Temporal changes in fatty acid content of seston in the central basin of Lake Erie: Implications for zooplankton productivity

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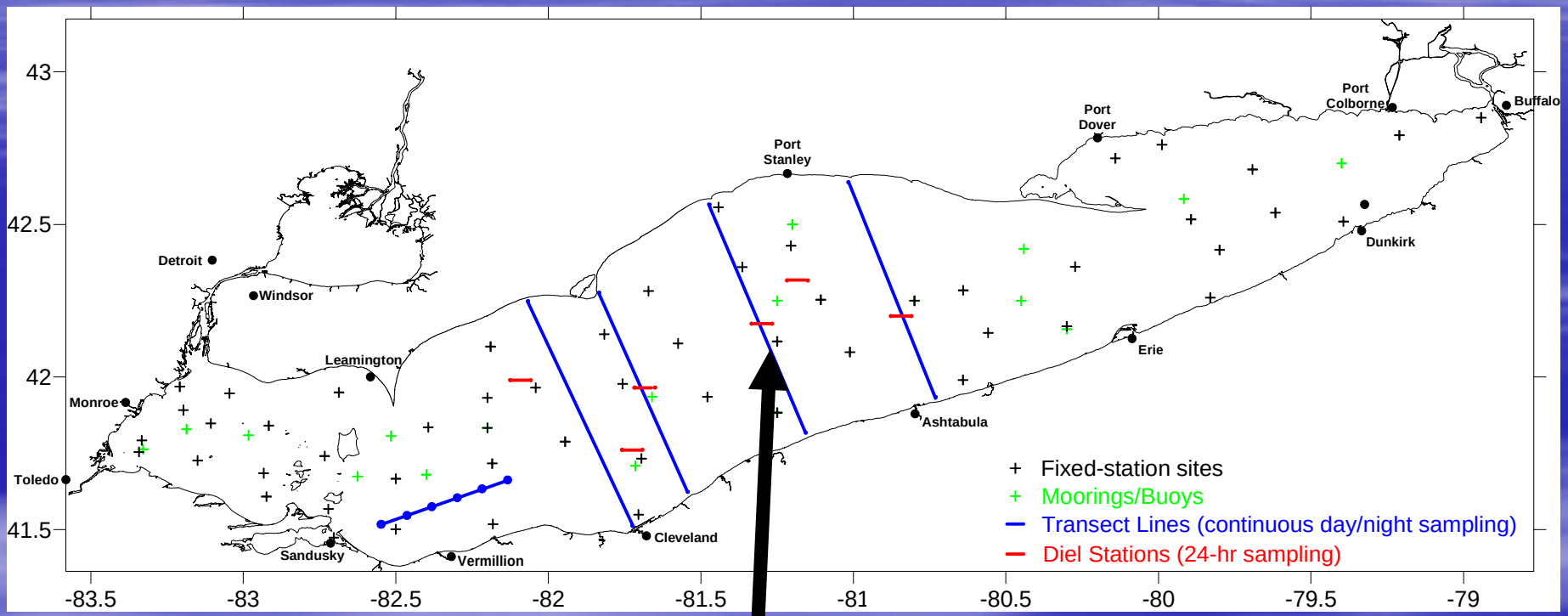
Objectives

- Determine the role of phytoplankton-derived fatty acids in secondary productivity in the central basin of Lake Erie

- Determine changes in phytoplankton community over summer
  - Using fatty acid biomarkers
- Assess changes in essential fatty acids that are required by zooplankton

