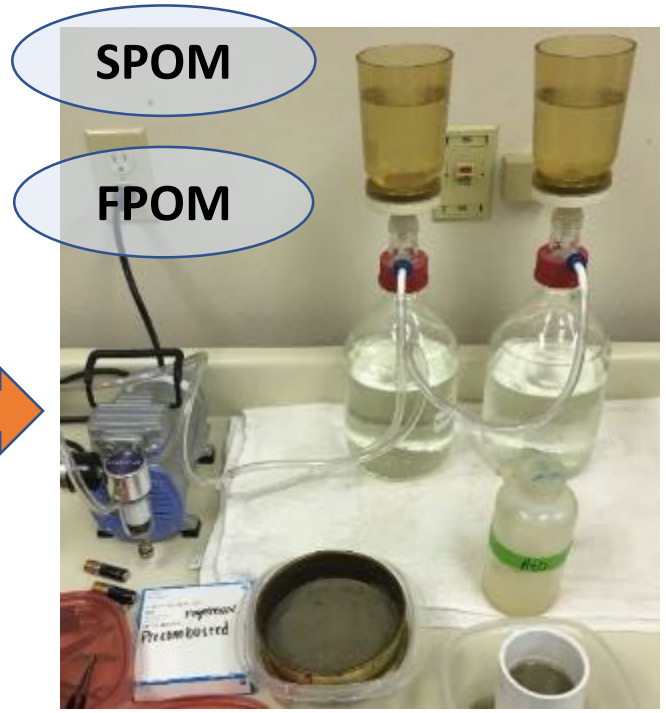
Utterbackiana hartfieldorum

recently immersed

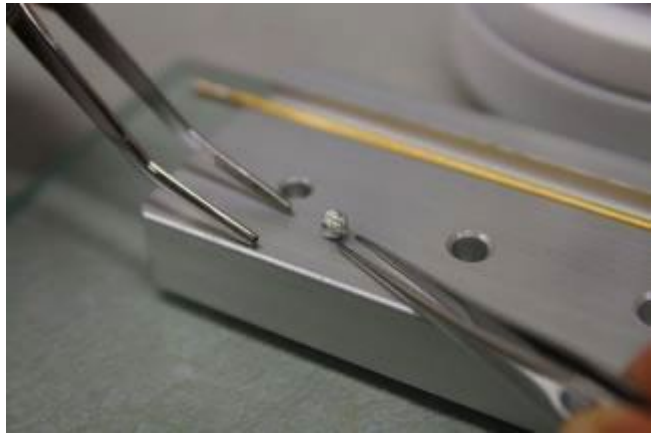
8-week emersion


Littoral Zone
Limnetic Zone
Littoral Zone
Littoral SPOM
Littoral FPOM
Limnetic SPOM
CPOM
Limnetic FPOM

