

Shifting Macrophytes: *Thalassia* and *Caulerpa* Support Unique Ecological Communities

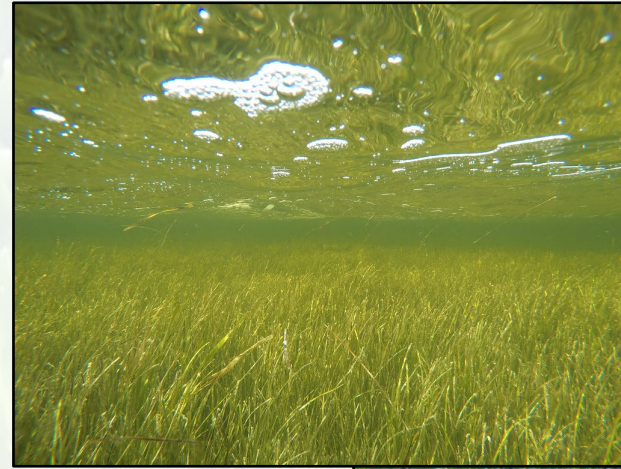
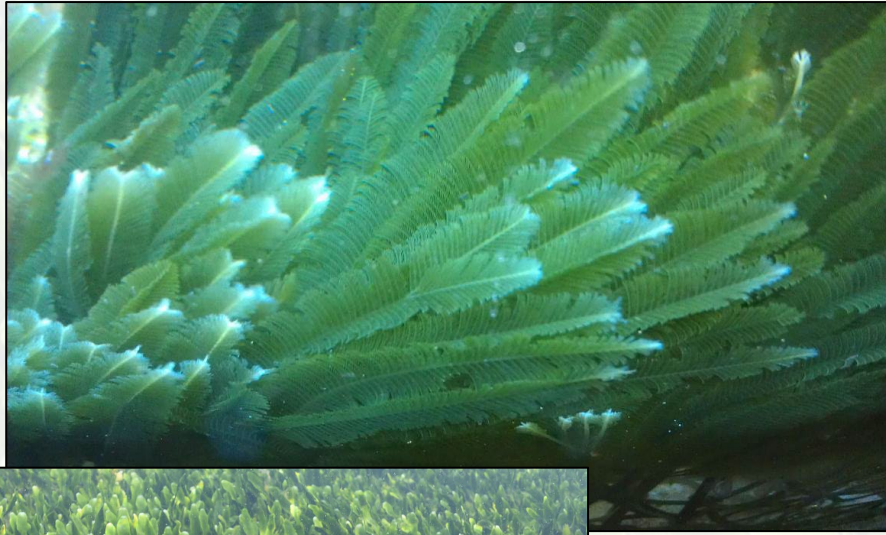
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²UF/IFAS Nature Coast Biological Station, Cedar Key, Florida;

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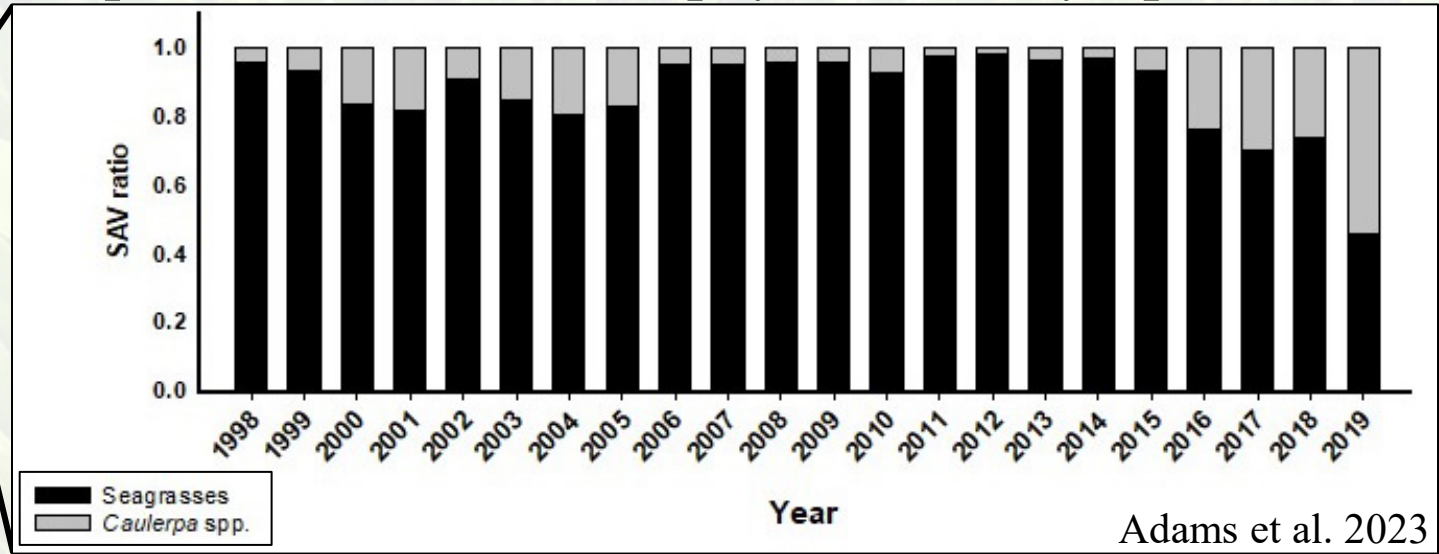
⁴UF/IFAS Soil, Water, and Ecosystem Sciences Department, Gainesville, Florida



Caulerpa Thrives in Degraded Systems



Proportion of Total Macrophyte Cover By Species



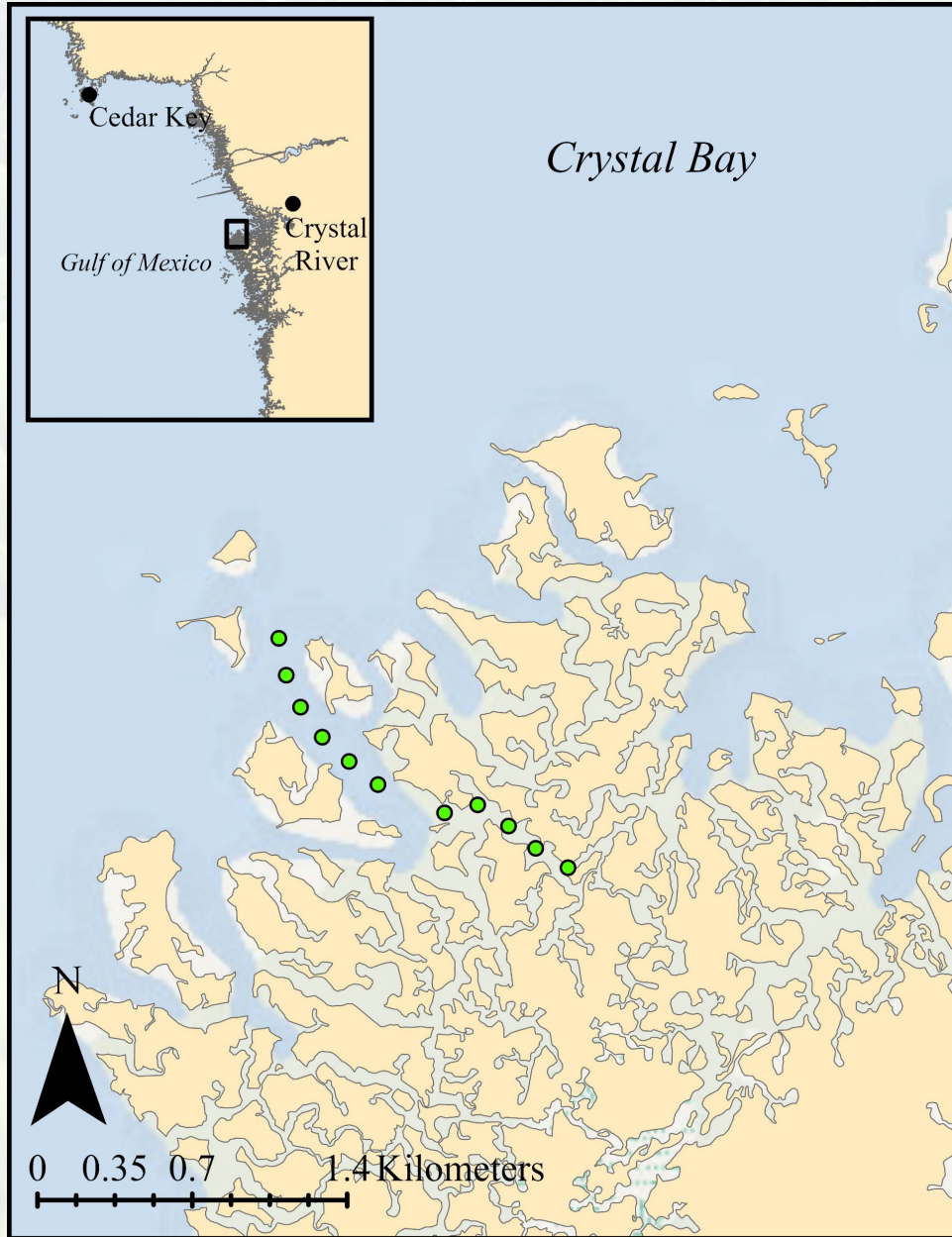
In Relatively Unimpacted Systems...

1. How do macrophytes naturally shift over time?
2. How do fauna communities respond to these changes?
3. What species drive community differences?

