

The Effects of Experimental Lake Fertilization on Condition and Diet of Slimy Sculpin (*Cottus cognatus*) in Oligotrophic Arctic Lakes, North Slope, AK

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Study Area

Arctic LTER: Toolik Field Station

- 150 miles north of the Arctic Circle
- Terrestrial ecosystems dominated by mosses, lichens, and small shrubs

Lakes:

- Small glacially formed kettle lakes
- Low species diversity
- Most lakes are closed systems
- Ice free period of ~100 days
 - Predicted to increase with climate warming

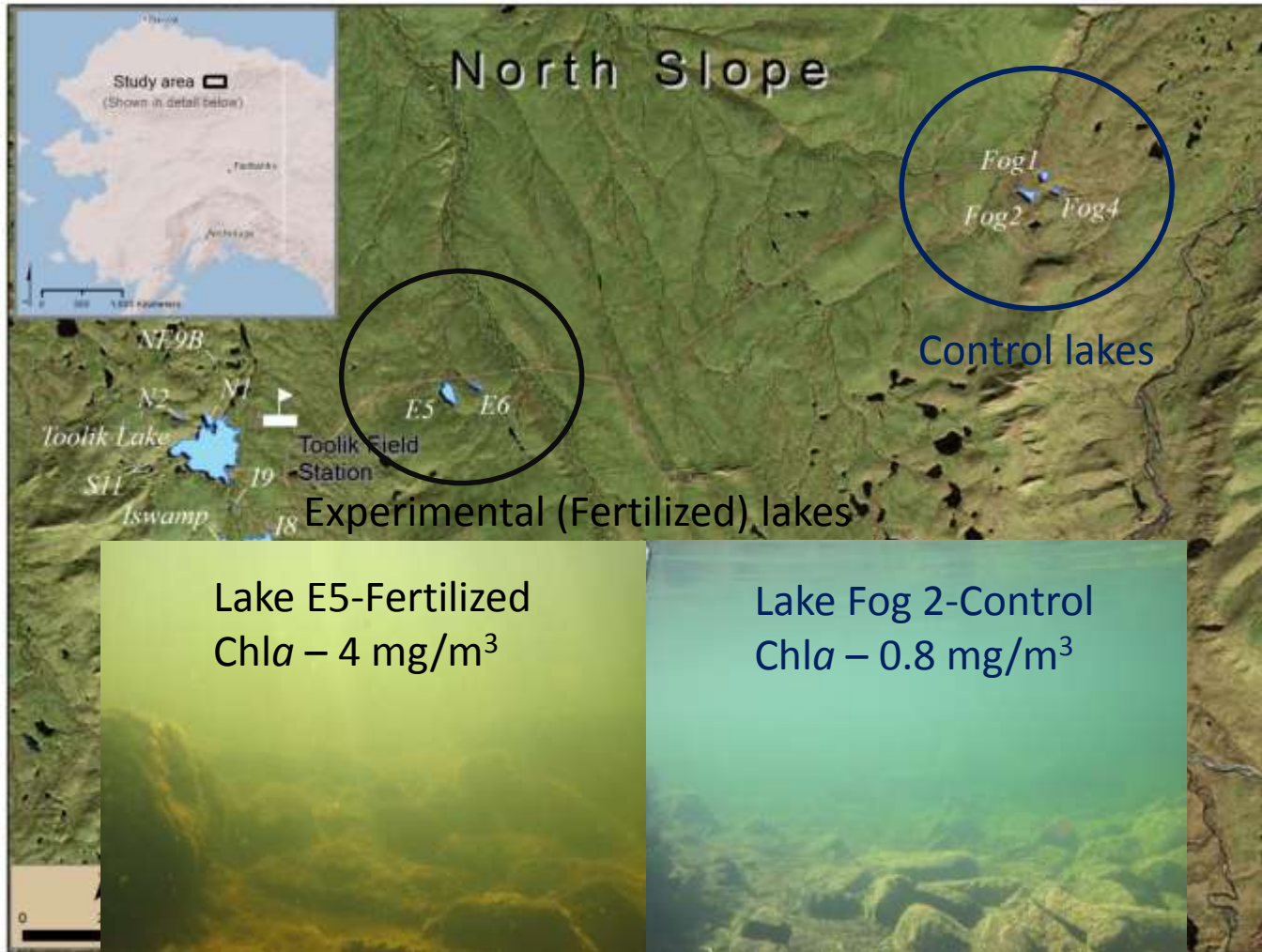


Background

- Mean annual air temperature has increased by 2.1°C in the last 30 years
- Mean annual or summer water temperature has not increased
- Rising temperatures predicted to increase:
 - External nutrient levels
 - Allochthonous nutrient inputs into lakes
 - Lake productivity



