The Effects of Supplementary LED Lights on the Function of Biofloc Systems and Growth of Tilapia

John Bailey O. Barksdale, Andrew J. Ray, and Leo Fleckenstein*

Aquaculture Division, Kentucky State University Land Grant Program

Kentucky State University

College of Agriculture, Food Science, and Sustainable Systems

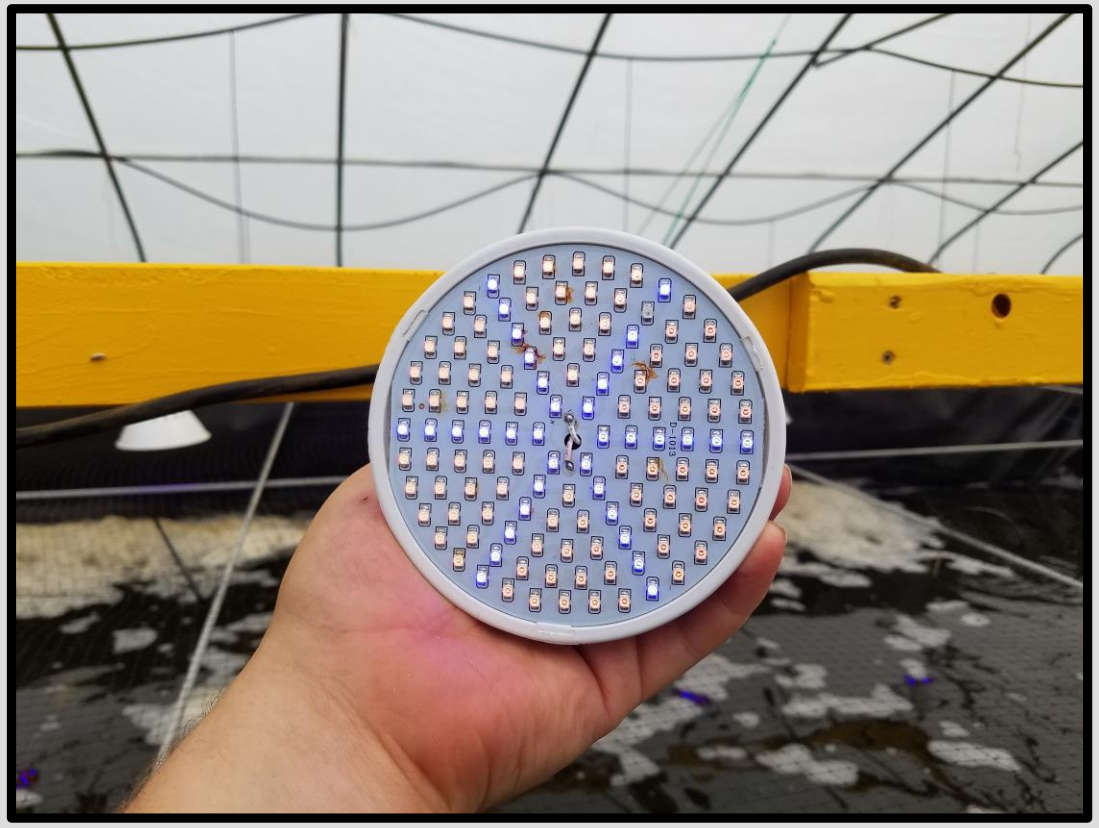
USDA

United States Department of Agriculture
National Institute of Food and Agriculture

Biofloc Systems

- Recirculating system
- Dense microbial community
  - Maintains water quality
  - Alternative feed source
  - Improves fish health
- Properly managing the microbe community is key

LED Lighting



- Energy efficient
- Little thermal output
- Cost effective
- Readily available
- Highly customizable light output

High-Tunnel Greenhouses

- Capture solar radiation and retain it for growing crops.
- High-tunnel greenhouses are simple and inexpensive
- Lengthened growing season
- Can we use High-tunnels to grow tropical animals in Kentucky?