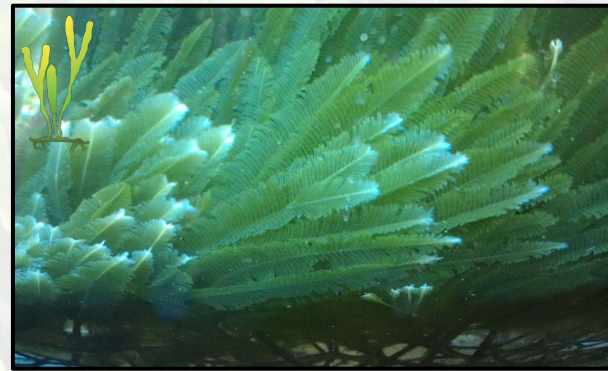
Our Natural Laboratory



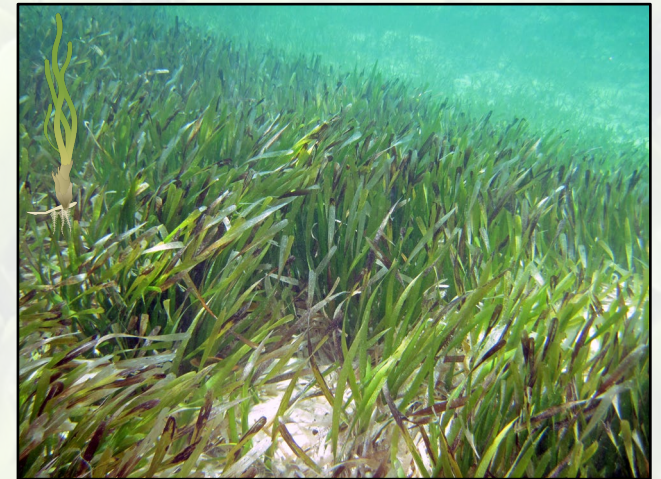
We Sampled SAV By...



- Designating 11 sites ranging from 100% *Caulerpa* spp to 100% seagrass cover



Caulerpa paspaloides



Thalassia testudinum



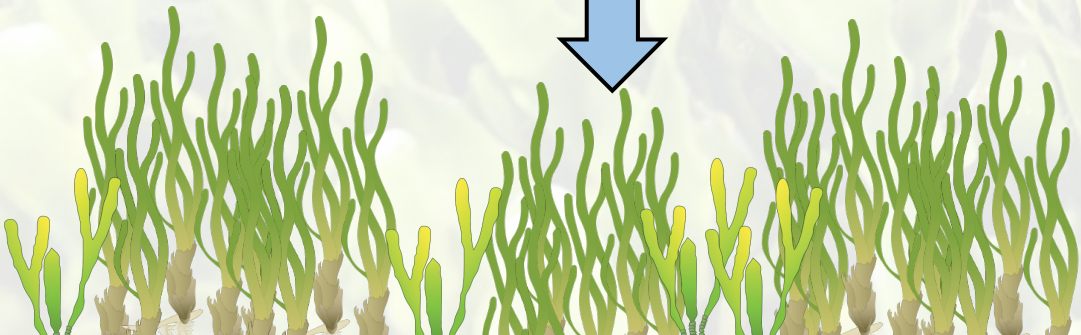
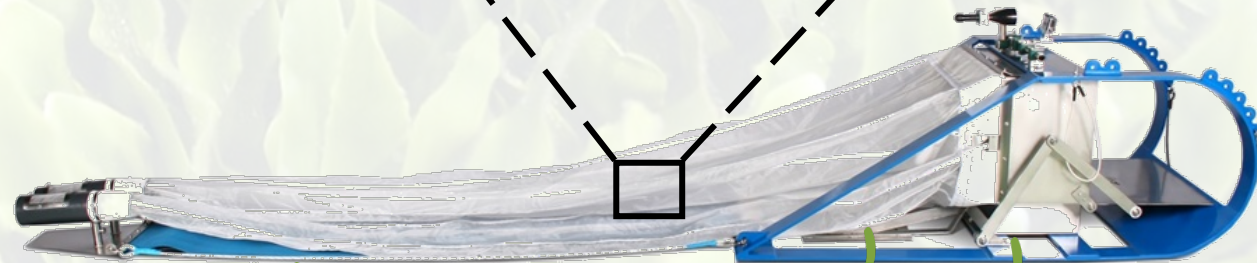
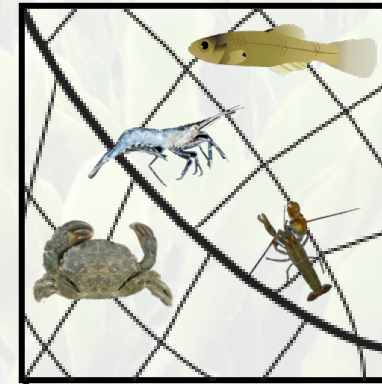
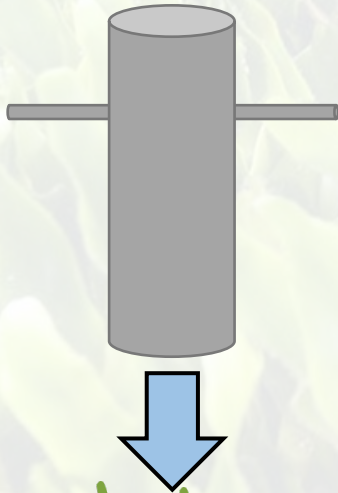
Caulerpa prolifera

We Sampled SAV Across Three Seasons With...

Macrophyte Core (x4 per site)  Benthic Sled (x3 per site)

- Aboveground biomass
- Shoot density
- Belowground biomass
- Leaf area

- Taxonomic ID
- Species counts

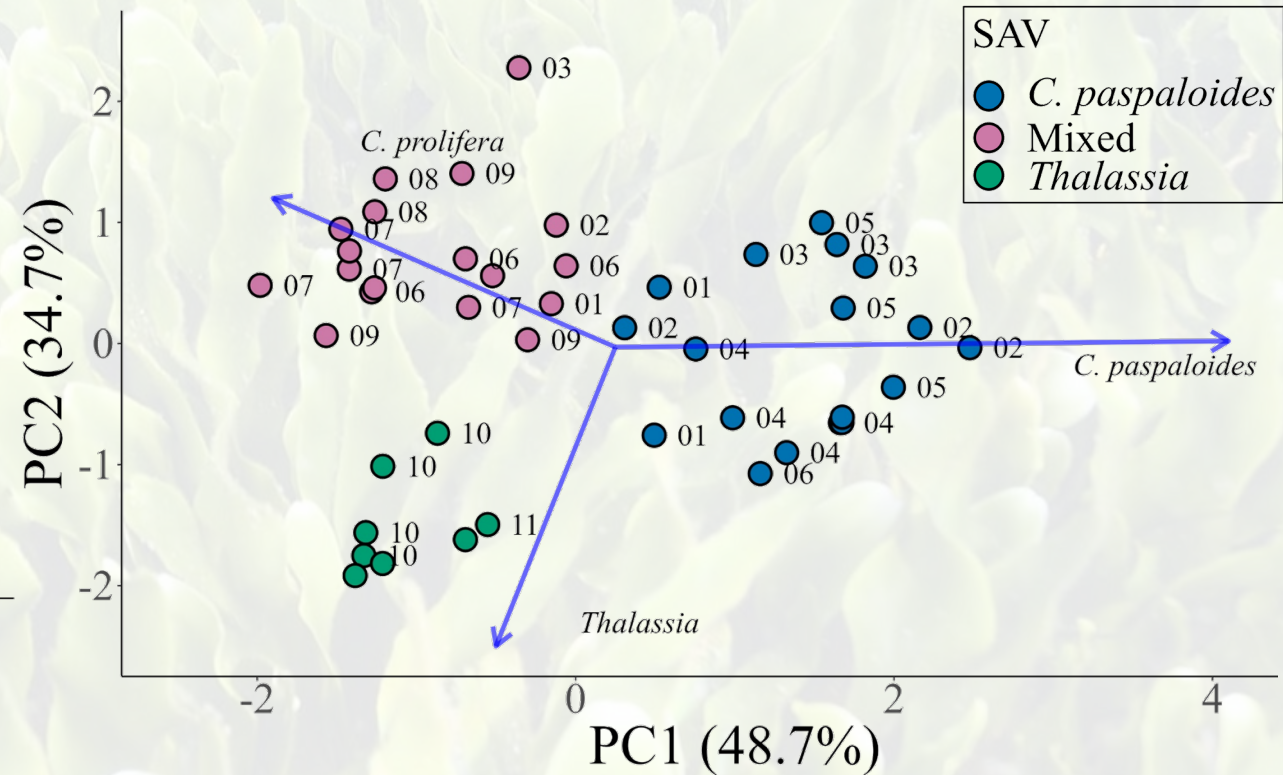
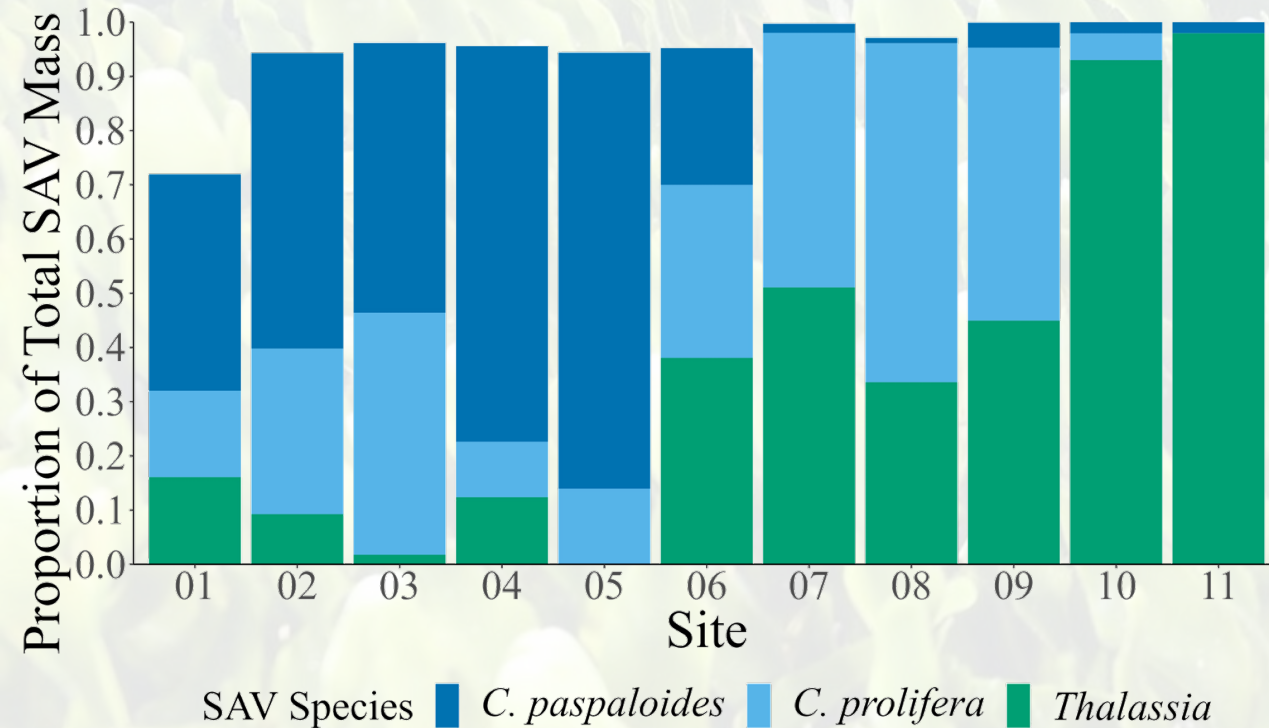


