SOUTH FLORIDA WATER MANAGEMENT DISTRICT

# Freshwater Zooplankton Dynamics in a Subtropical Lake


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## The Basics

- Zooplankton are multi-level consumers that transport energy from lower trophic levels to higher trophic levels.
- Excessive phosphorus promotes larger phytoplankton, like cyanobacteria, dominating phytoplankton communities, making it harder for zooplankton to serve as energetic links.
- Planktivorous fish exert greater top-down trophic pressures on larger species of zooplankton.
- Given their pressures, different size classes of zooplankton function at slightly different trophic levels.

## The Big Questions

1. How do zooplankton vary spatially within Lake Okeechobee?
2. How do zooplankton in Lake Okeechobee change over time?
3. How do zooplankton fit into the pelagic trophic web of Lake Okeechobee?

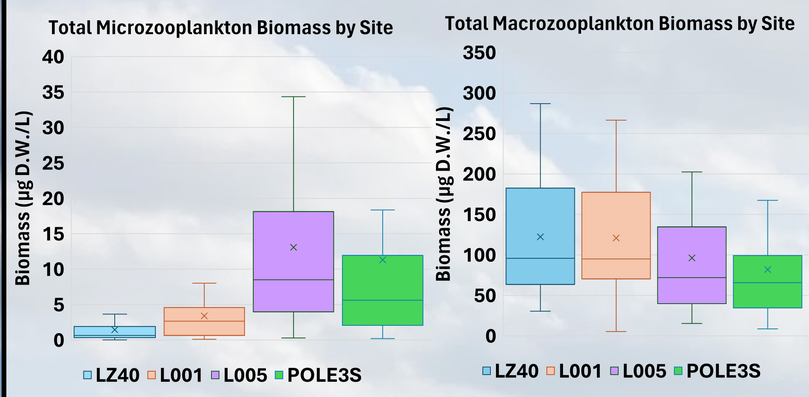
## The Project

- Data collected through SFWMD's Routine Plankton Monitoring Program
- Monthly sampling frequency
- Four sites in four ecological zones
- Timeline: May of 2022 through April of 2023
- Parameters measured:
  - Microzooplankton: 35µm – 153 µm
  - Macrozooplankton: 153 µm+
  - Phytoplankton (Chlorophyll-*a*)
  - Water quality, including TP, SRP, DIN, TSS, etc.

## Question 1: How do zooplankton vary spatially within Lake Okeechobee?

### Biomasses

- Sites L001 and LZ40 had significantly lower biomasses than L005 and POLE3S
- No significant differences in macrozooplankton biomasses

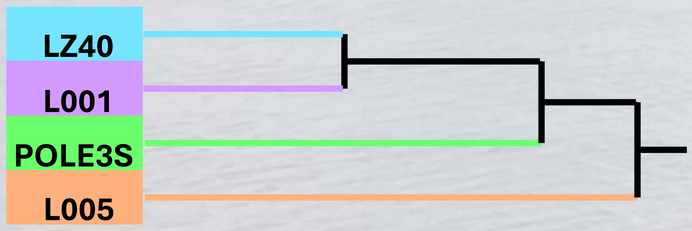



### Communities

- Both microzooplankton and macrozooplankton communities exhibit similar relationships between sites

#### Microzooplankton

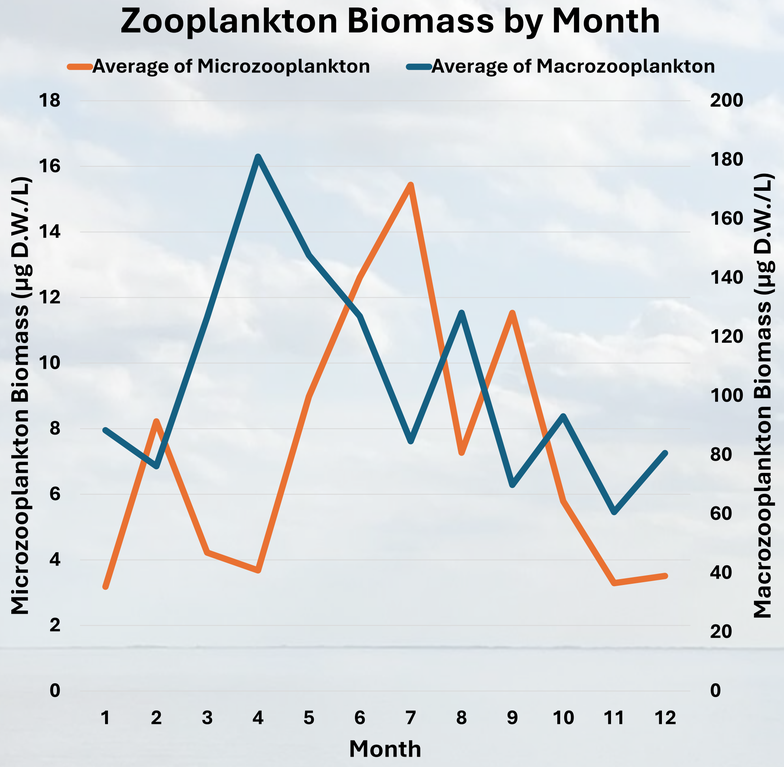

#### Macrozooplankton




## Question 2: How do zooplankton in Lake Okeechobee change over time?

### Microzooplankton

- Few significant monthly biomass differences
- Community analyses identified summer months to have the most variable communities
- Few seasonal community groups