Tilapia

- *Oreochromis niloticus*
- Tolerant tropical cichlid:
  - Poor water quality
  - High stocking density
  - Omnivorous
- Rapid growth to marketable size

High-Tunnel Fish Tanks

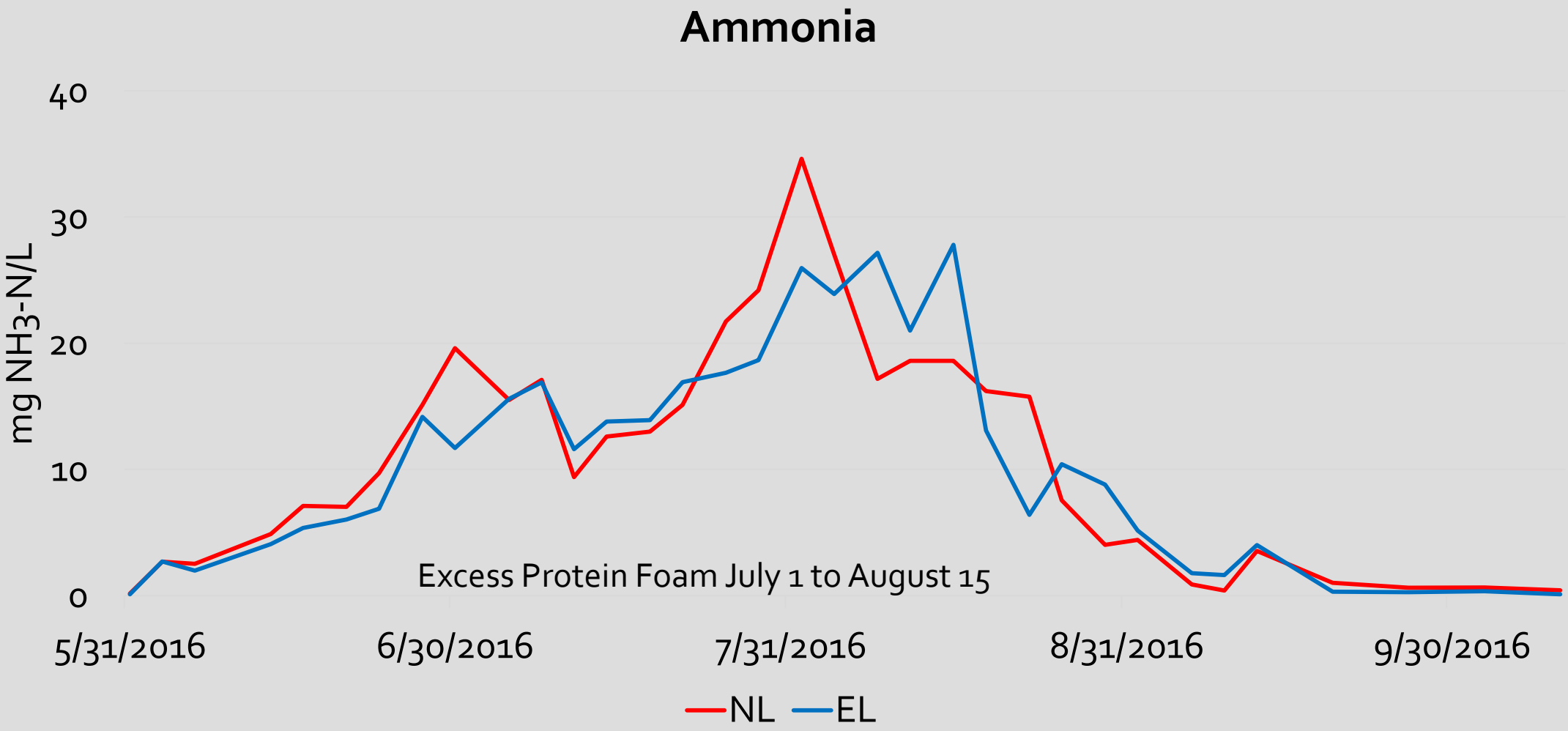
- Twelve custom-built tanks from readily available materials
- LED lighting was added to 6 of the 12 tanks
  - Lighting arrays consisted of 15 individual LED “bulbs”
  - “Bulbs” contain 126 LEDs in the red and blue spectrums
  - The lights were on 24/7