SAV Samples Showed High Clustering in Fall 2021

Time

Fall 2021

Proportion Biomass of SAV By Site



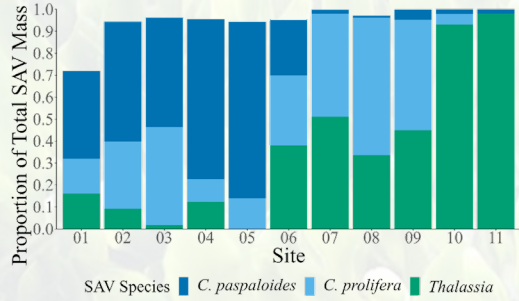
SAV Dominance Varied Over Seasons

Time

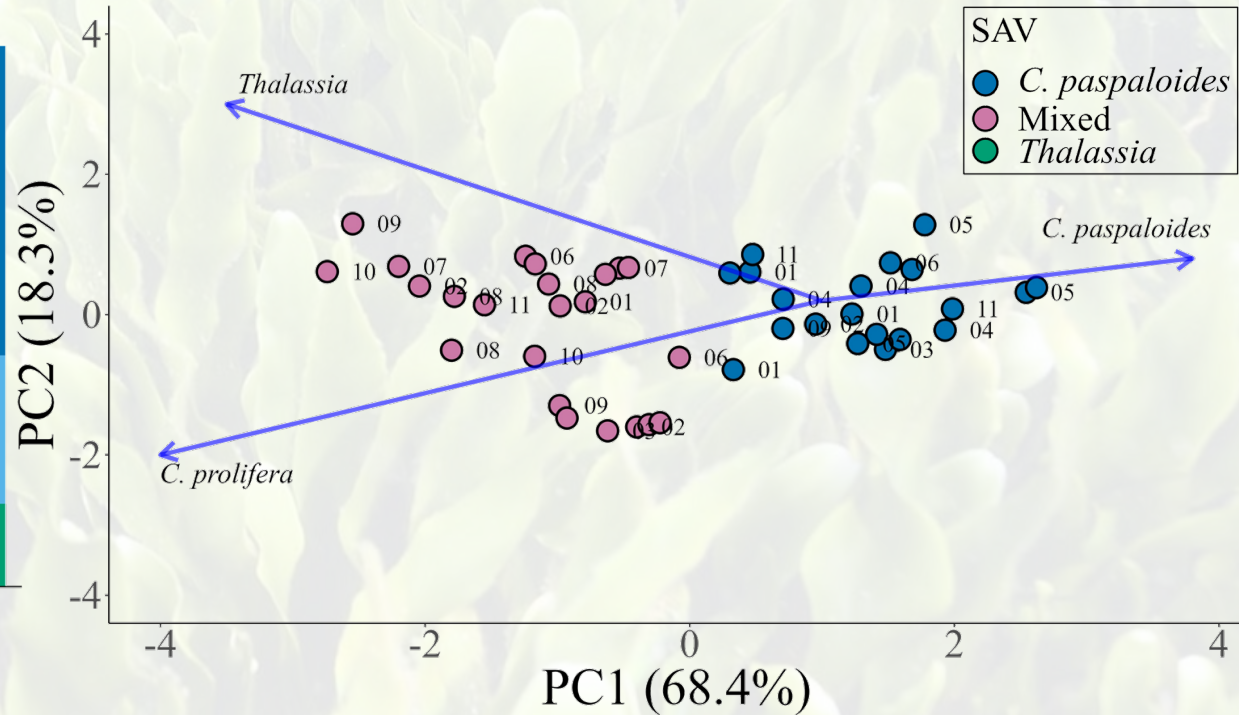
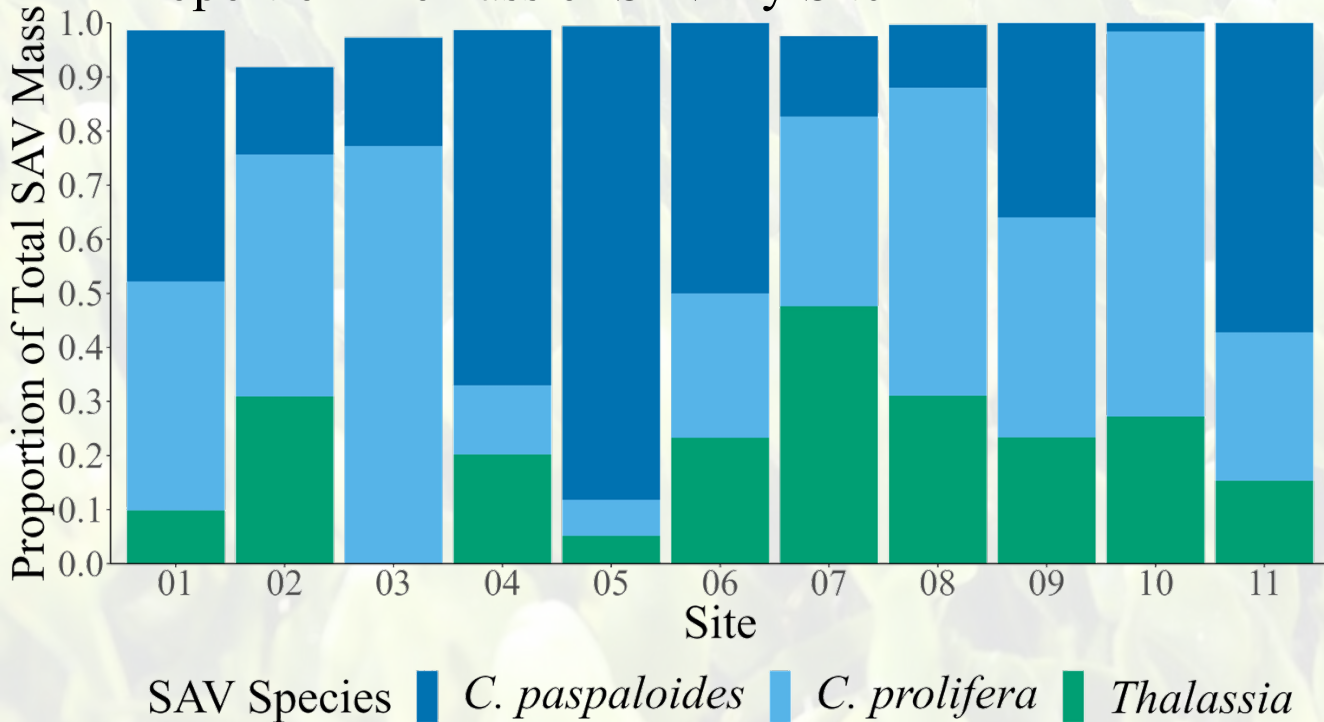
Fall 2021