Lake Erie – Summer 2005



Central basin Station e78

Fatty Acids

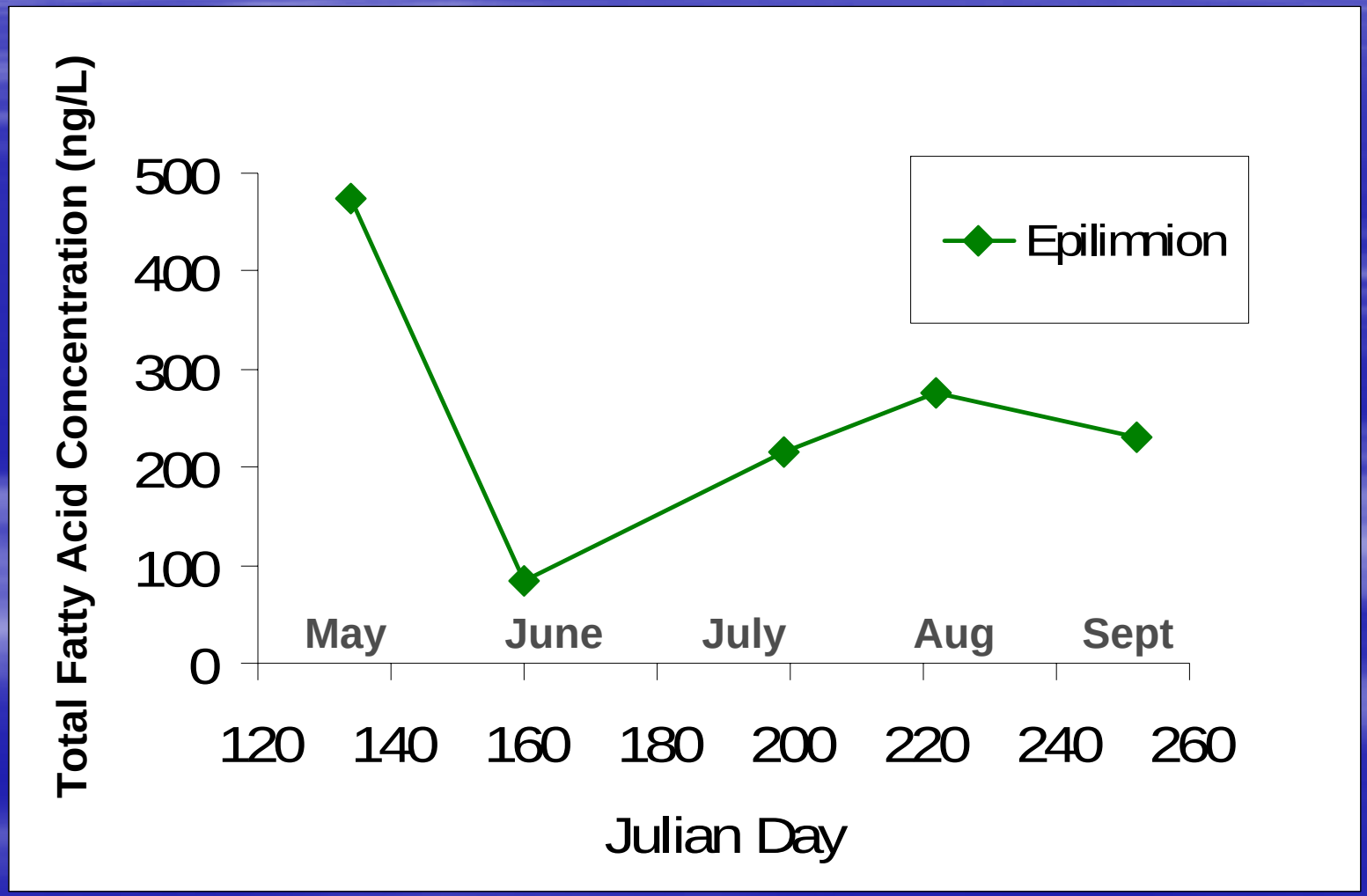
- Present in all plants and animals
  - Components of membranes
  - Energy sources
- Changes in fatty acid availability and composition will determine secondary production

