Evaluating Population Dynamics of the Everglades Crayfish Within Marl Prairies of Big Cypress National Preserve

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Macroinvertebrate indicators of restoration

Everglades Crayfish

Procambarus alleni

- Dominant in **short hydroperiod** marshes
- Burrows during **annual dry downs**
- **More sensitive** to fish predators

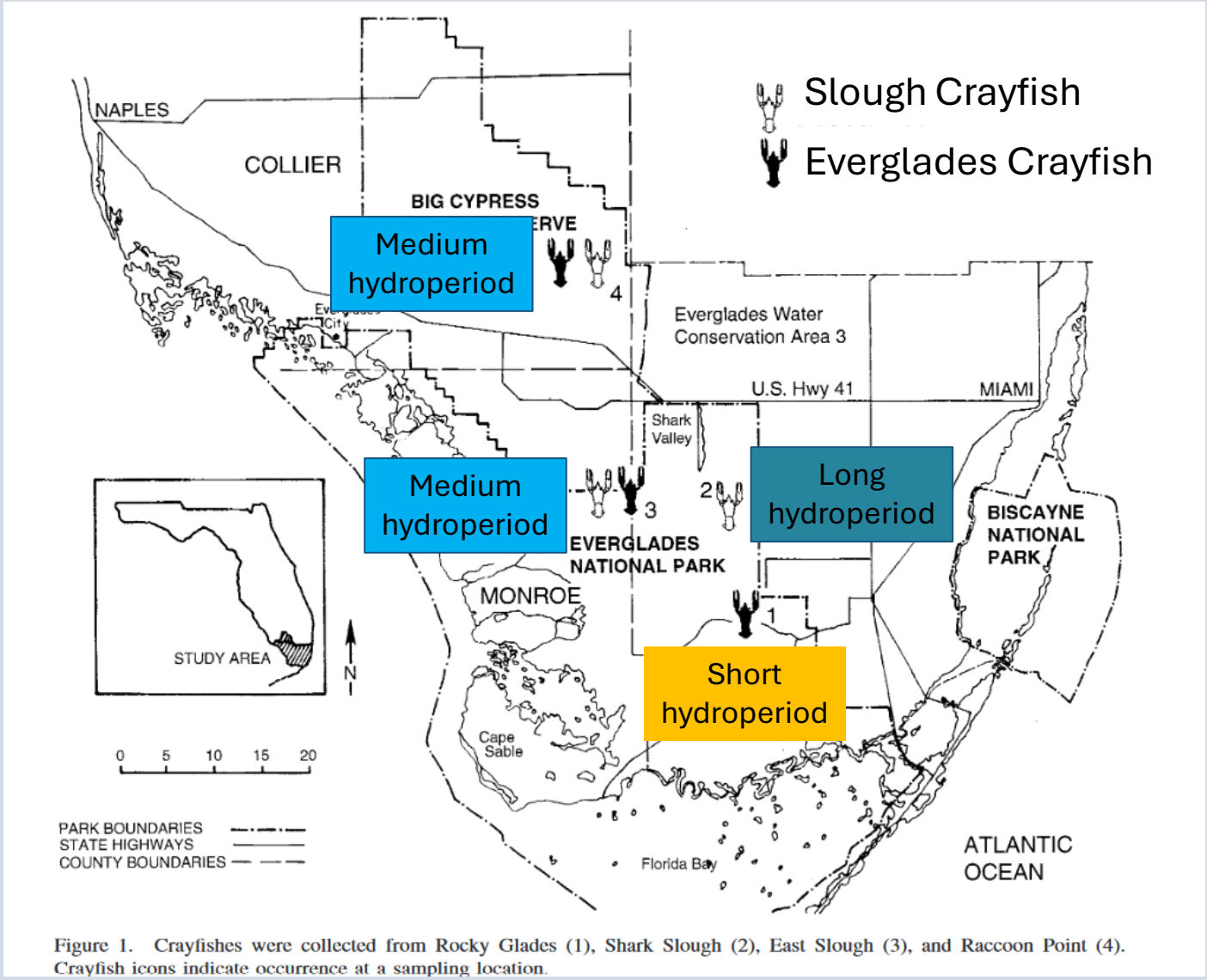
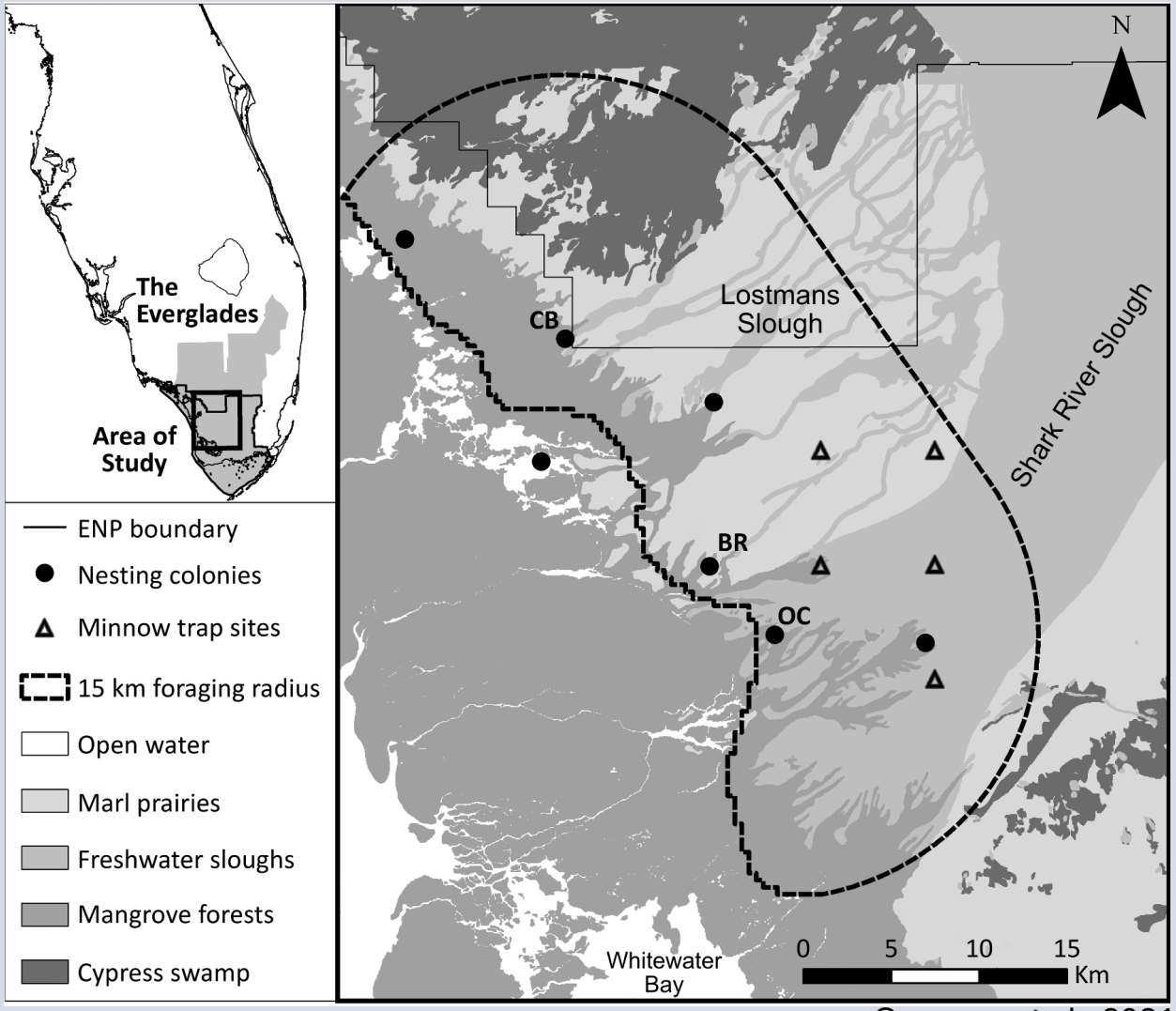