Time

Spring 2022



Proportion Biomass of SAV By Site



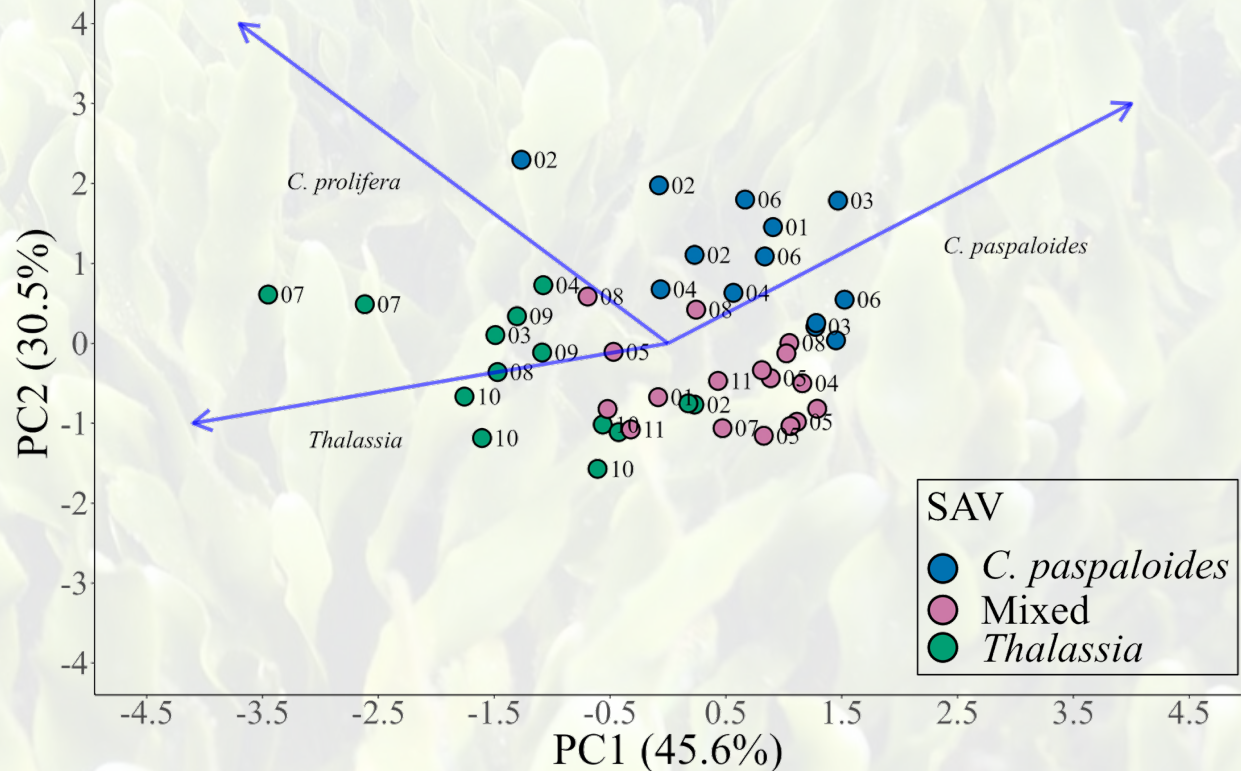
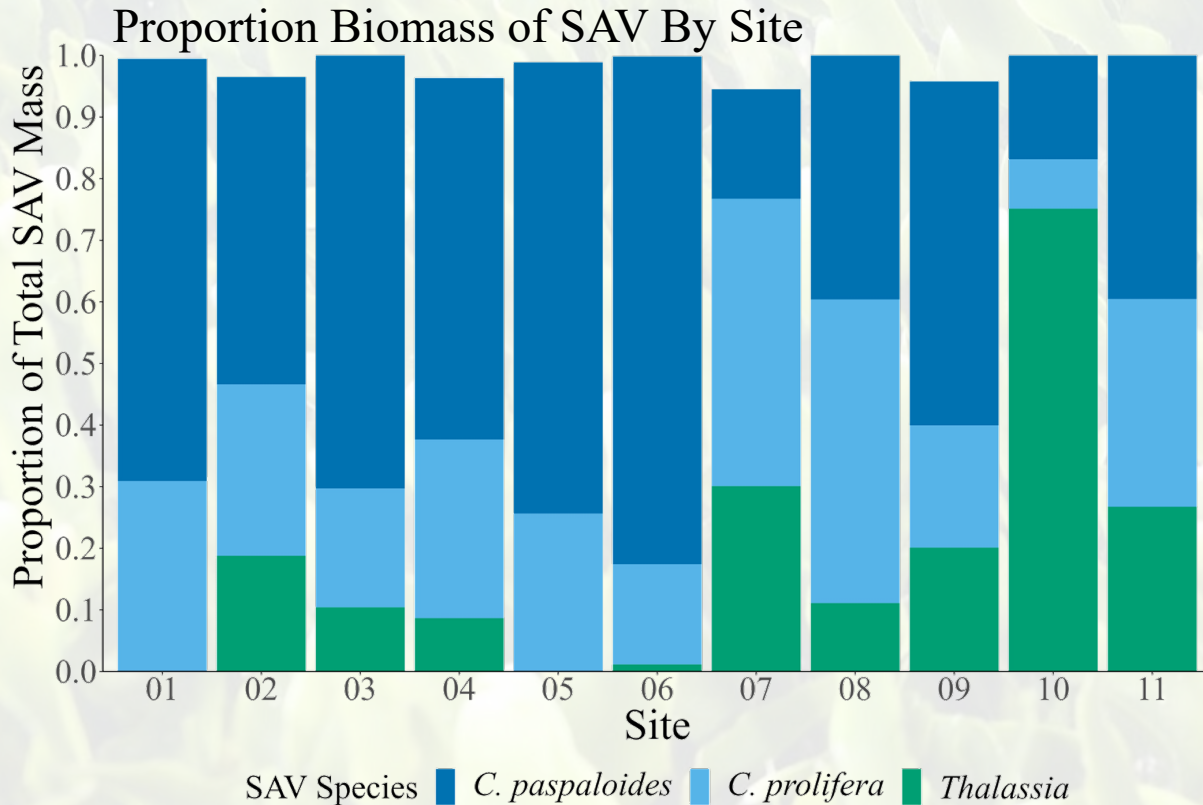
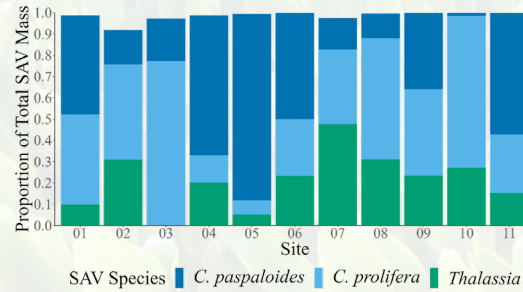
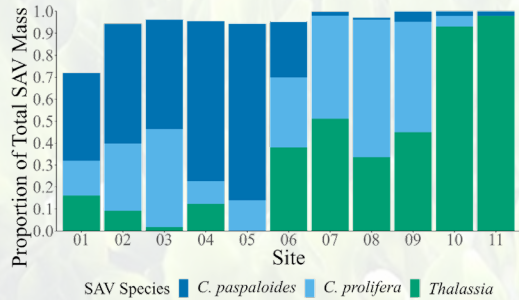
SAV Dominance Varied Over Seasons

Time

Fall 2021

Spring 2022

Fall 2022



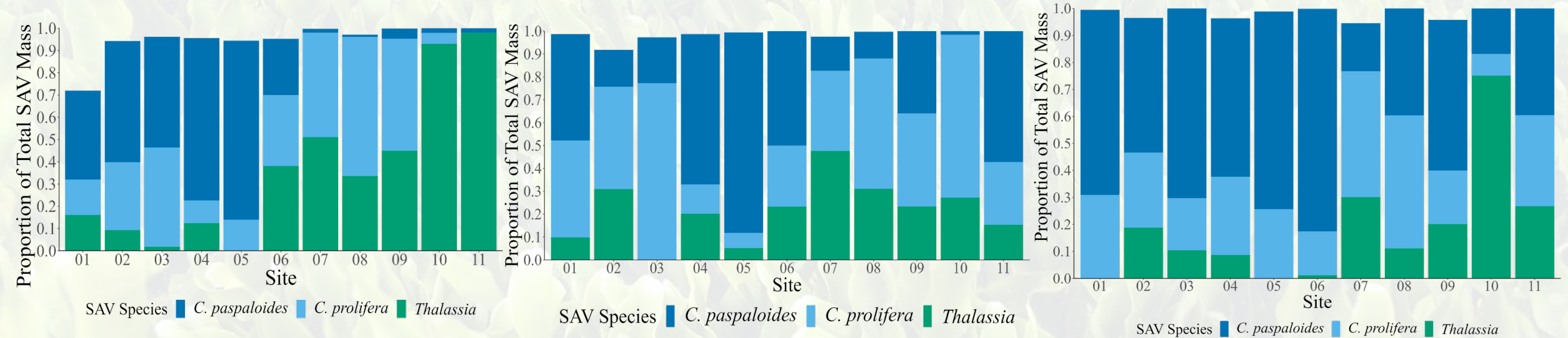
SAV Dominance Varied Over Seasons

Time

Fall 2021

Spring 2022

Fall 2022



We Used CCA to Look at the Effect of SAV on Fauna

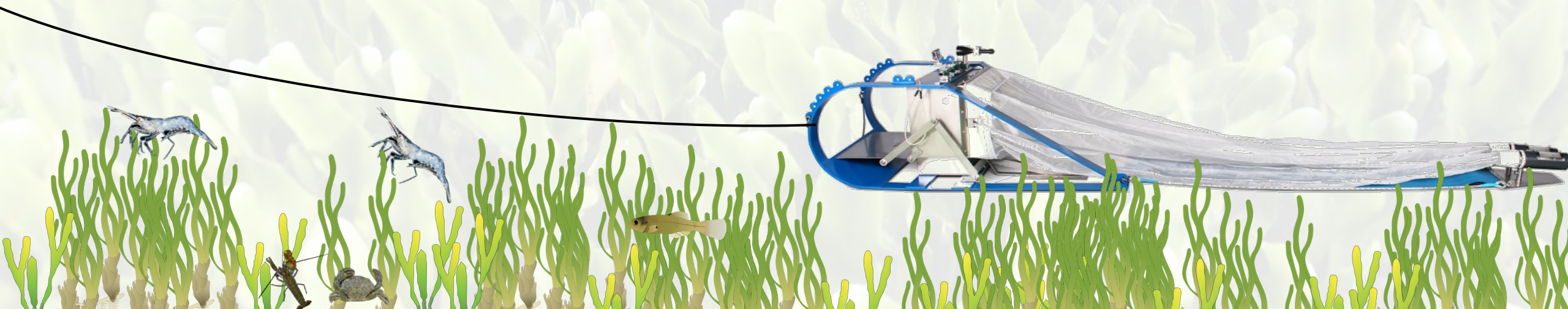
Canonical Correlation Analysis (CCA)