Essential Fatty Acids

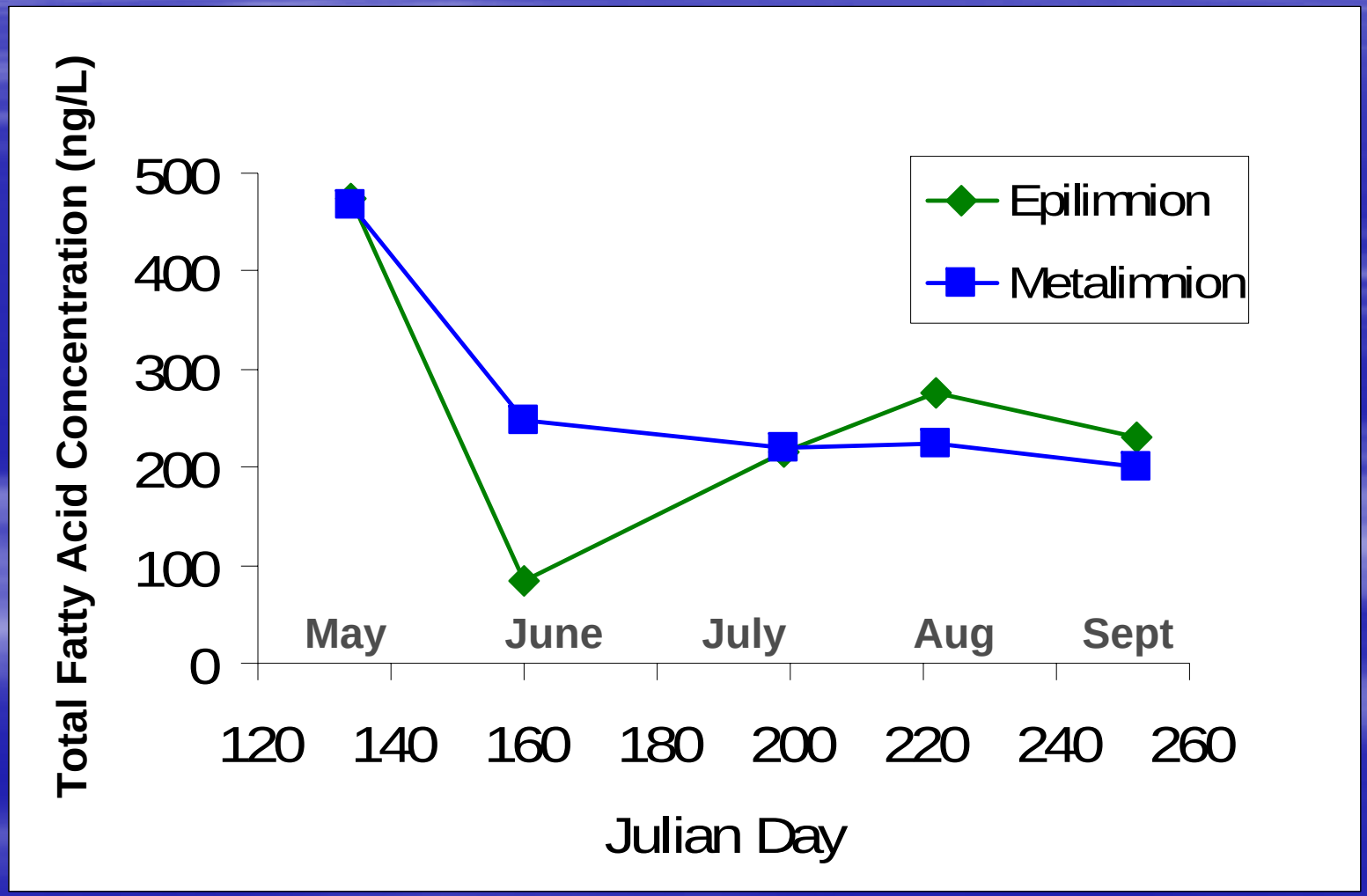
- Essential fatty acids (ω3 and ω6) are synthesized by phytoplankton
- Polyunsaturated fatty acids (PUFAs) contain many double bonds
- Zooplankton require these dietary PUFAs for growth
  - EPA and DHA known as “fish oils”