Figure 1. Crayfishes were collected from Rocky Glades (1), Shark Slough (2), East Slough (3), and Raccoon Point (4). Crayfish icons indicate occurrence at a sampling location.

Hendrix and Loftus 2000

White Ibis nesting success is limited by crayfish availability



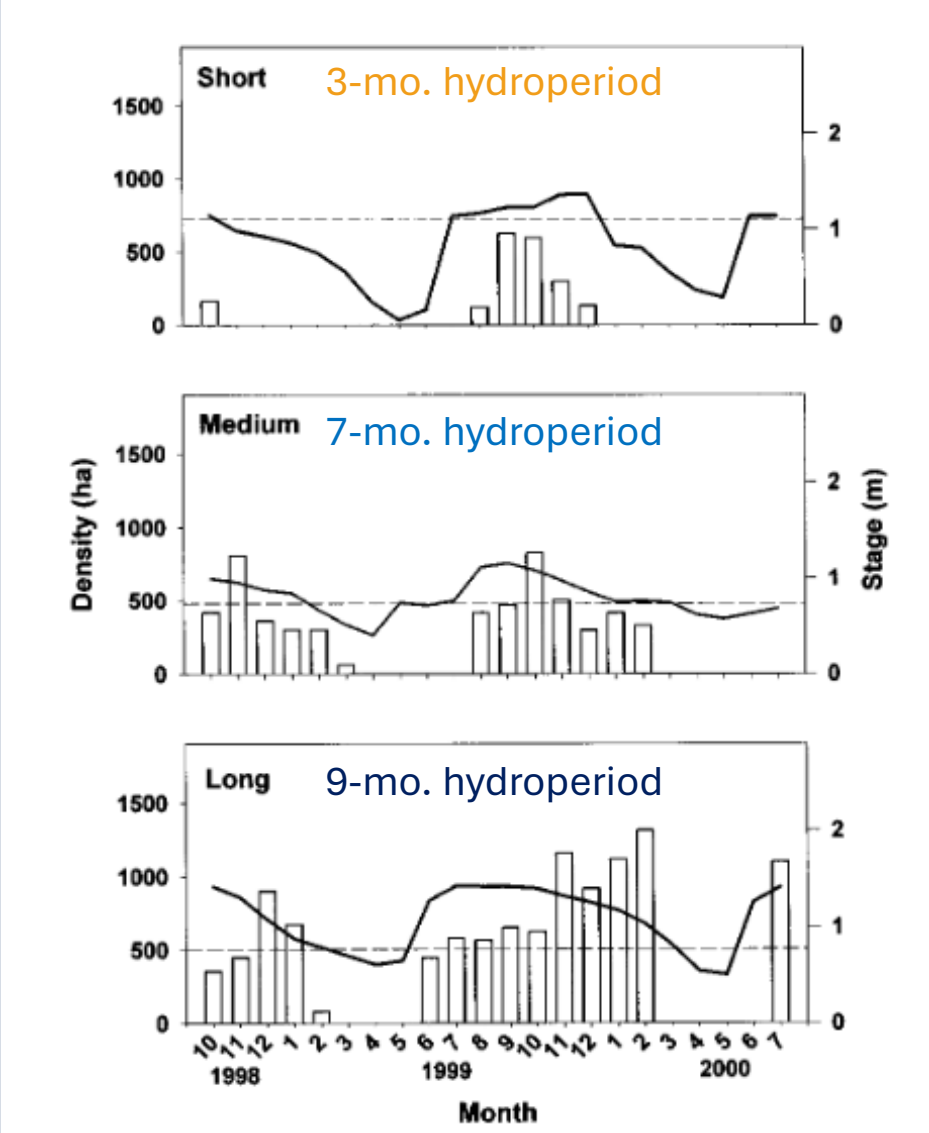
Cocoves et al. 2021

TABLE 1. Prey biomass means (dry g ± SE) for all prey types observed in boluses collected from White Ibis (*Eudocimus albus*) chicks at coastal colonies in Everglades National Park, Florida, USA, during the 2017 and 2018 breeding seasons.