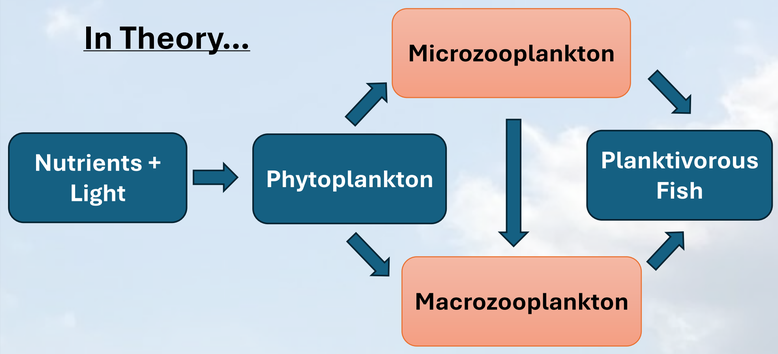



### Macrozooplankton

- Biomass peaks during the spring and declines during the summer and fall
- Community analyses identified winter communities as most similar and late summer communities as most variable
- October had a distinct community composition

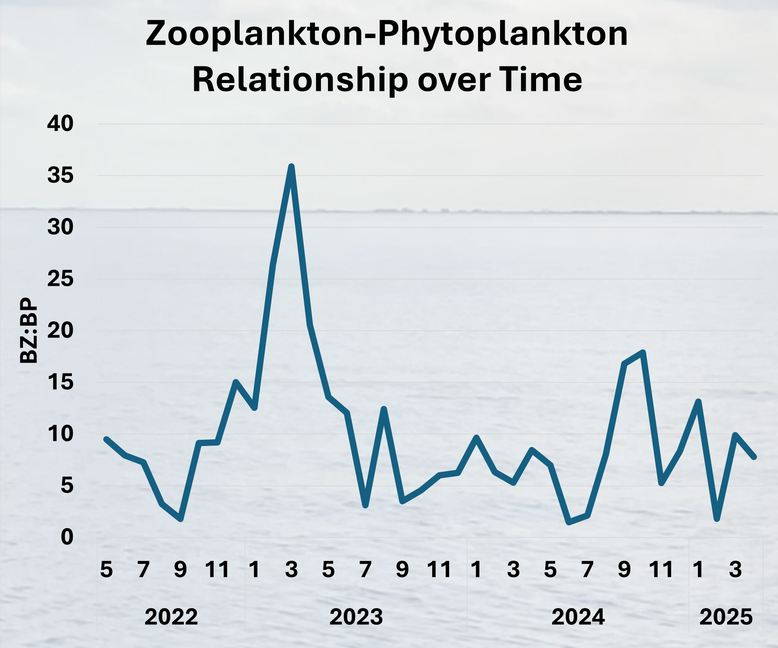
## Question 3: How do zooplankton fit into the pelagic trophic web of Lake Okeechobee?

### In Theory...




### Let's Investigate

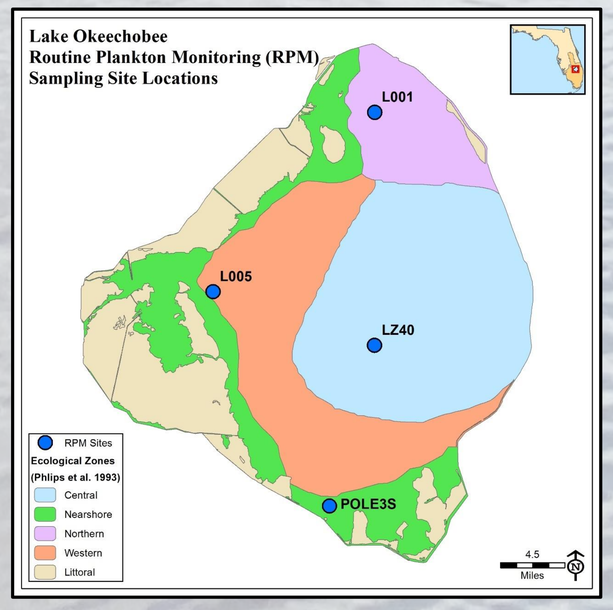
- Biomass of Zooplankton (BZ): Biomass of phytoplankton (BP) is used to quantify the relationship between zooplankton and phytoplankton
- Chlorophyll-*a* is used as a proxy for phytoplankton biomass
- Higher BZ:BP = higher food web efficiency
- Principal components analysis revealed that BZ:BP is more closely associated with phytoplankton than zooplankton




## Question and Answer

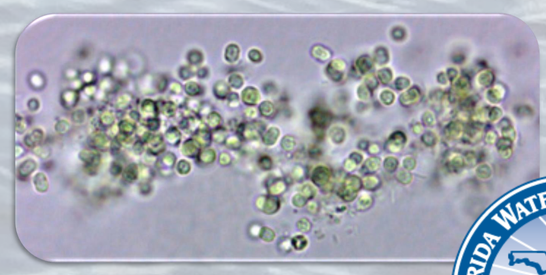
### Q: How do zooplankton vary spatially within Lake Okeechobee?

**A**: While few biomass differences were observed, there are clear community trends, regardless of zooplankton size class. These data point to species composition as the reason for community variability, as opposed to trophic forces.




### Q: How do zooplankton fit into the trophic web of Lake Okeechobee?

**A**: In theory, zooplankton serve both as energy links between phytoplankton and planktivorous fish and as regulators of phytoplankton dynamics. These data suggest that phytoplankton significantly influence the relationship between zooplankton and phytoplankton, but planktivorous fish may also play a significant role in shaping this relationship.



### Q: How do zooplankton in Lake Okeechobee change over time?

**A**: It depends on the group. Seasonal biomass differences were observed with macrozooplankton but not with microzooplankton.