Photo: Kim Schulz

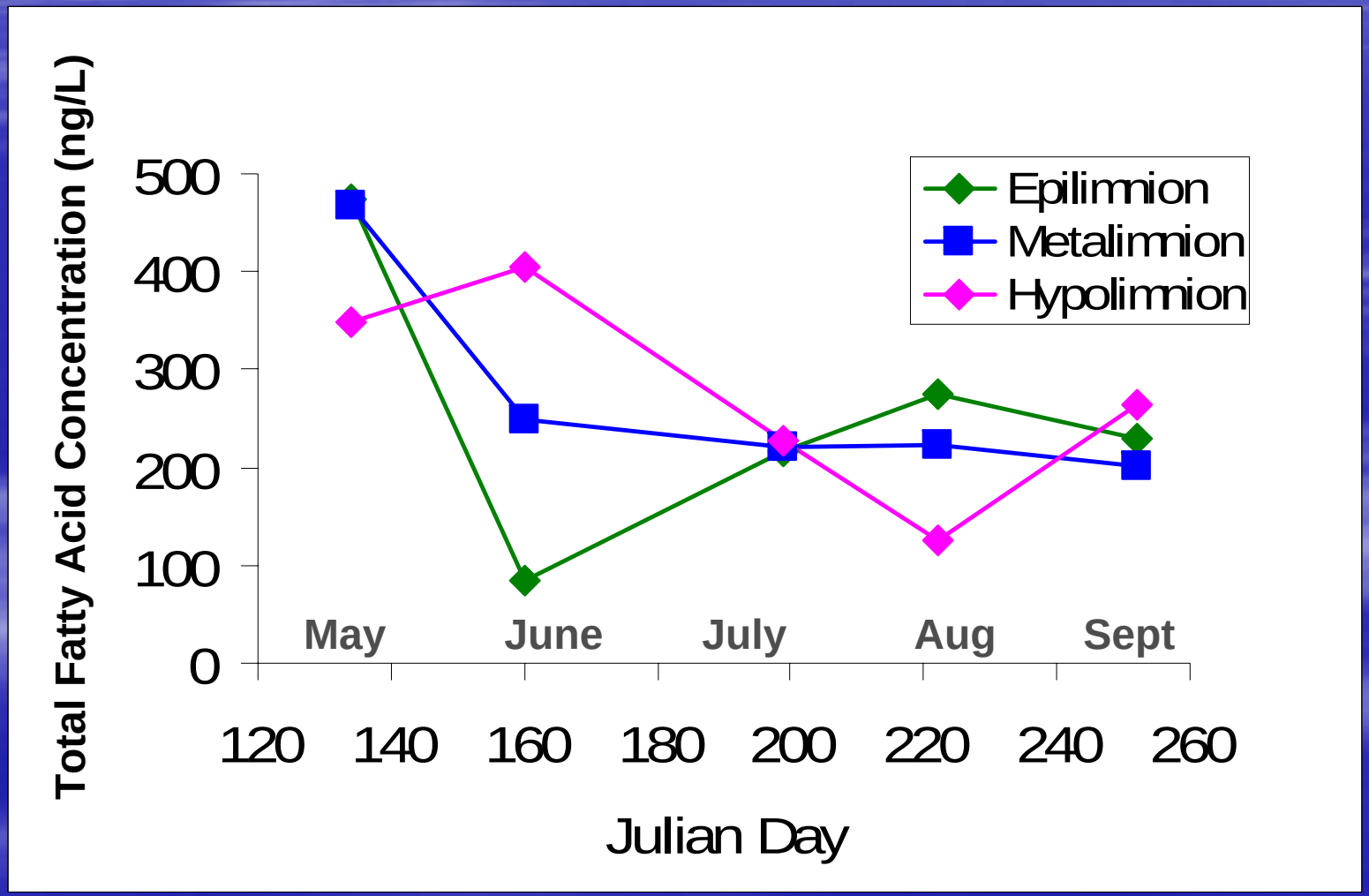
Phytoplankton Biomass



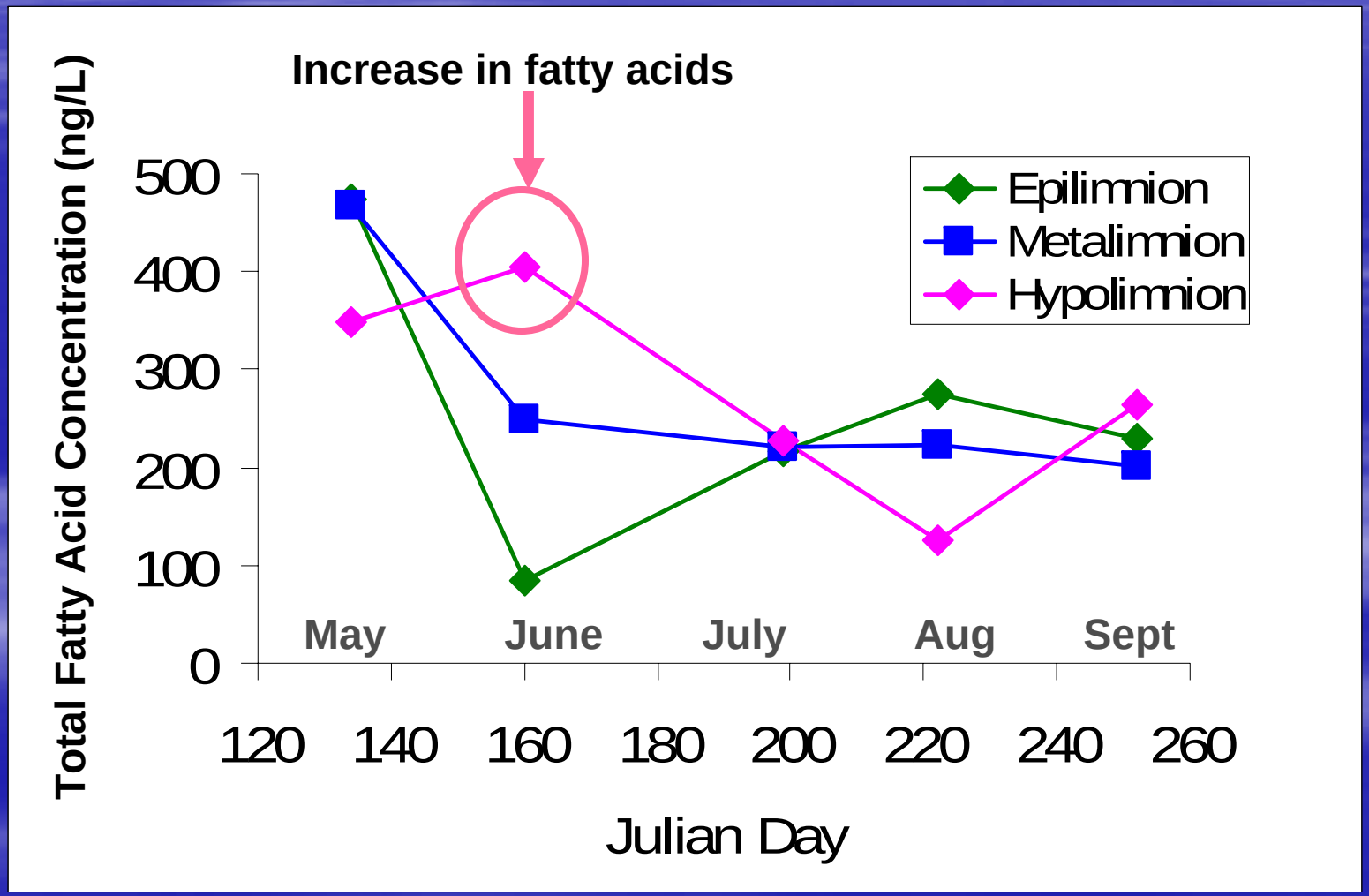
Phytoplankton Biomass



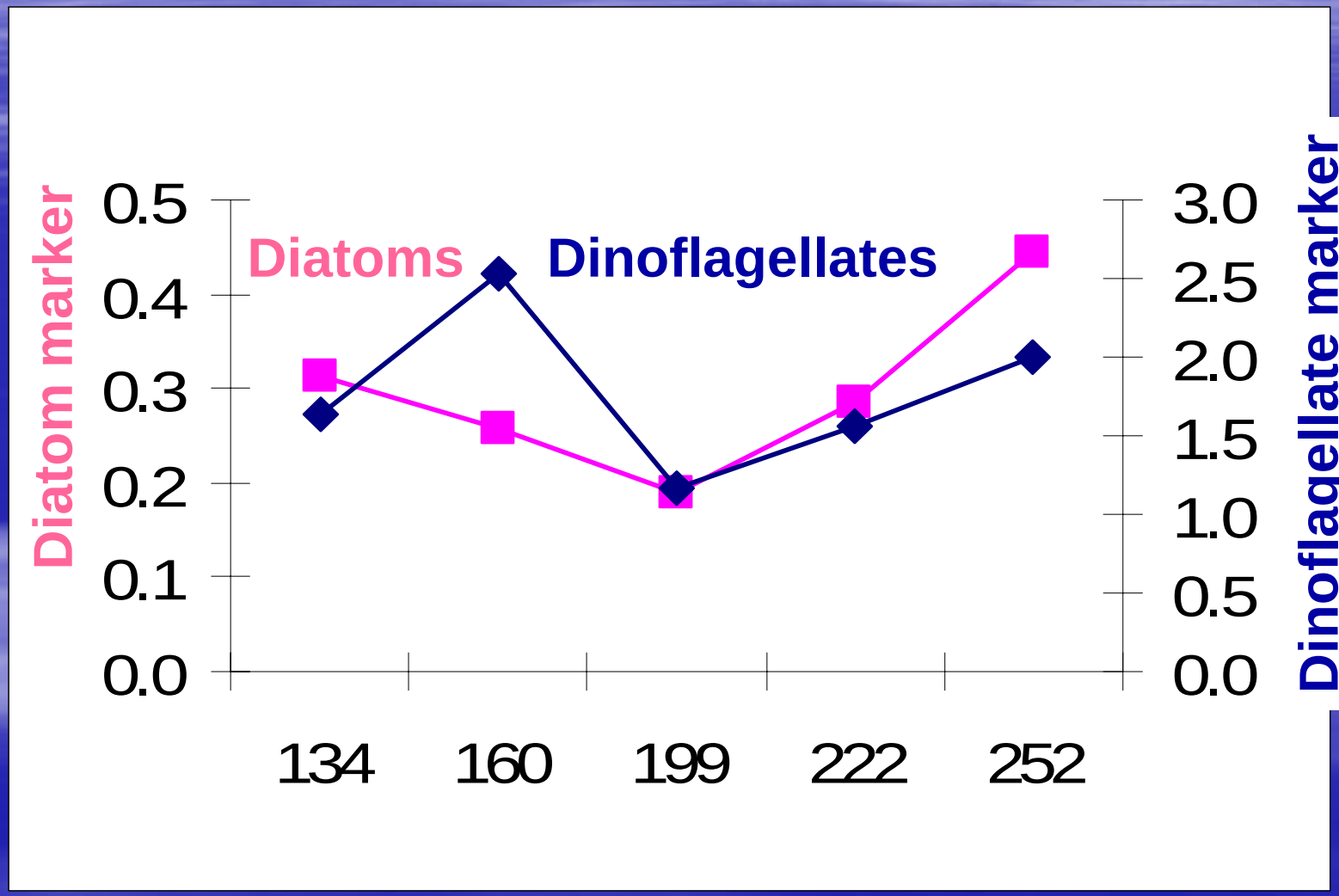
Phytoplankton Biomass



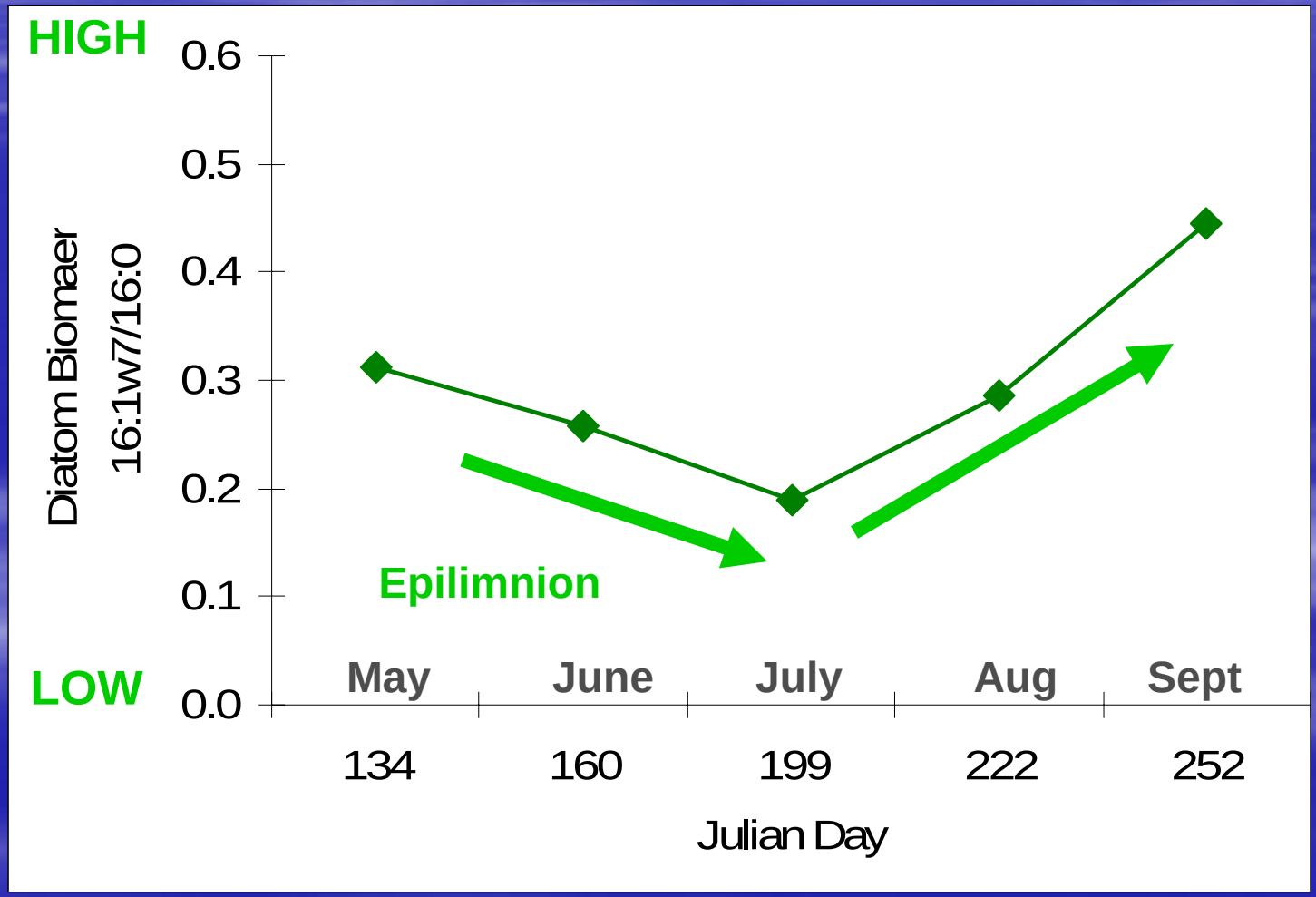