Prey type	2017	2018
Crayfish	0.48 ± 0.24	2.45 ± 0.41
Crabs	1.33 ± 0.26	0.35 ± 0.10
Fish	0.26 ± 0.12	1.37 ± 0.20
Aquatic insects	0.06 ± 0.02	0.05 ± 0.02
Shrimp	0.00 ± 0.00	0.02 ± 0.01
Terrestrial invertebrates	0.00 ± 0.00	0.00 ± 0.00
$\bar{x}$ g bolus^{-1}	2.14 ± 0.31	4.25 ± 0.39
n	40	120

Cocoves et al., 2021

Mechanisms limiting Everglades Crayfish abundances in short-hydroperiod wetlands remains less clear



Acosta and Perry 2000

Conclusions about Everglades Crayfish population dynamics from work in the 1990s:

- Biomass is limited with hydroperiods < 7 months long
- Slower growth in short hydroperiod wetlands
- Survival belowground is reduced with hydroperiods < 6 months

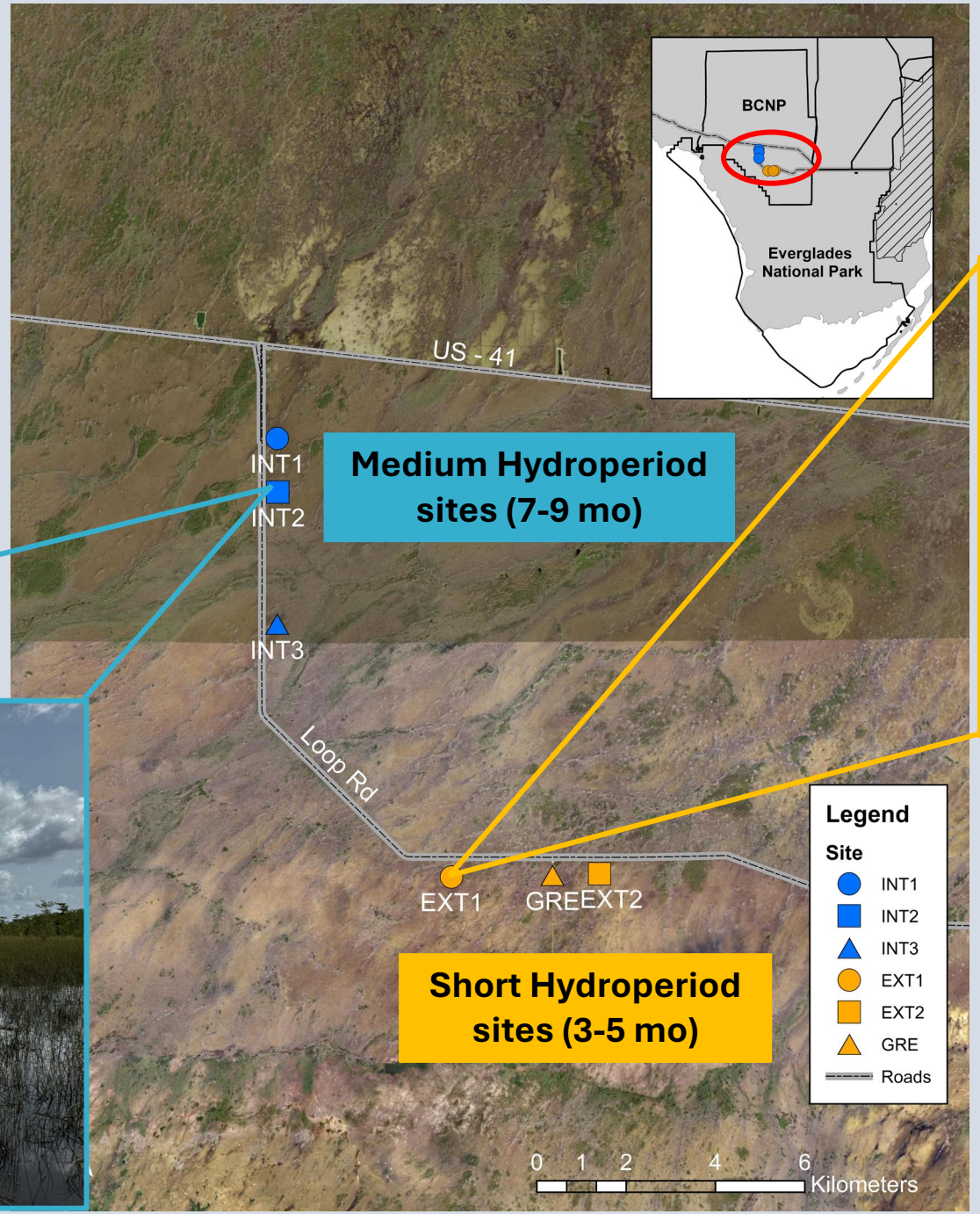
Acosta and Perry (2000, 2001, 2002)

Questions

1. Are Everglades Crayfish populations limited by shortened hydroperiods?

2. What mechanisms might limit Everglades Crayfish abundances in seasonal wetlands?
   a. Mortality during the dry season
   b. Growth rates during the wet season
   c. Development period