Lake Fertilization Experiment



- Lake E5 was fertilized from 2001-2013 at 2X the natural nutrient loading rate

Objectives

- 1) Compare Slimy Sculpin diet between fertilized and control lakes
- 2) Compare Sculpin relative condition (length-weight relationship) between fertilized and control lakes
- 3) Use diet information to help understand the role of Slimy Sculpins in food webs and nutrient cycling

Methods

Field

- 95 Slimy Sculpin were collected from the littoral zone of each by beach seine
- Sacrificed upon capture
- Recorded total length and weight



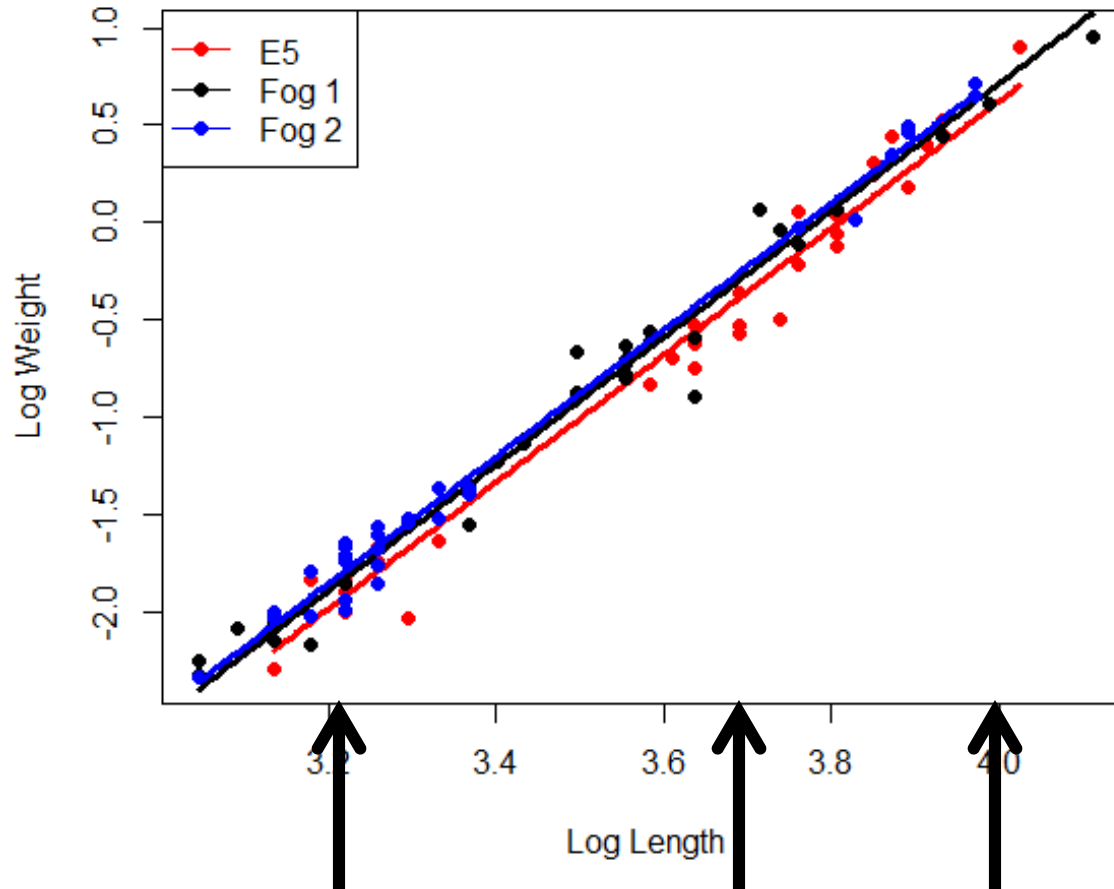
Methods

Laboratory



- Stomachs were removed, weighed, and preserved
- Contents were identified to genus if possible
- Wet weight and average length of each prey group was recorded