- Fauna Abundance Matrix (Y) ~ Macrophyte Biomass Matrix (X)



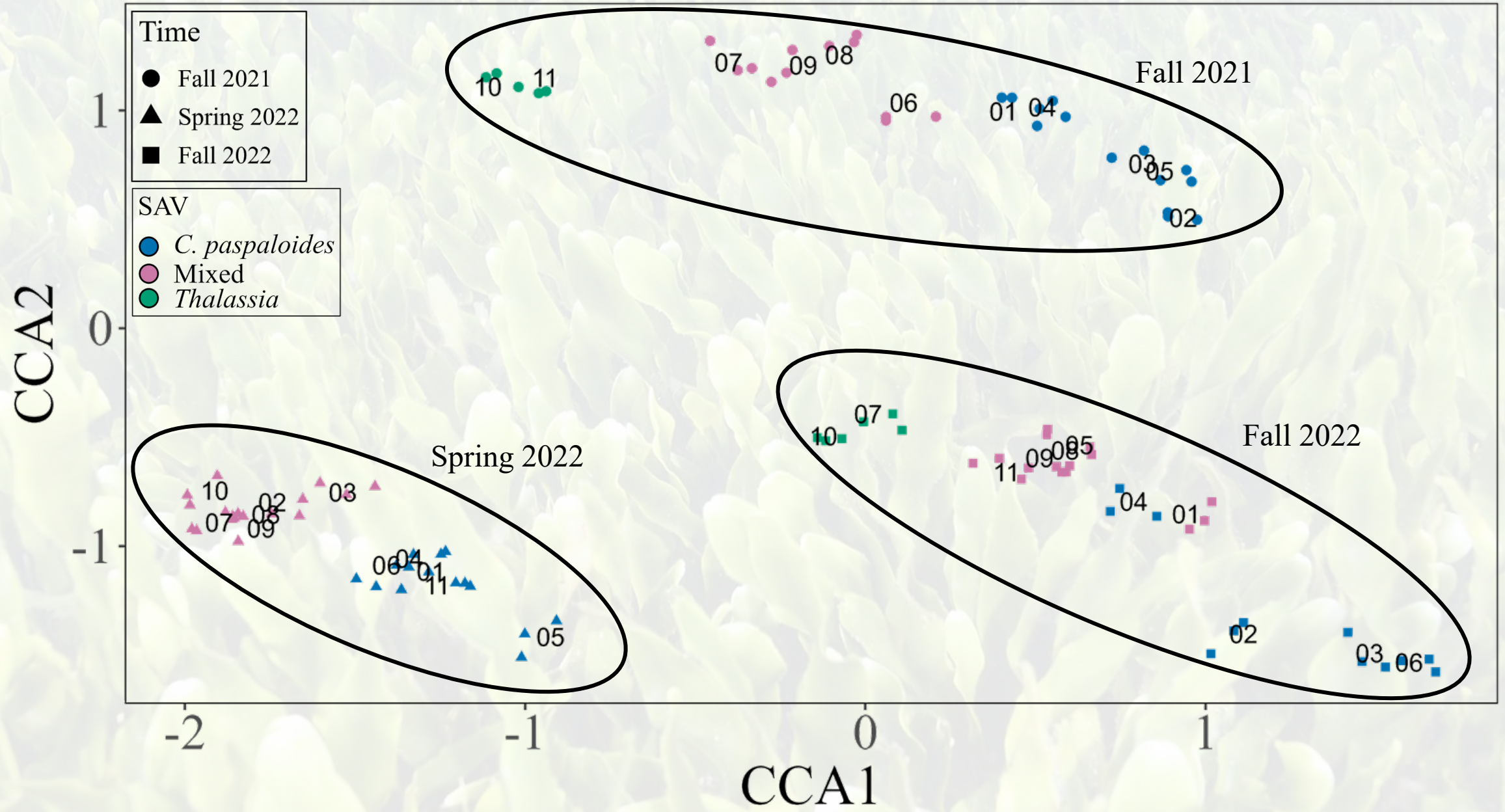
R² Forward Model Selection

- Fauna Community ~ Season + *C. paspaloides* biomass + *Thalassia* biomass



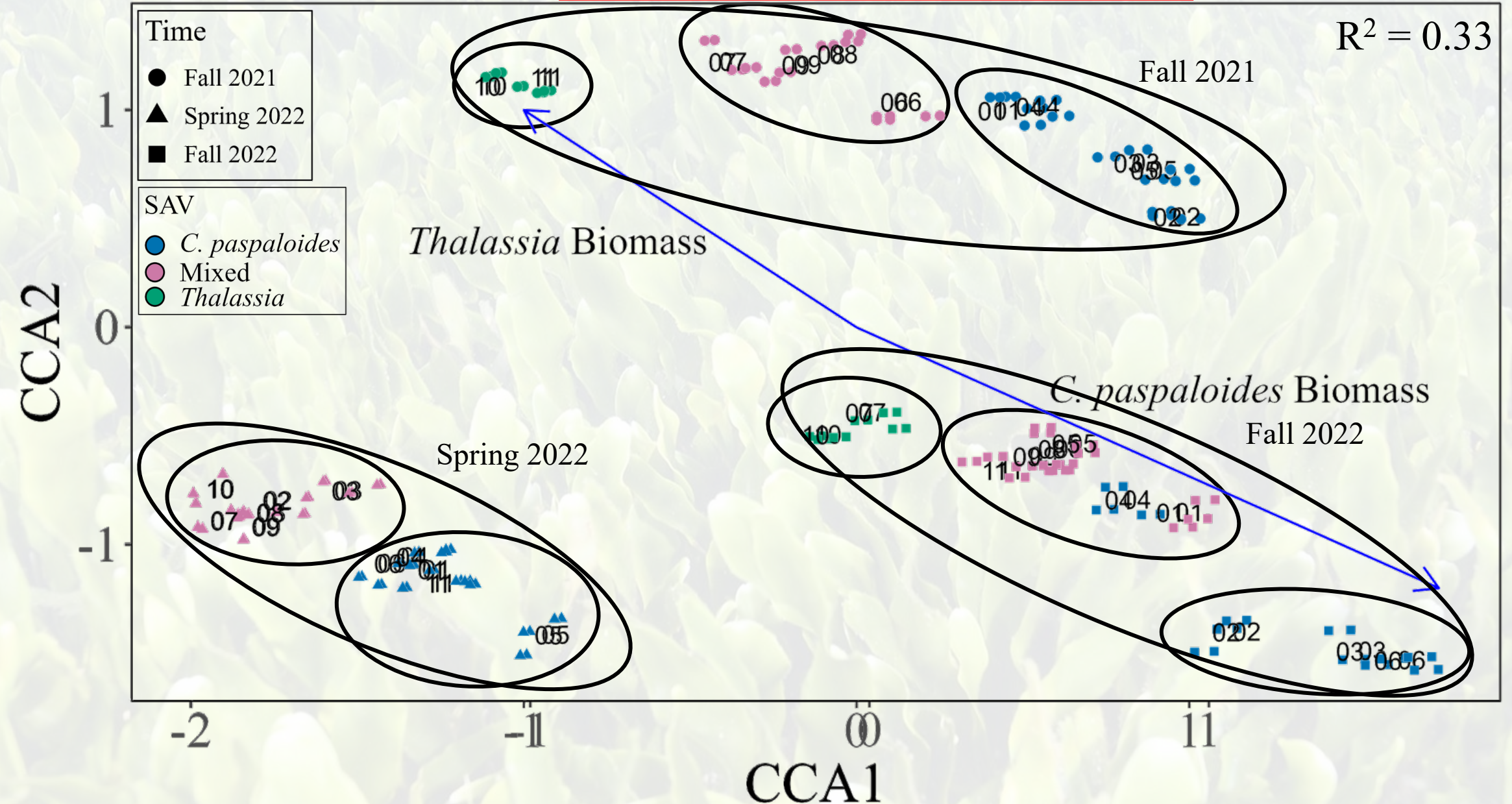
Fauna Respond to Changes in Time...