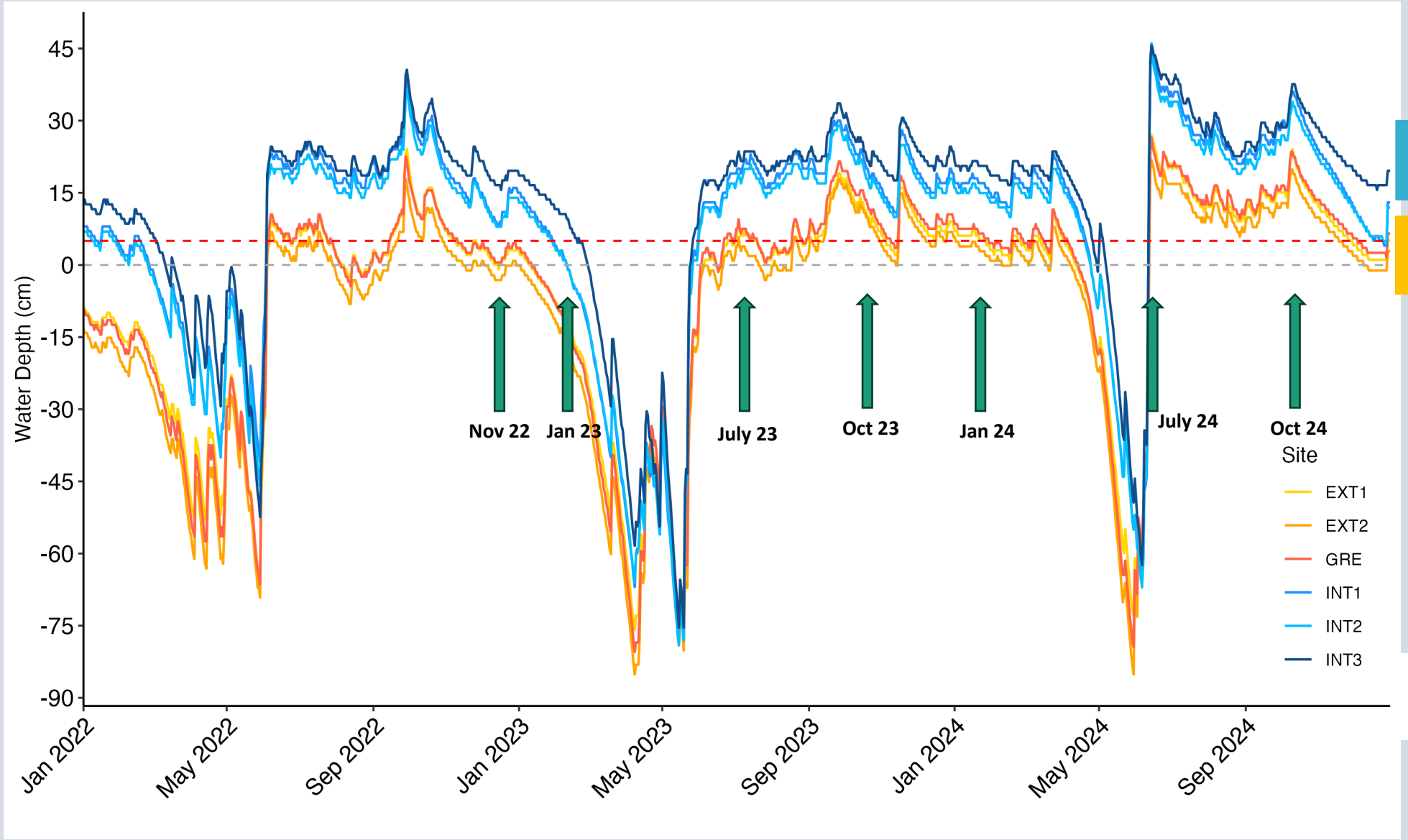
Marl Prairie Wetlands near Loop Road



Avg water depth July: 42cm

Avg water depth July: 12cm

Seasonal wetlands with depth and hydroperiod variation



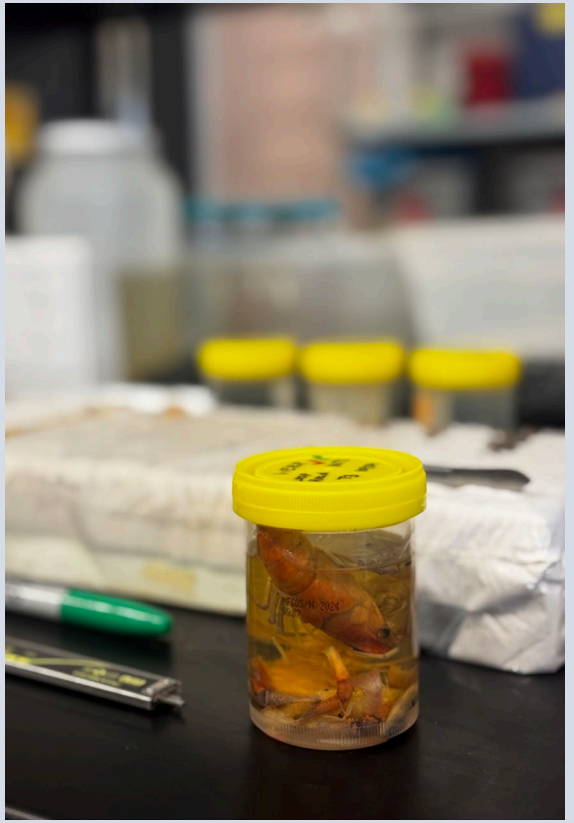
Medium Hydroperiod

Short Hydroperiod

EVERGLADES DEPTH ESTIMATION NETWORK
EDEN

USGS
science for a changing world

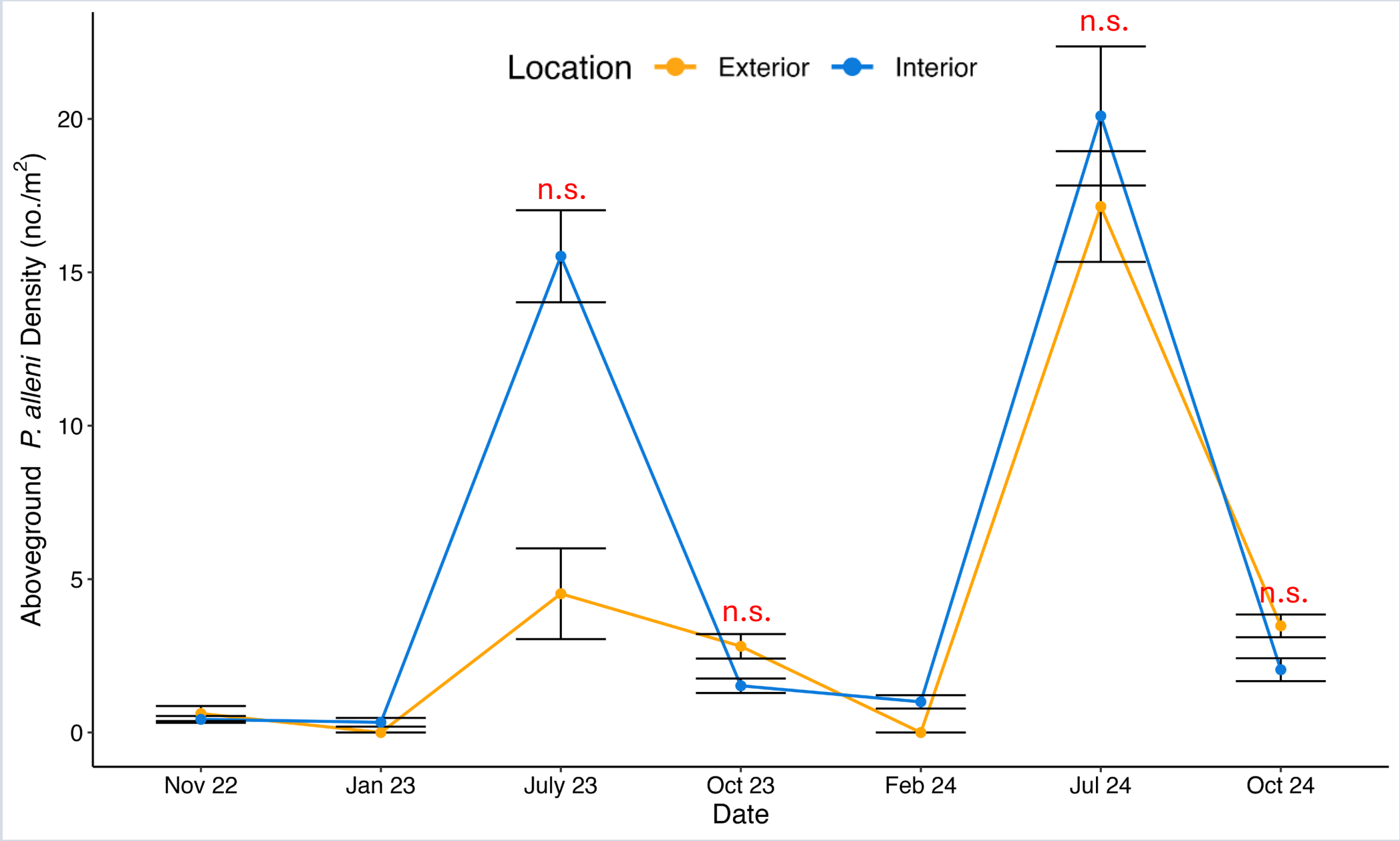