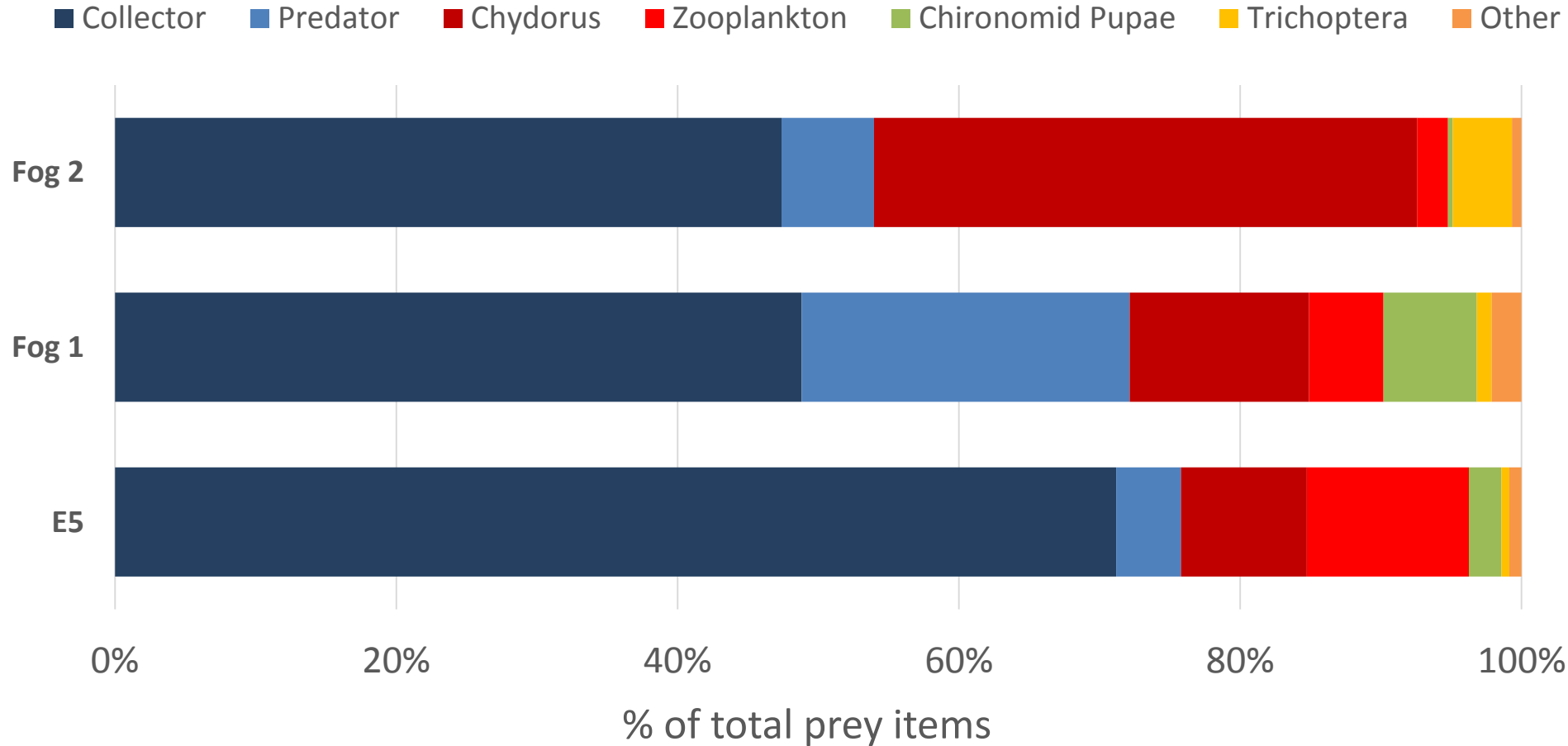
Results -- Condition



Lake	25mm
E5	0.146g
Fog 1	0.160g
Fog 2	0.167g

- Sculpins in the fertilized lake weigh less at all lengths

Diet



- Collector chironomids were consumed most frequently in all lakes

Summary

Conclusions:

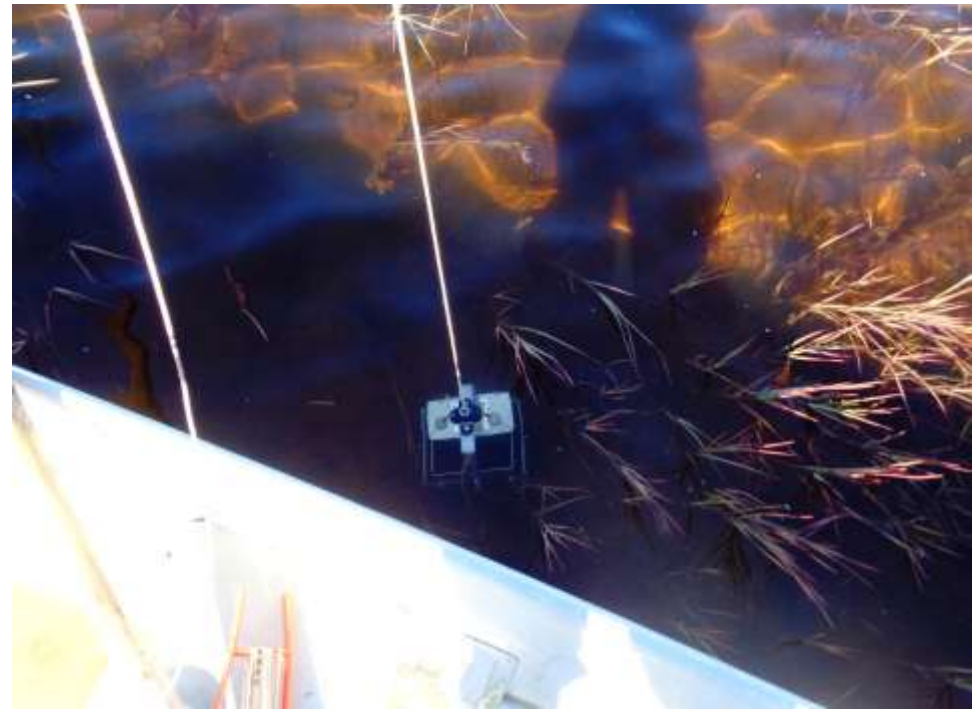
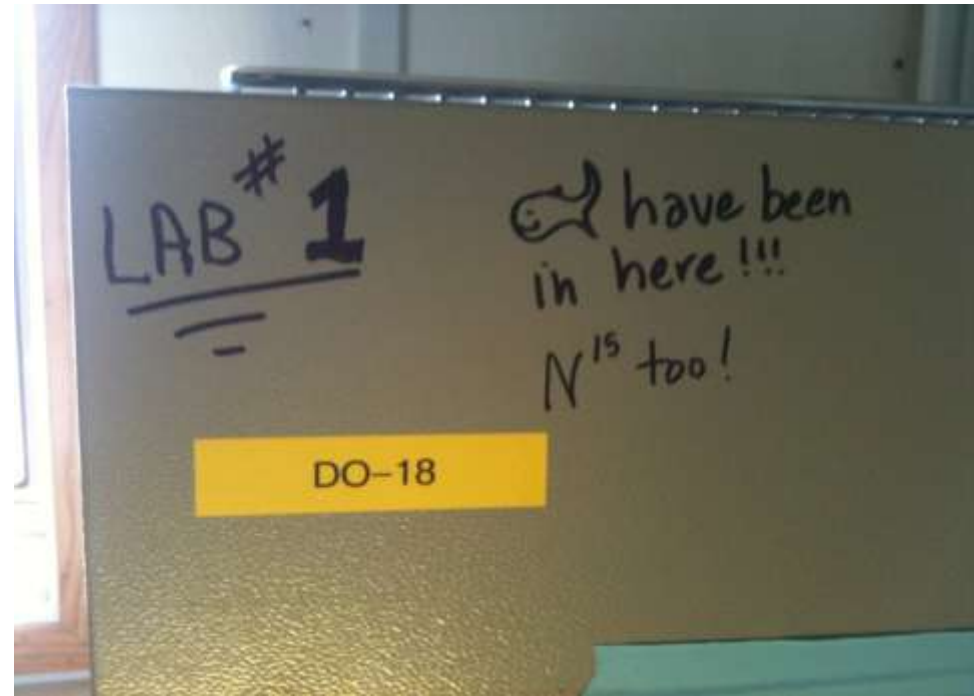
- Sculpins of equal length were generally heavier in the Fog lakes than E5
- Sculpin diets consisted of mainly larval chironomids

Discussion:

- Nutrient inputs due to climate change might negatively affect condition of Slimy Sculpins
- Increased productivity could lead to a slight diet shift

Future Plans

- Analyze littoral dredges of the three study lakes to determine prey selectivity
- Process YOY char diets to see if there is interspecific competition



Acknowledgements



National Science Foundation
WHERE DISCOVERIES BEGIN



Toolik Field Station Staff



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