Fauna Community ~ Season + *C. paspaloides* biomass + *Thalassia* biomass



Fauna Respond to Changes in Time and SAV

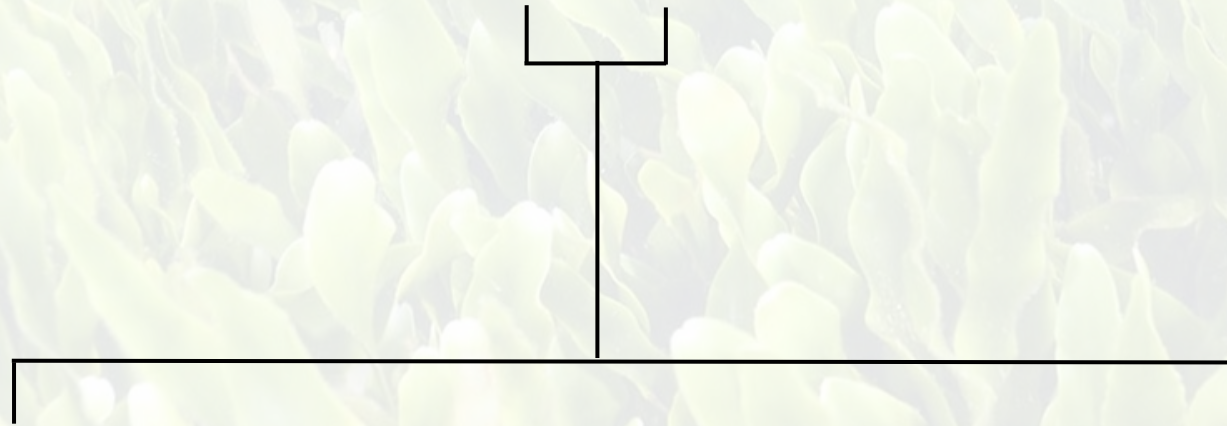
Fauna Community ~ Season + *C. paspaloides* biomass + *Thalassia* biomass



How to Identify Species Influenced by SAV Gradient

Generalized Linear Mixed Model (GLMM)

Fauna Abundance \sim SAV + Fauna Species + (1|Season)



Fauna Abundance $\sim \log(C. paspaloides \text{ biomass} / Thalassia \text{ biomass}) + \text{Fauna Species} + (1|\text{Season})$

Many Species Responded to Changing SAV

Increasing *Thalassia* Biomass

Increasing *C. paspaloides* Biomass



Rainwater Killifish

Harrieta faxoni



Brackish Grass Shrimp



Common Atlantic Marginella



Nassarius Snail



Arrow Shrimp



Bringing It All Together

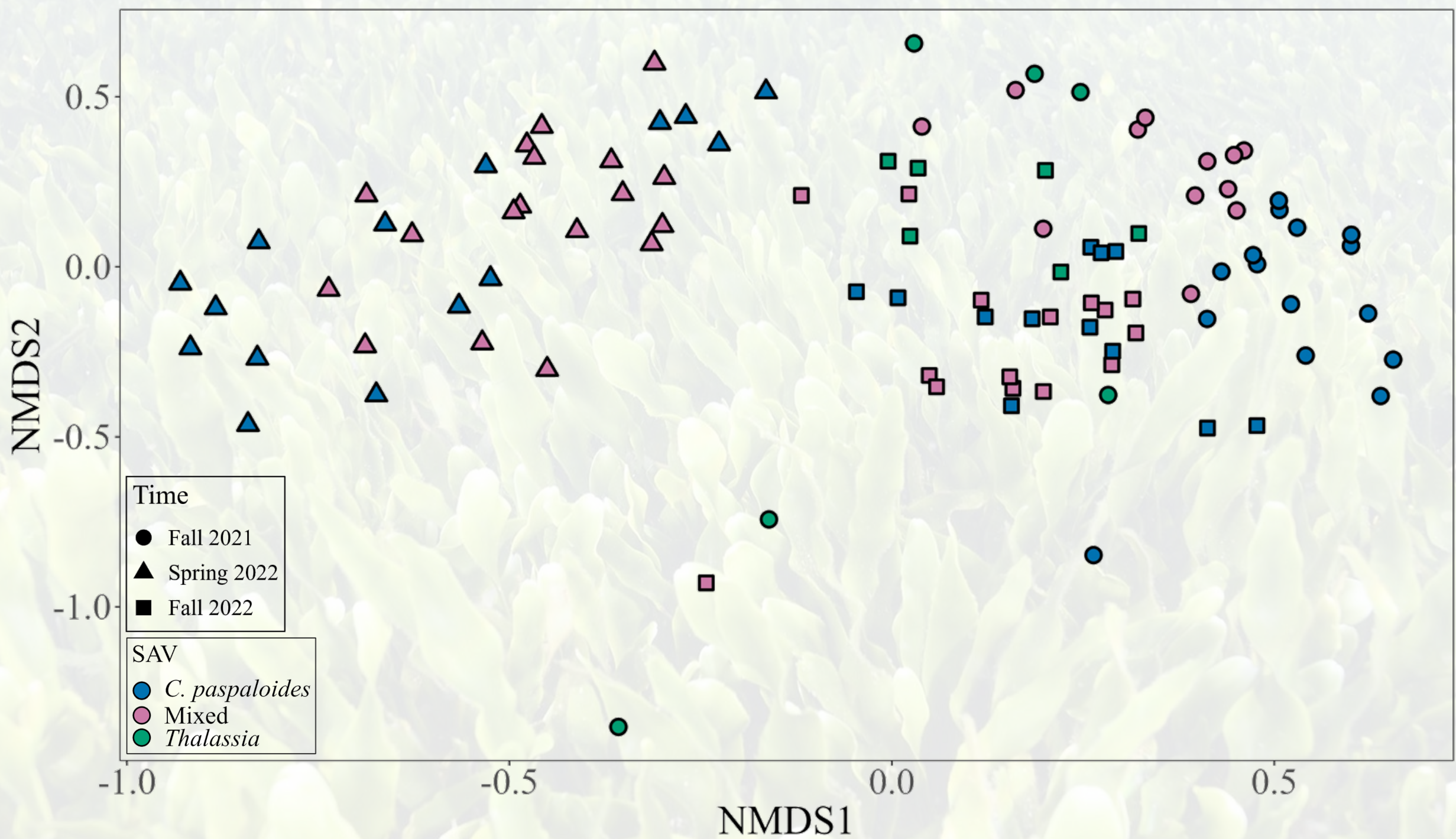
1. Seagrass and macroalgae relative biomass shift seasonally
2. Fauna communities respond to these changes
3. Many taxa and functional groups drive these community-level changes