Monitoring population density and biomass dynamics.



- Min water depth needed to sample: **> 5cm**

Sample Seasons:
1) January 2023, 2024 **(Early dry season)**
2) July 2023, 2024 **(Early wet season)**
3) Nov/October 2022, 2023, 2024 **(Late wet season)**

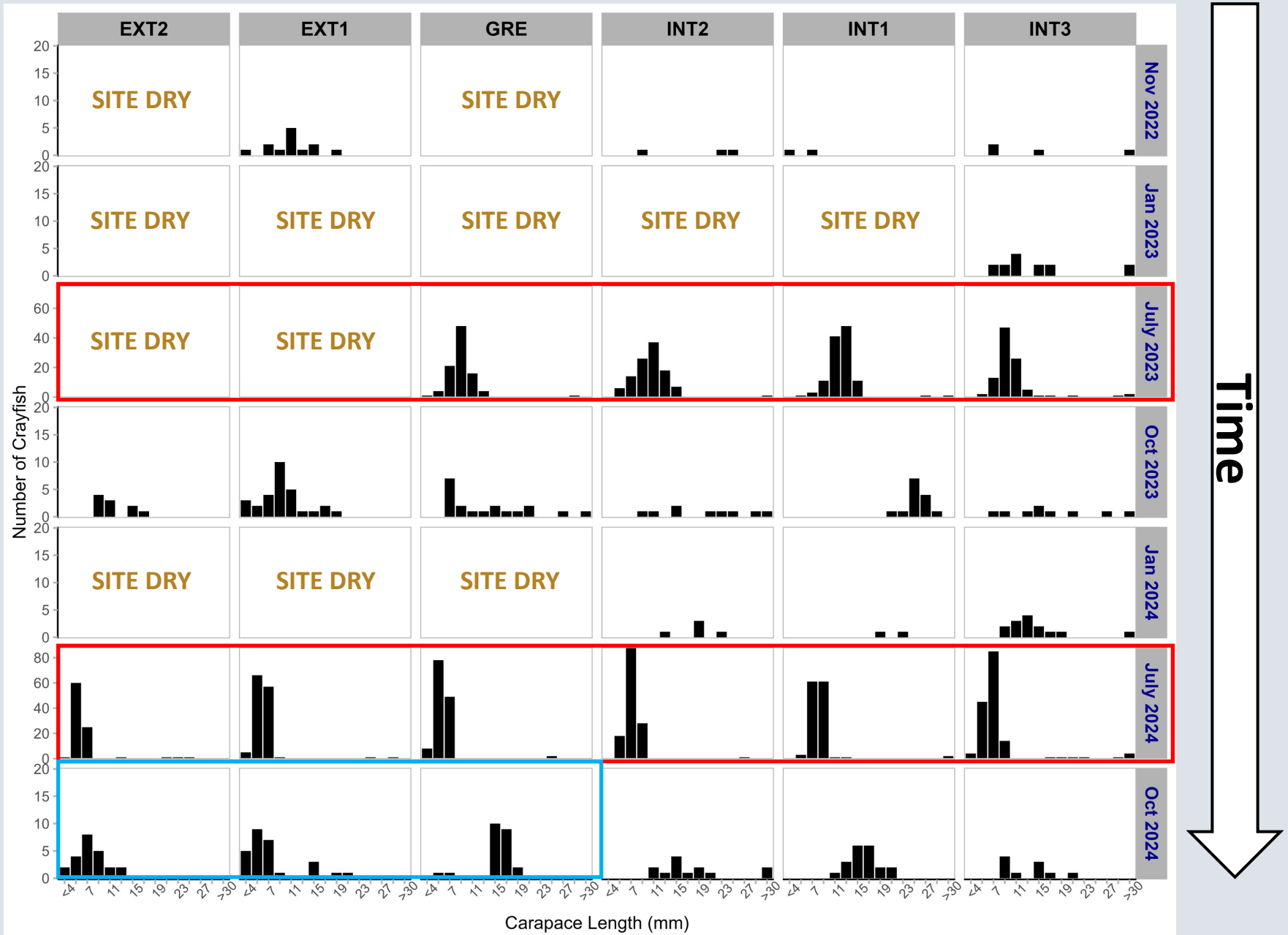
Interior and Exterior sites achieved similar densities when flooded