Methods

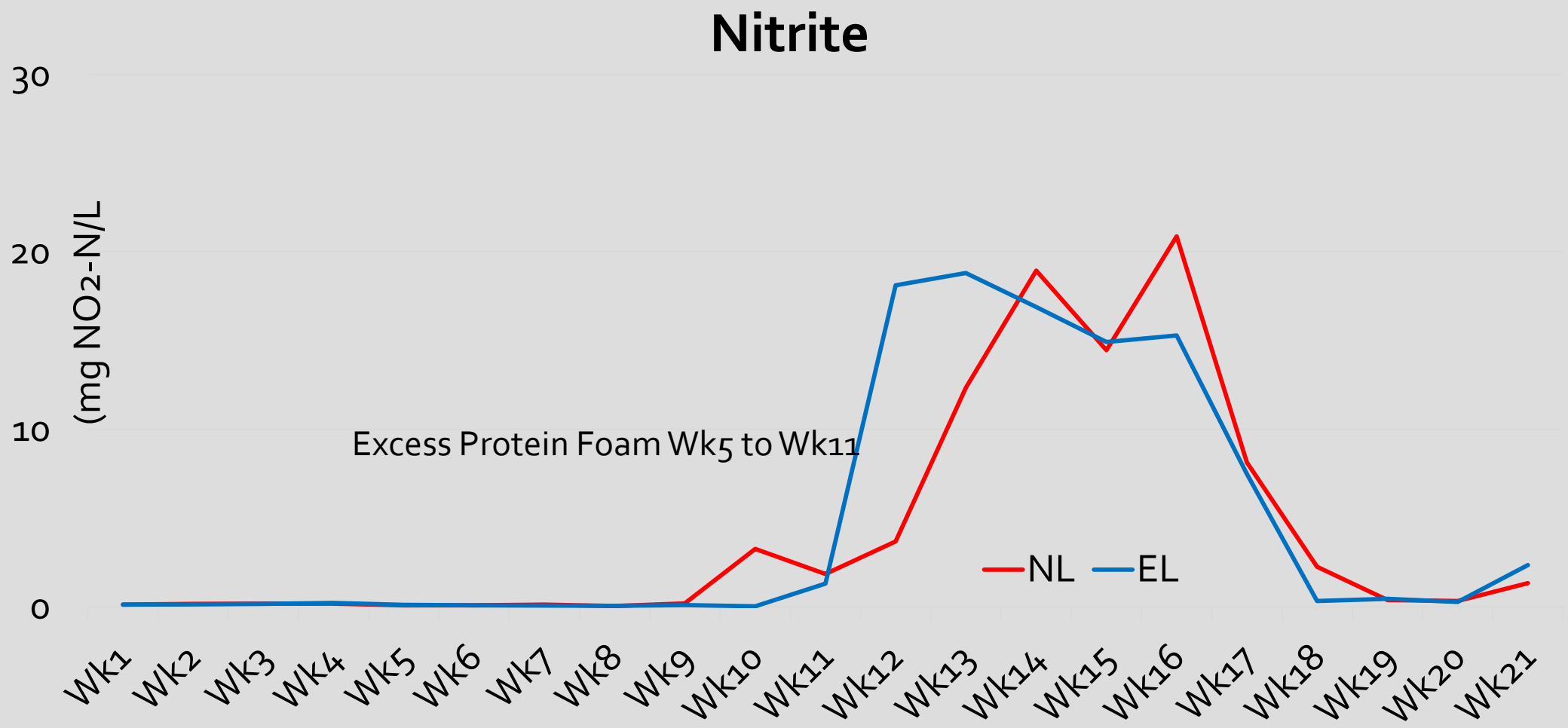
- Daily water parameters
  - Water temperature, DO, pH
- Weekly water quality
  - Ammonia, Nitrite, Nitrate
  - Chlorophyll
  - TSS/VSS and Turbidity
- Biweekly fish sampling
- Feed to satiation 3/day