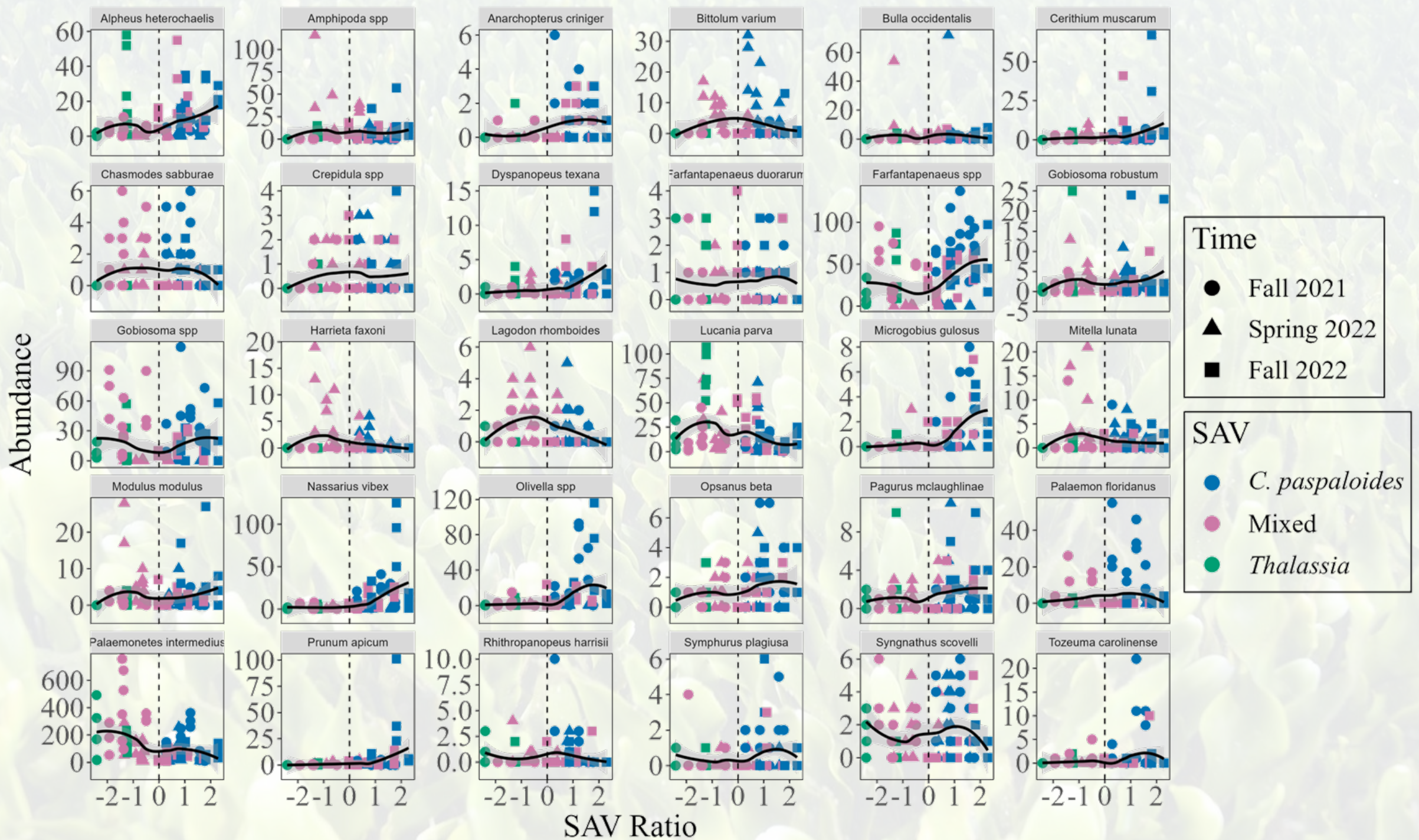


Acknowledgements

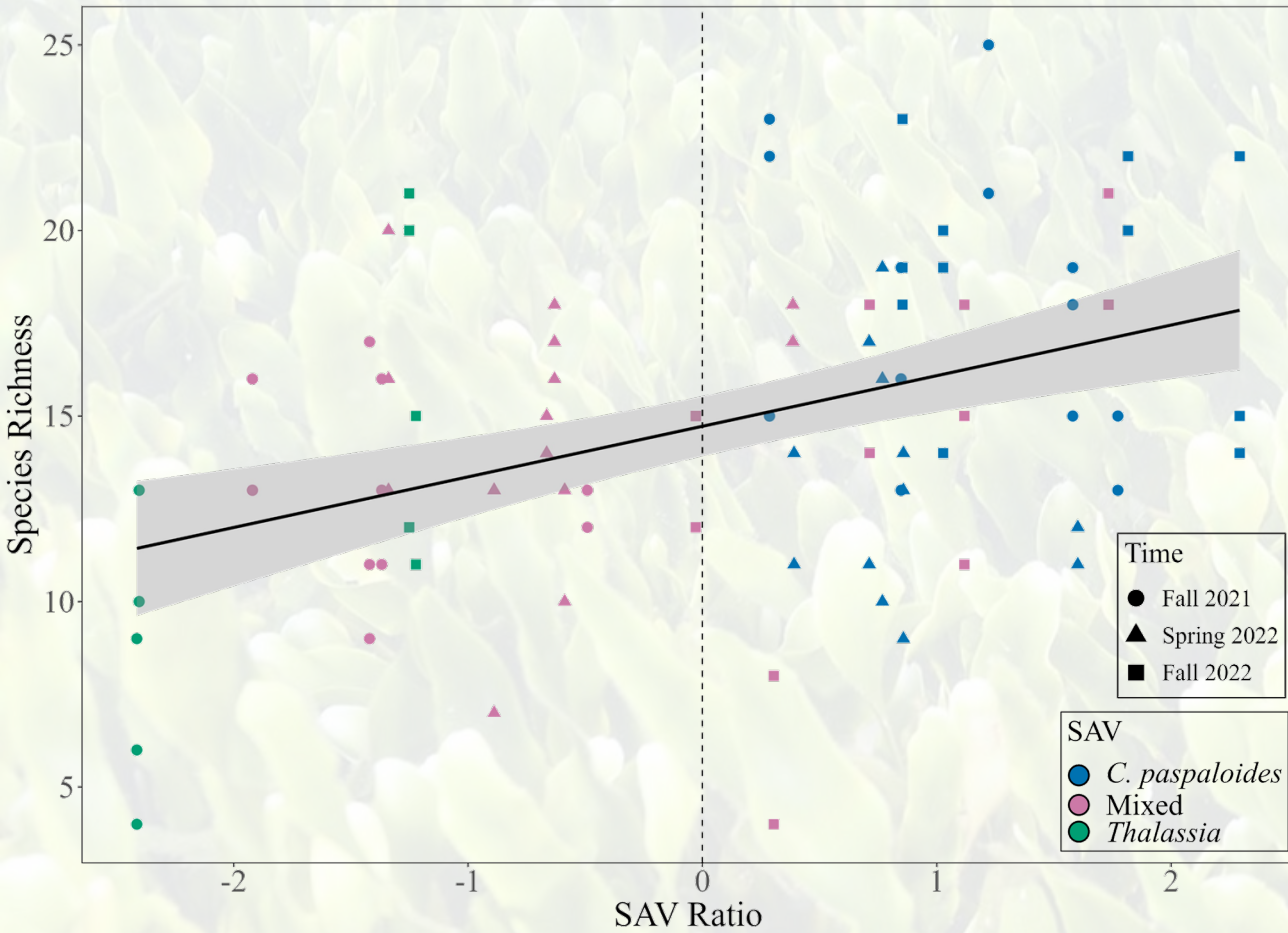
- Committee: Micheal S. Allen, Joel C. Trexler, Savanna C. Barry
- Ari Siegel, Kamila Koralasbayev, Leighton Levering, Faith Dunlap, Bianca Ruiz, Alex Bijak, Jamila Roth, Jenna Reimer, Jordan Bajema, Zoey Hendrickson, Ashley McDonald, Audrey Looby, Adam Siders, Justina Dacey, Liam Kehoe, Scott Alford, Kaitlyn Tucker, Teagan Frazier, Vanesa Rostan, Gabrielle Gonzalez, Serena Huberty, Julianne Robinson, Max Taylor, Chloe Spengler, Sydney Kaufman, Grace Hejmanowski, Sara Hutchinson, Ally Raudenbush
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 - NSF Graduate Research Fellowship
 - Guy Harvey Ocean Foundation
 - SNRE Water Institute Symposium Funding
- UMD Integration and Application Network Media Library