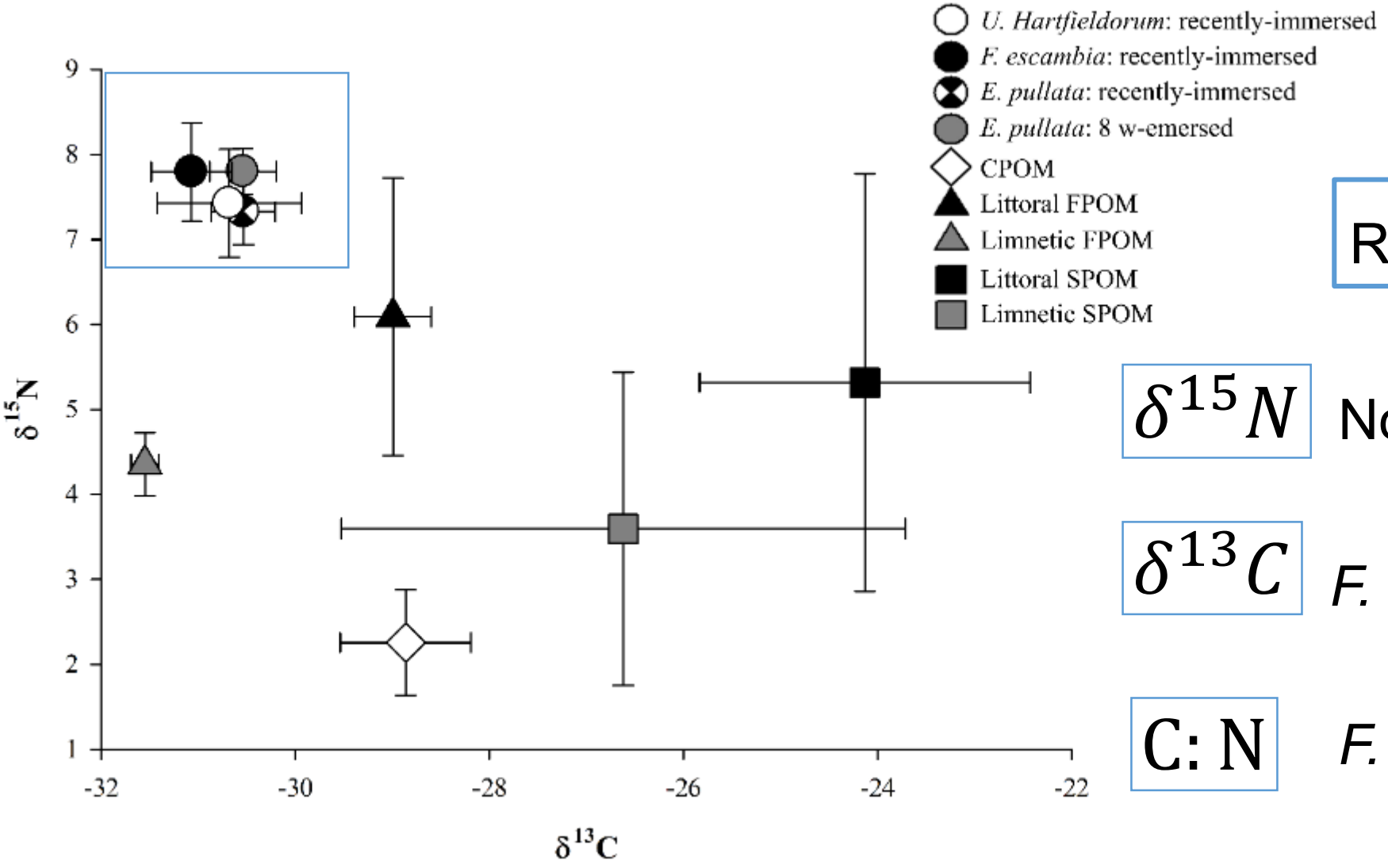




$\delta^{13}C$ $\delta^{15}N$



1. Are mussels eating the same thing regardless of species?