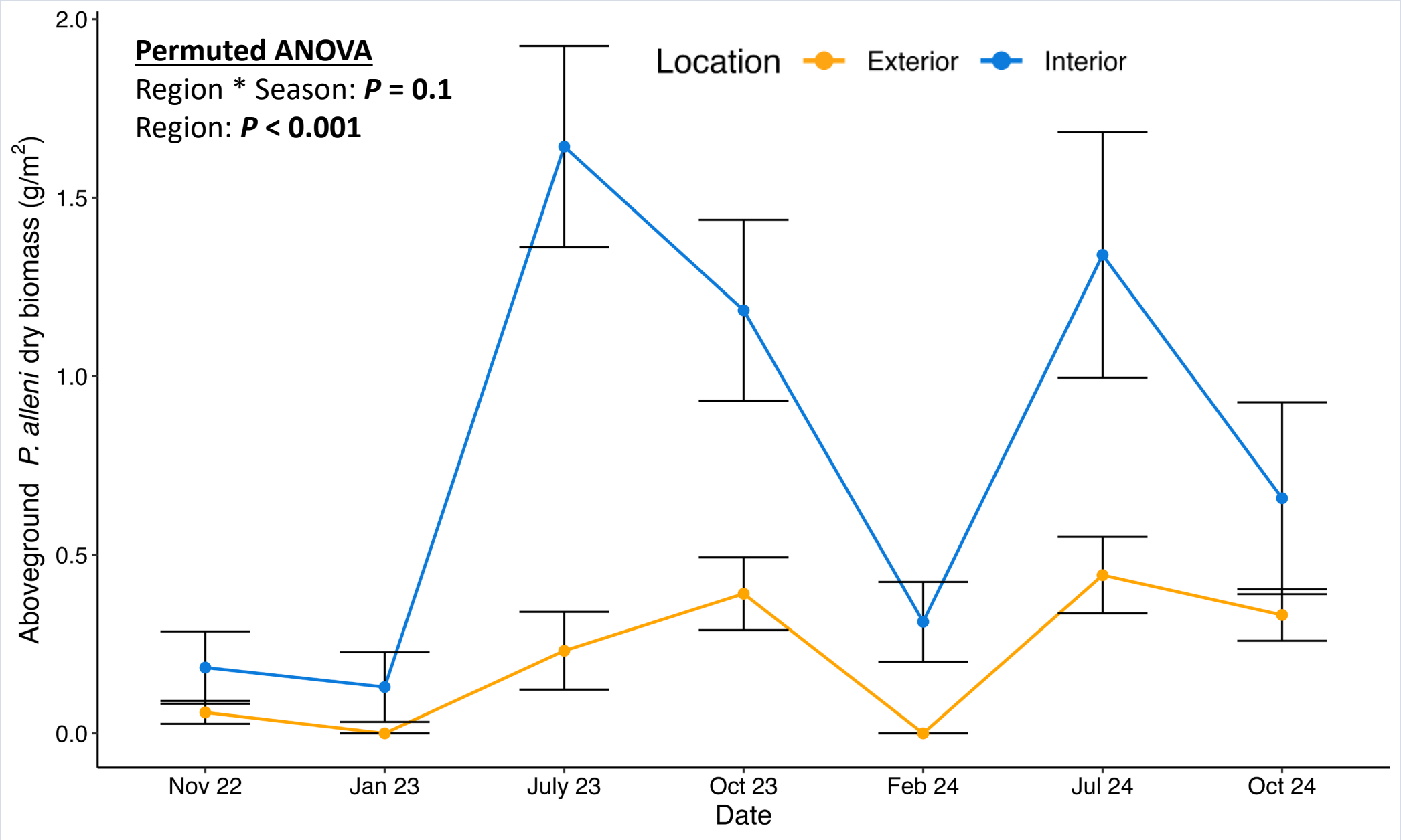
Hydroperiod length

5-yr avg hydroperiod:

EXT2: 92 Days
EXT1: 147 Days
GRE: 151 Days
INT2: 241 Days
INT1: 248 Days
INT3: 268 Days



Medium hydroperiod sites had higher biomass in the wet season



Did Medium hydroperiod marl prairies support more aboveground biomass of Everglades Crayfish on average?

Yes. But that's mostly caused by seasons with crayfish belowground

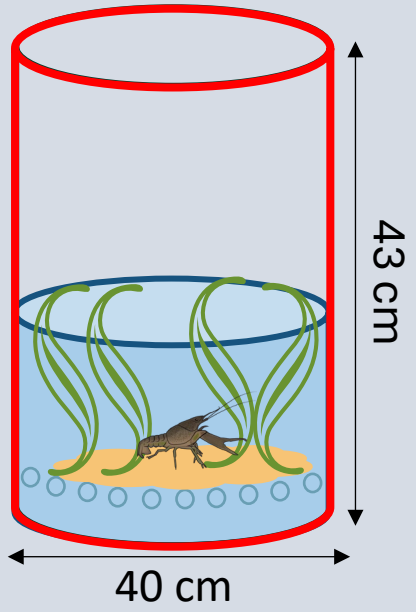
Do crayfish grow faster in the longer hydroperiod wetlands?