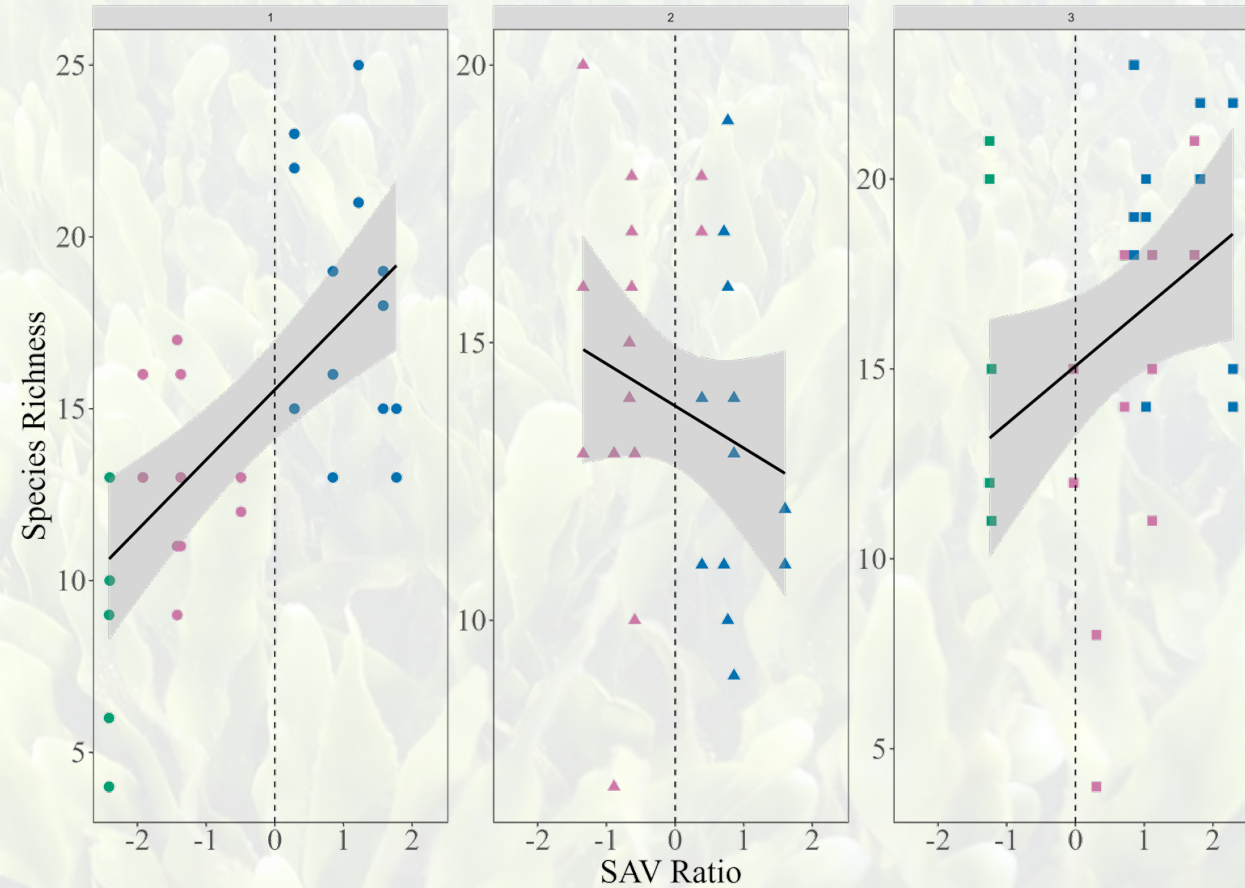




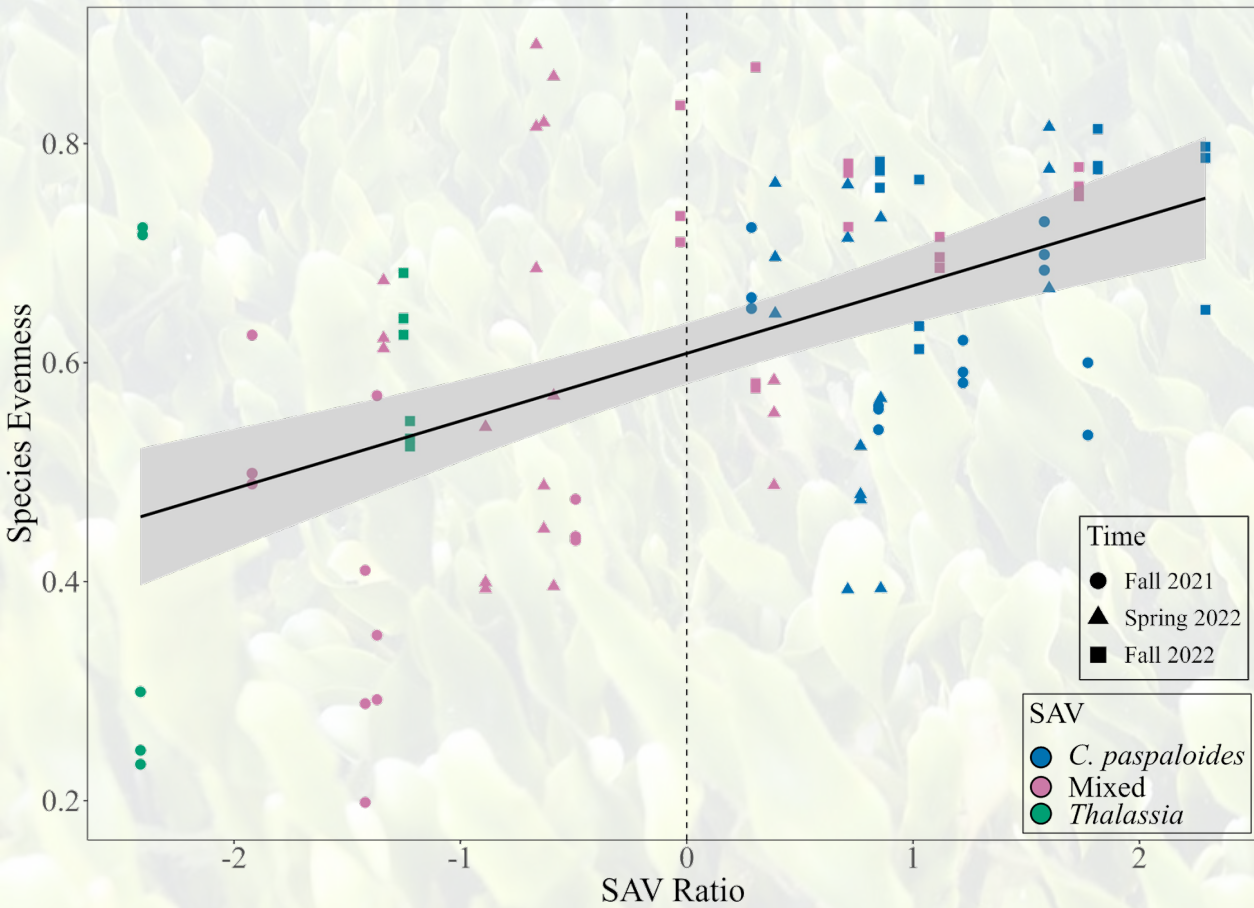
Species Richness Across SAV Ratio



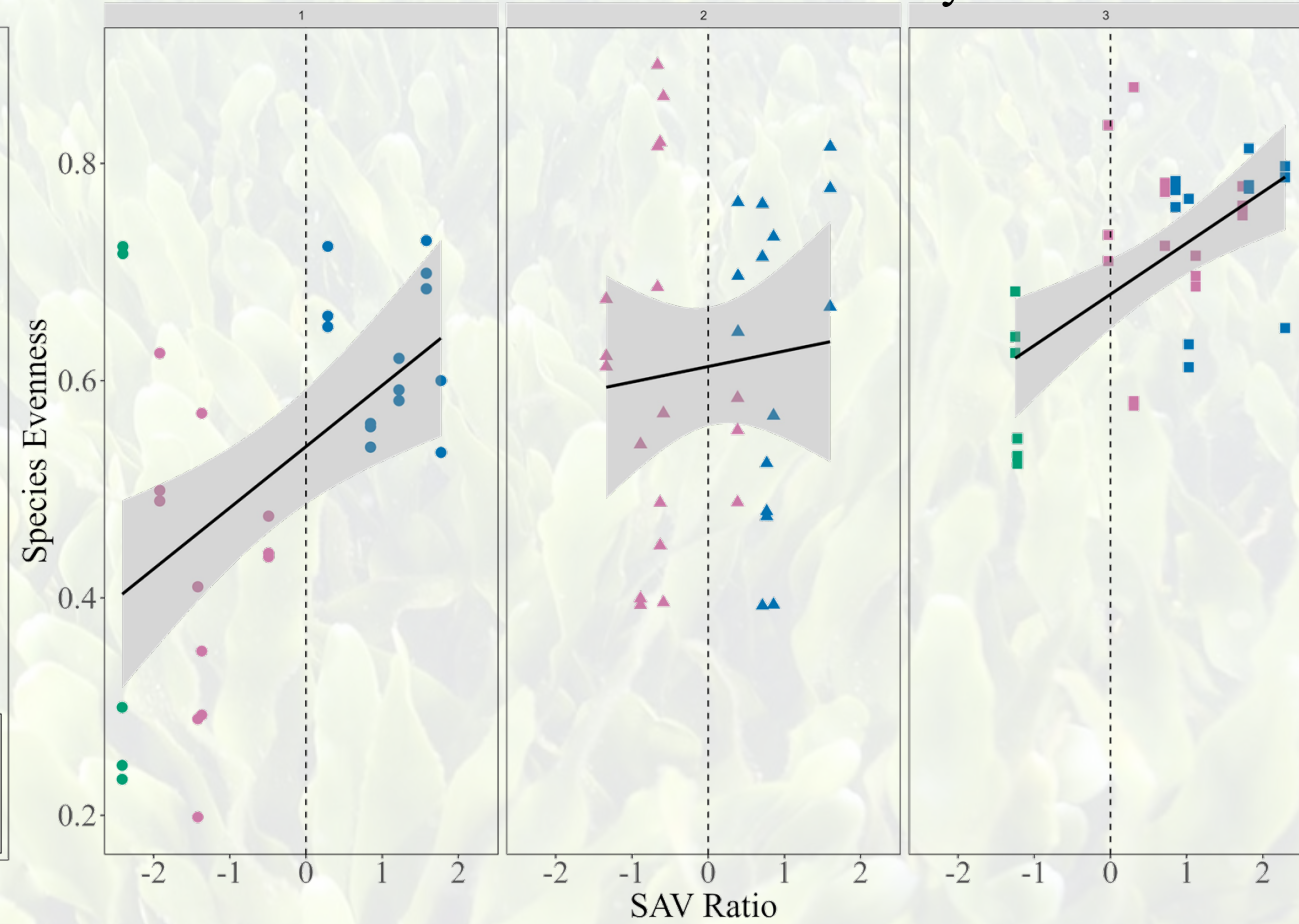
Species Richness Across SAV Ratio By Season



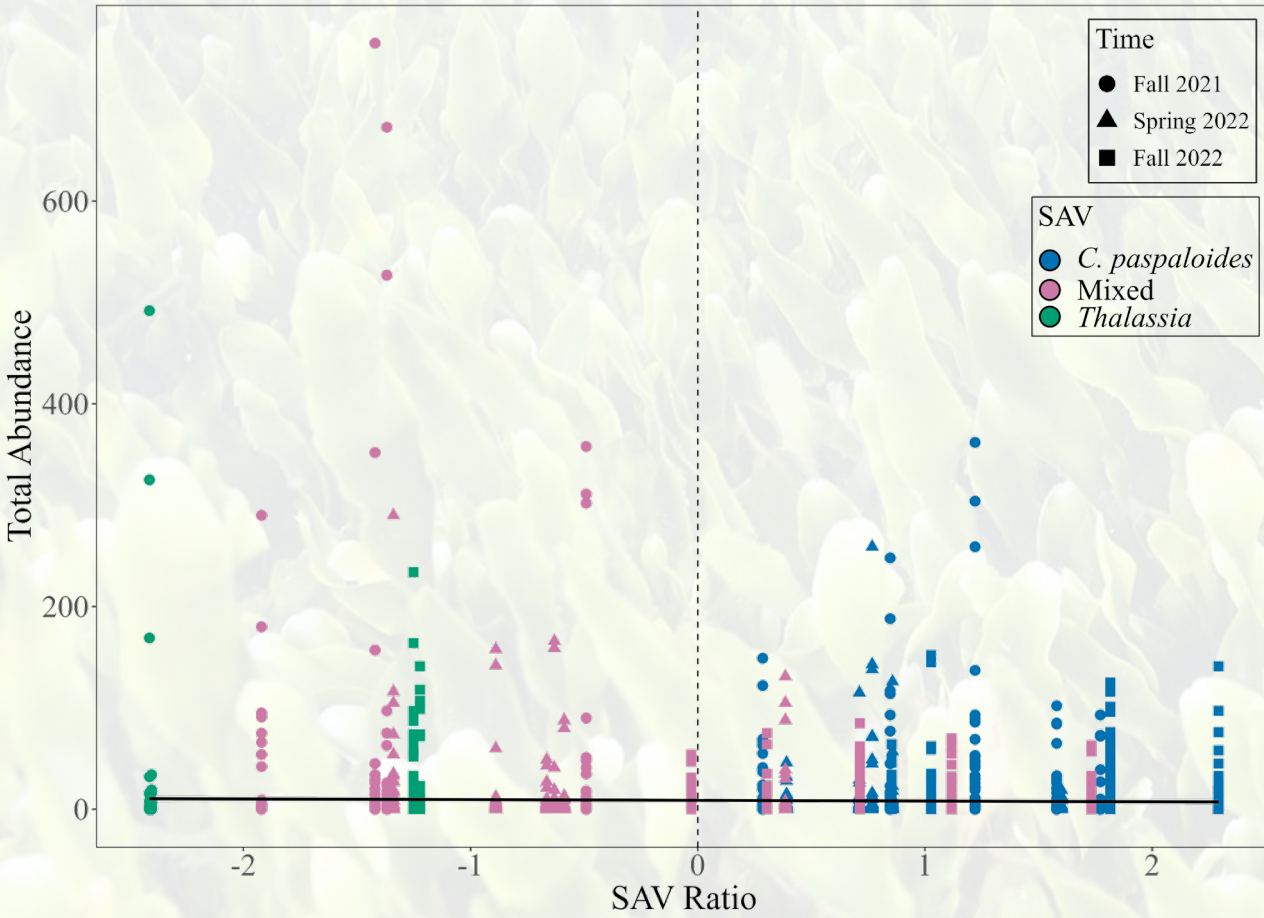
Pielou's Evenness Across SAV Ratio



Pielou's Evenness Across SAV Ratio By Season



Total Abundance Across SAV Ratio



Total Abundance Across SAV Ratio (>50)