Recently immersed

$\delta^{15}N$ No difference

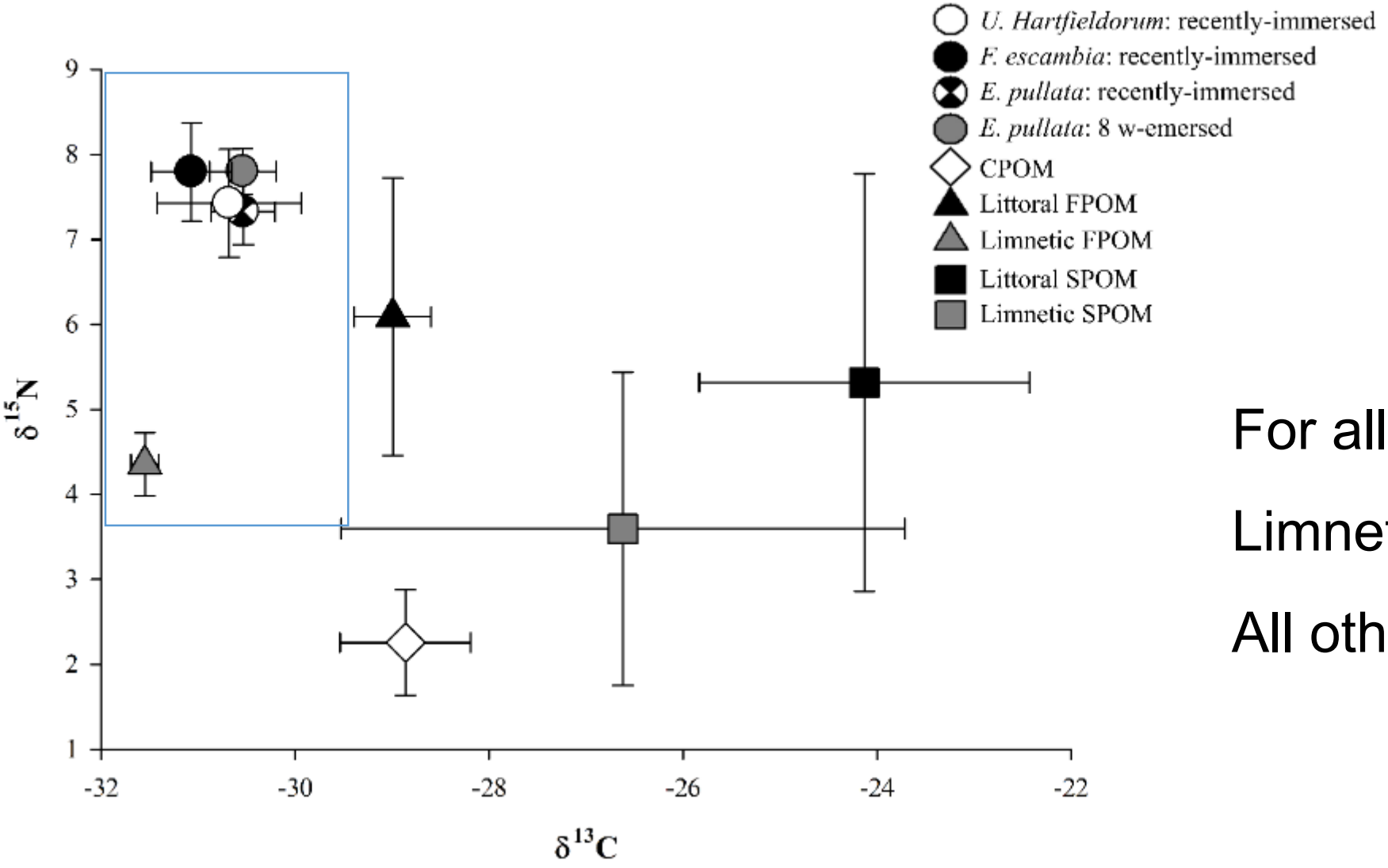
$\delta^{13}C$ *F. escambia* < *E. pullata*