Within site density treatments:

- High density = 3 crayfish
- Low density = 1 crayfish
- N = 6 buckets per site

(3 reps per treatment per site)

Duration: 3 weeks (July 2024)



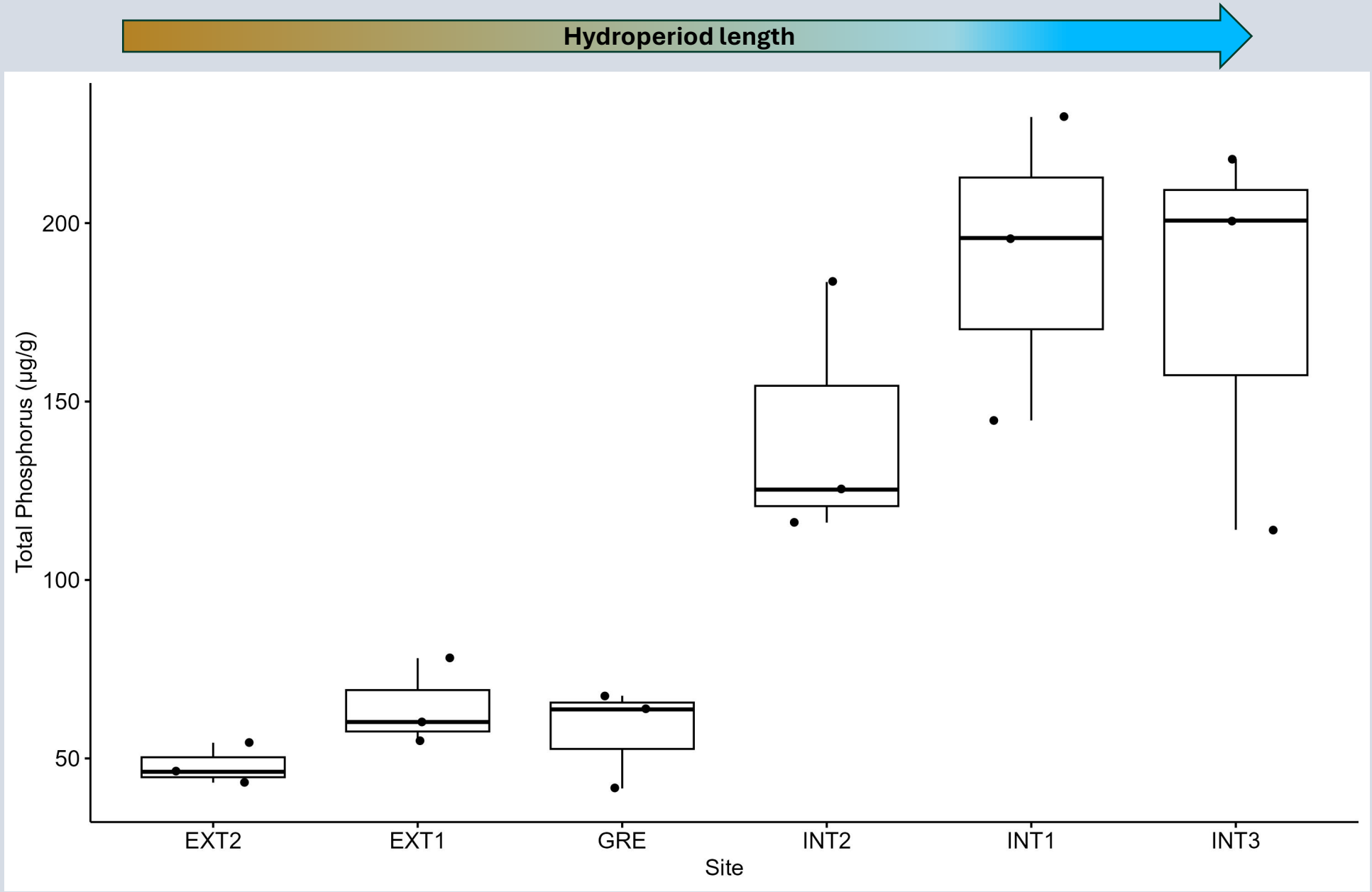
Total bucket area: 0.1m^2

Size of juvenile crayfish used:

8-9mm carapace length

Site-specific resources

Ambient phosphorus



Growth Results

Proportional Growth Rate:

$$\ln\left(\frac{\text{final mean dry biomass}}{\text{starting mean drybiomass}}\right)$$