Phytoplankton Biomass



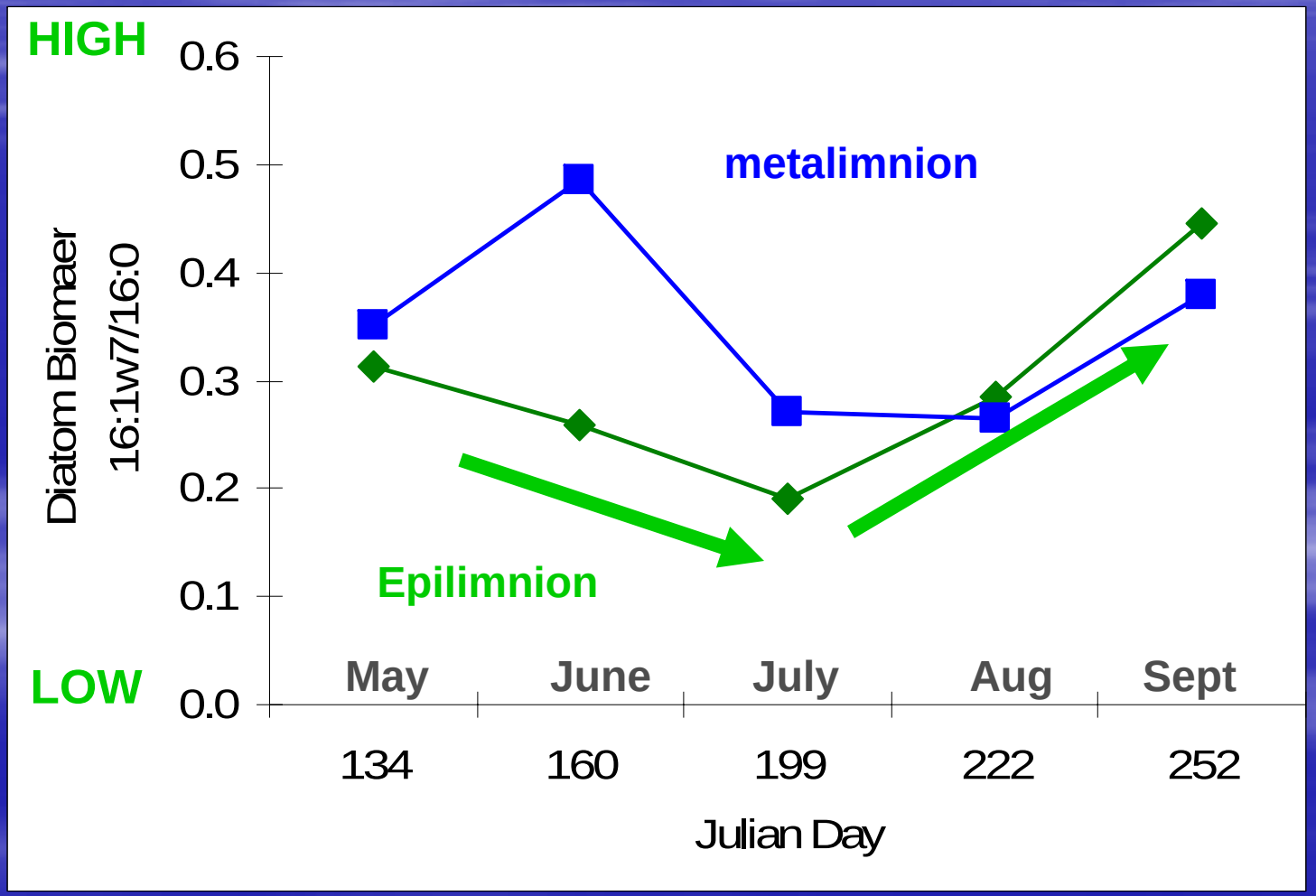
Phytoplankton Community Shifts



High Diatom Abundance in May



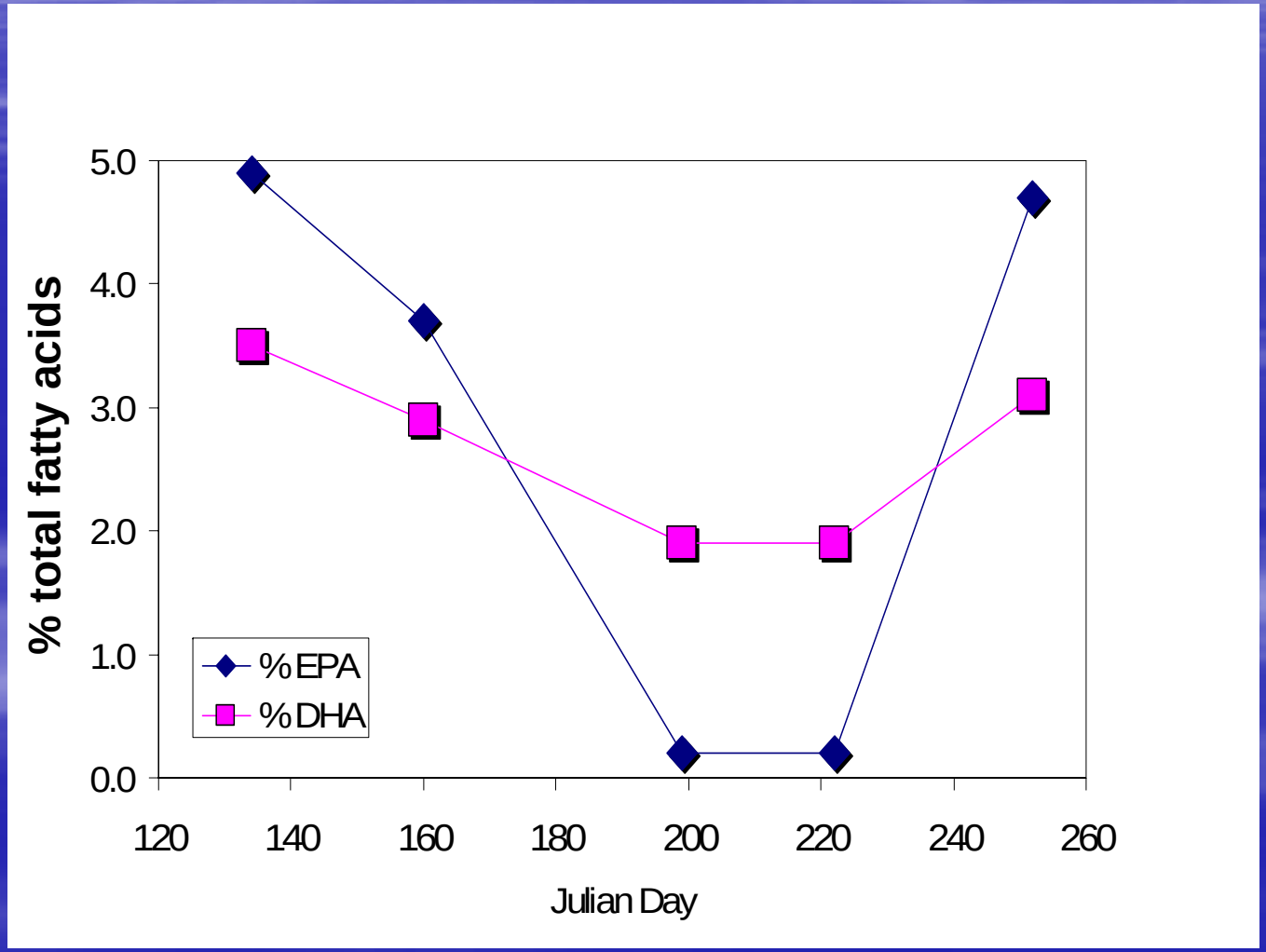
Increase in Diatom Fatty Acids in Metalimnion in June



Phytoplankton Community

- Shift from diatoms to dinoflagellates and chlorophytes or cyanobacteria
- Diatom bloom in May
- Bloom crashes and begins to sink
  - High abundance of diatom fatty acids in metalimnion
  - Increased total fatty acids in hypolimnion

Decrease in availability of essential PUFAs in July and August



Summary

- Shift from diatoms to dinoflagellates and chlorophytes or cyanobacteria
- Diatom bloom in May
- Bloom crashes and begins to sink
- High concentrations of phytoplankton-derived fatty acids in metalimnion and hypolimnion
  - Food source for microbial biomass in deeper layers
- Decrease in essential PUFAs may affect zooplankton productivity during mid-summer

Thank you to R/V Lake Guardian crew