H_3 = 8.63, p = **0.035**

C: N *F. escambia* < *E. pullata*

H_3 = 15.64, p = **0.001**

2. Feeding mode: Benthic or suspended?

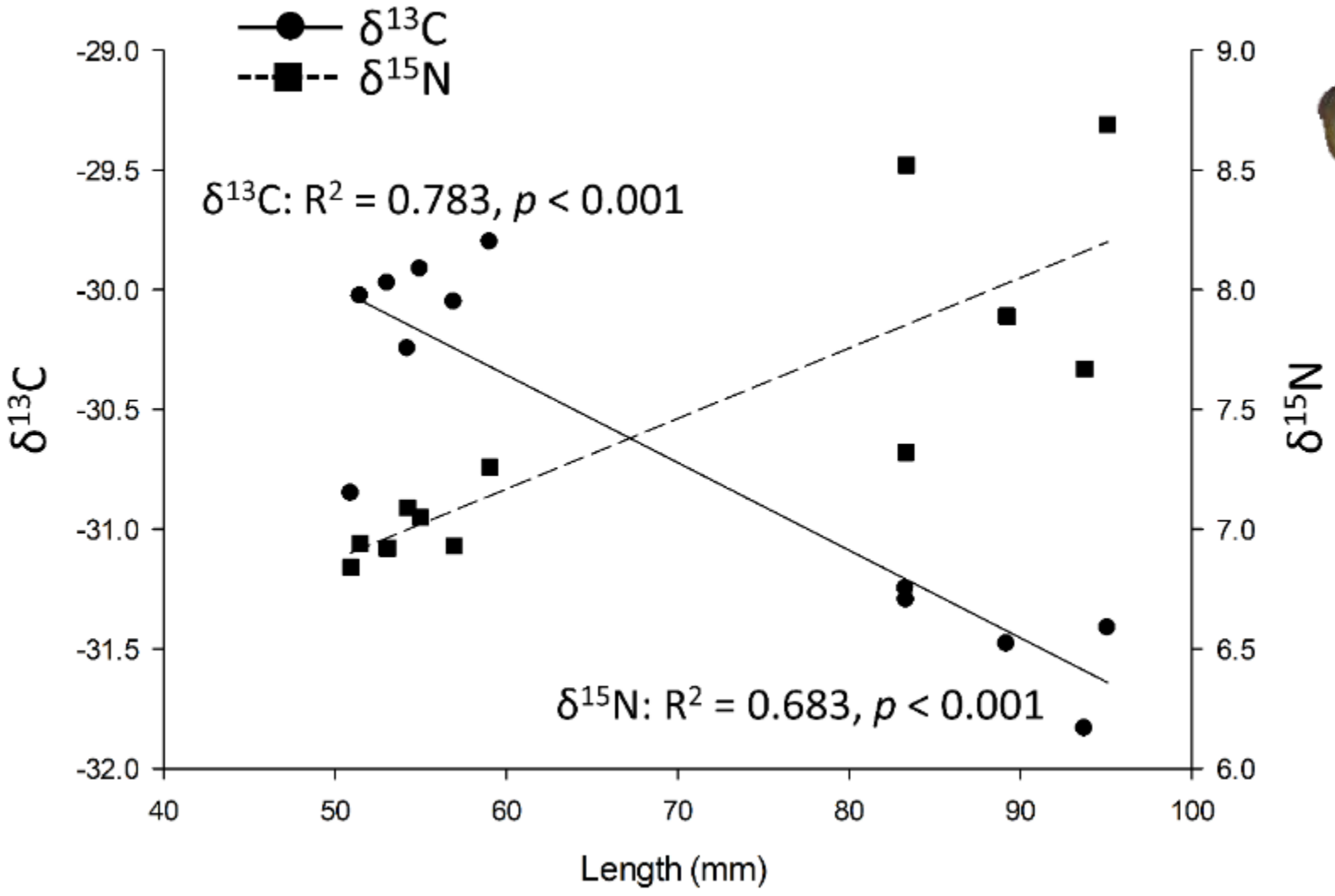


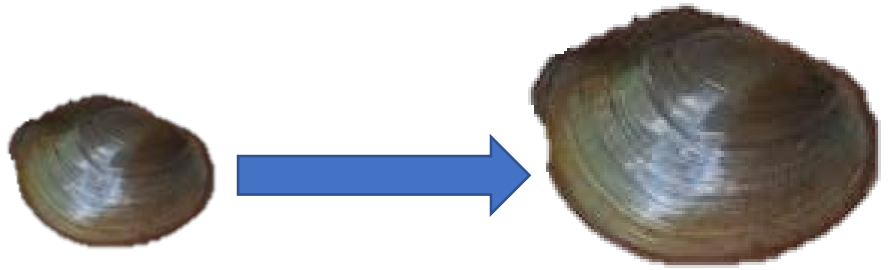
For all species:

Limnetic FPOM = ≥99%

All other food sources = <1%

3. Does feeding change with age/size?



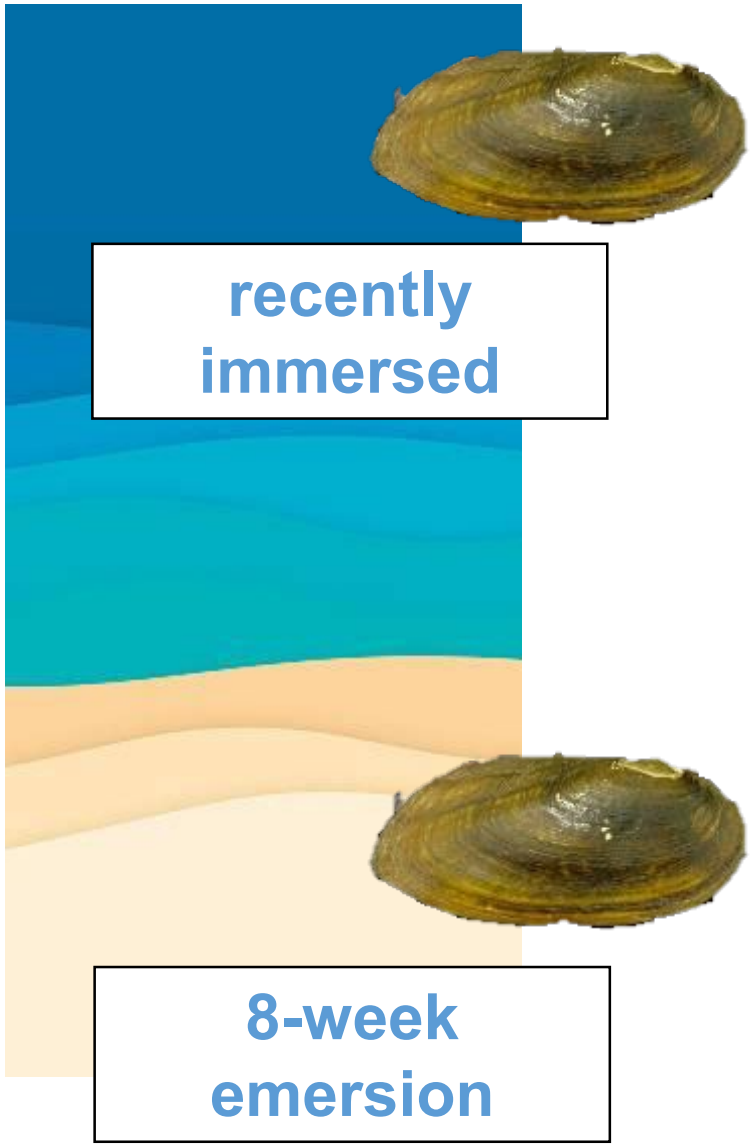


U. hartfieldorum

$\delta^{13}C$ ↓

$\delta^{15}N$ ↑

4. Are recently immersed mussels different from emersed mussels?



$$\delta^{15}N$$

Emersed > Immersed

H_3 = 11.24, p = **0.01**

1. Are mussels eating the same thing regardless of species?

Minimal variation in isotopic signatures

All species deriving C from limnetic FPOM

Minimal inter-specific variation in C source - community wide management approach

2. Feeding mode: Benthic or suspended?

99% dietary C from limnetic FPOM, <1% from SPOM

Benthic sources can be dominant food resources for mussels

Quality of benthic sources

3. Does feeding change with age/size?

Relationships in size and length for *U. hartfieldorum*

Diet shifts associated with ontogenetic niche shifts between young and old individuals

4. Are recently immersed mussels different from emersed mussels?

Emersed *E. pullata* more nitrogen enriched – self catabolism

Stranded unionids may rely on internal energy stores to survive emersion