Site x Density model

Site * Density

$F_{11,22} = 3.164$; ***P = 0.01***

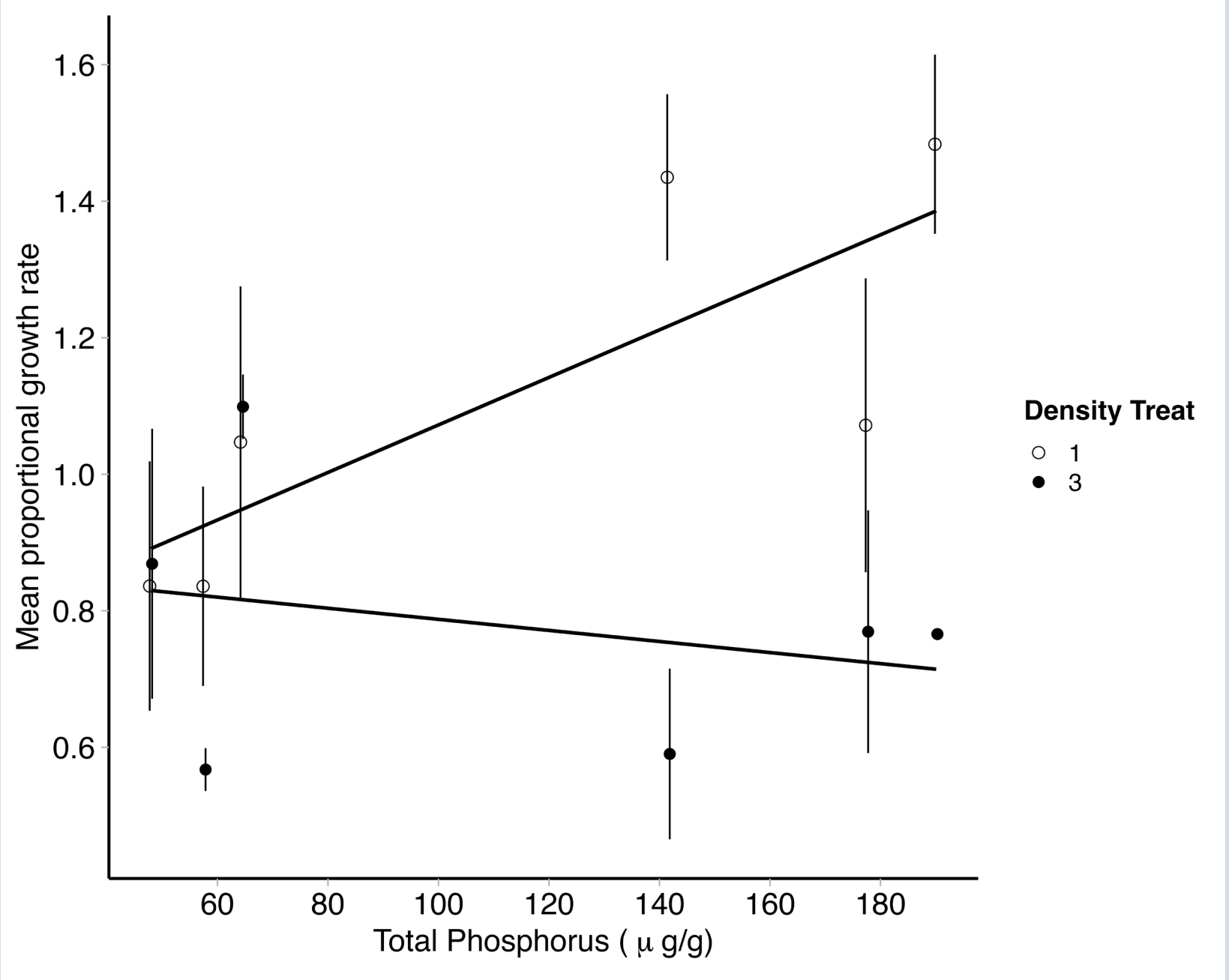
TP x Density model

No overall effect of periphyton TP

Interaction:

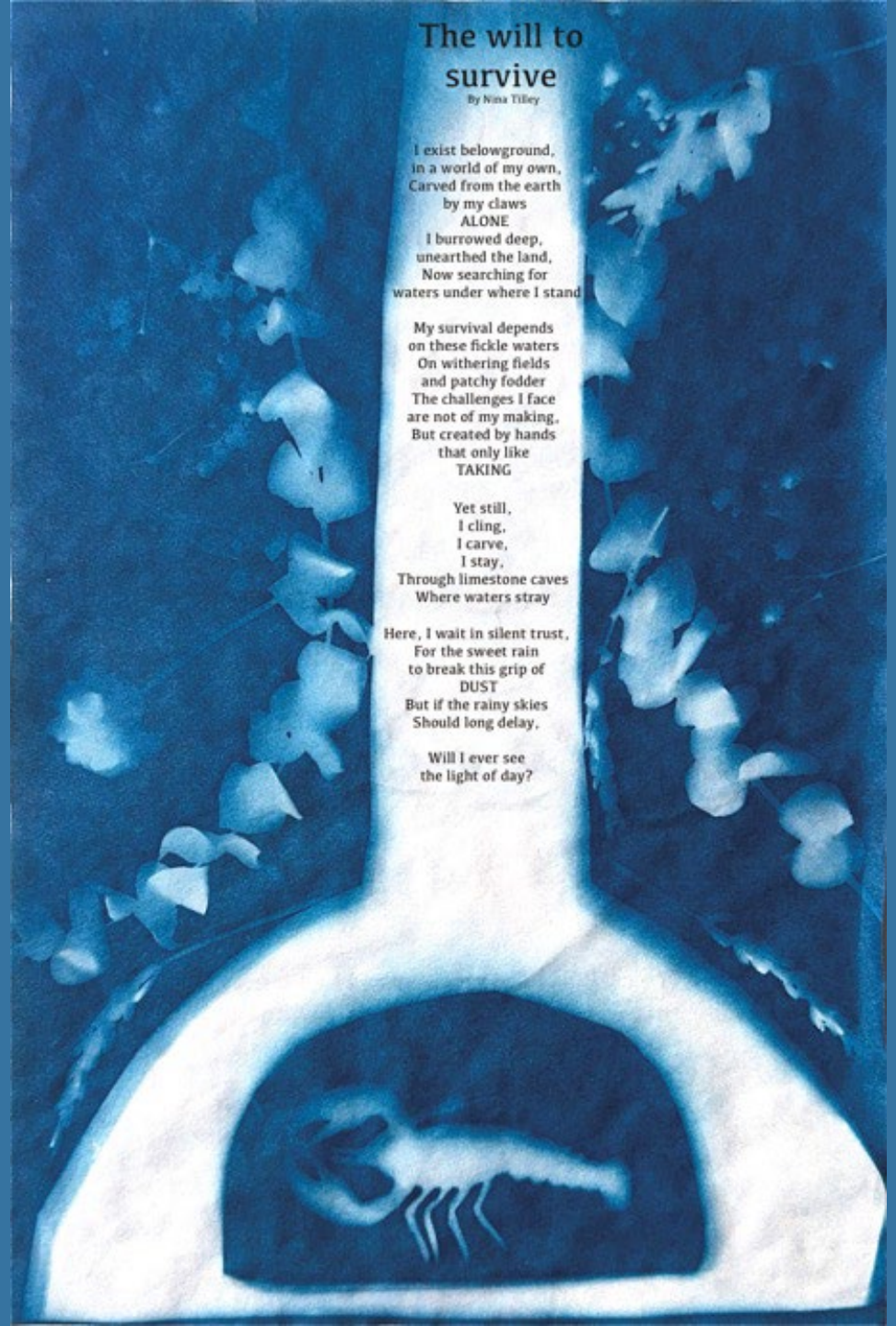
Phosphorus * Density

$F_{1,30} = 5.83$; ***P = 0.02****



Summary of findings

- Most juvenile recruitment was timed to reflooding of the marsh in the early wet season
- Crayfish in short and medium hydroperiod marl prairies reached similar densities when flooded
- Average biomasses were lower in short hydroperiod wetlands
- Average biomass during flooded periods was not generally different between regions
- Everglades Crayfish tolerates a range of hydroperiods but will be belowground in most dry seasons (during bird nesting).



Questions and Acknowledgements

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