Hurdles

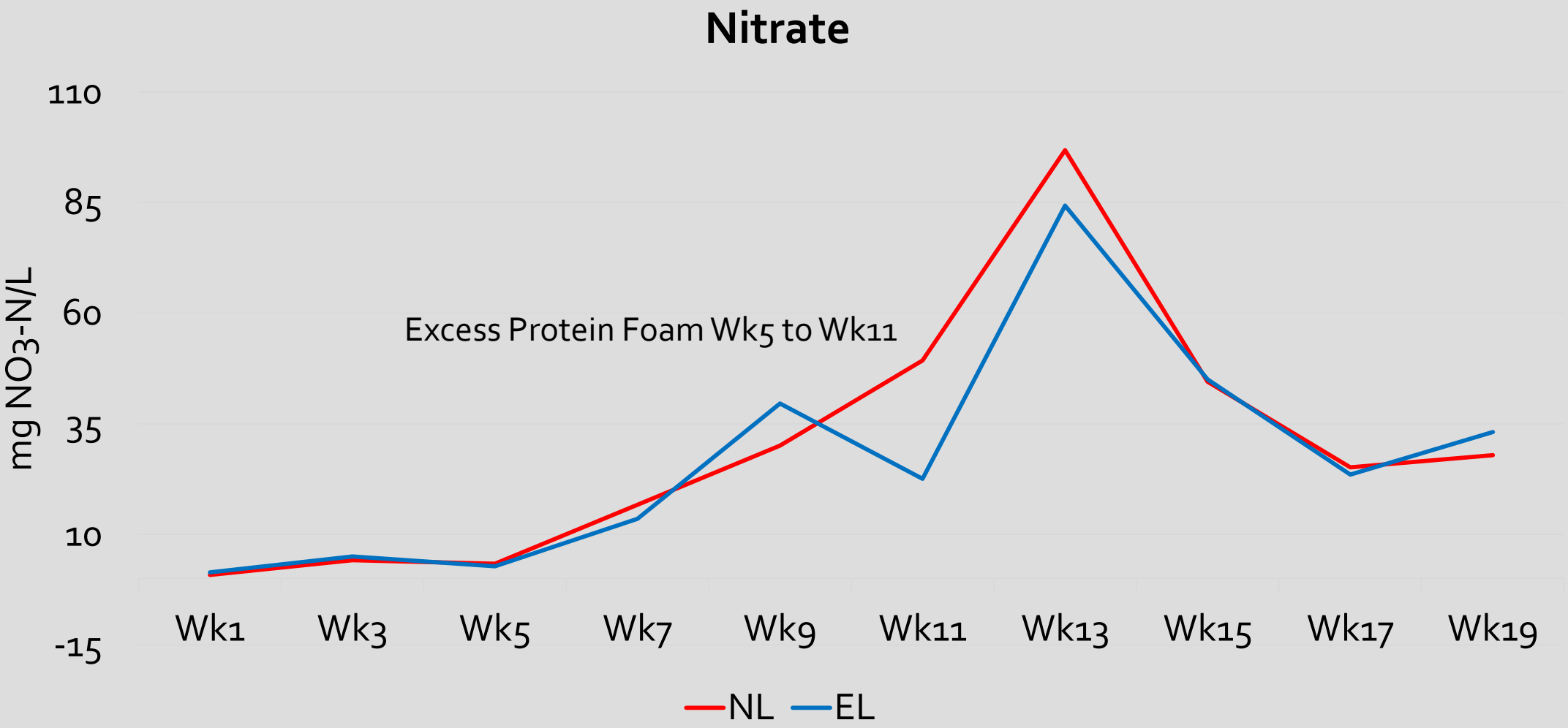
Water Quality



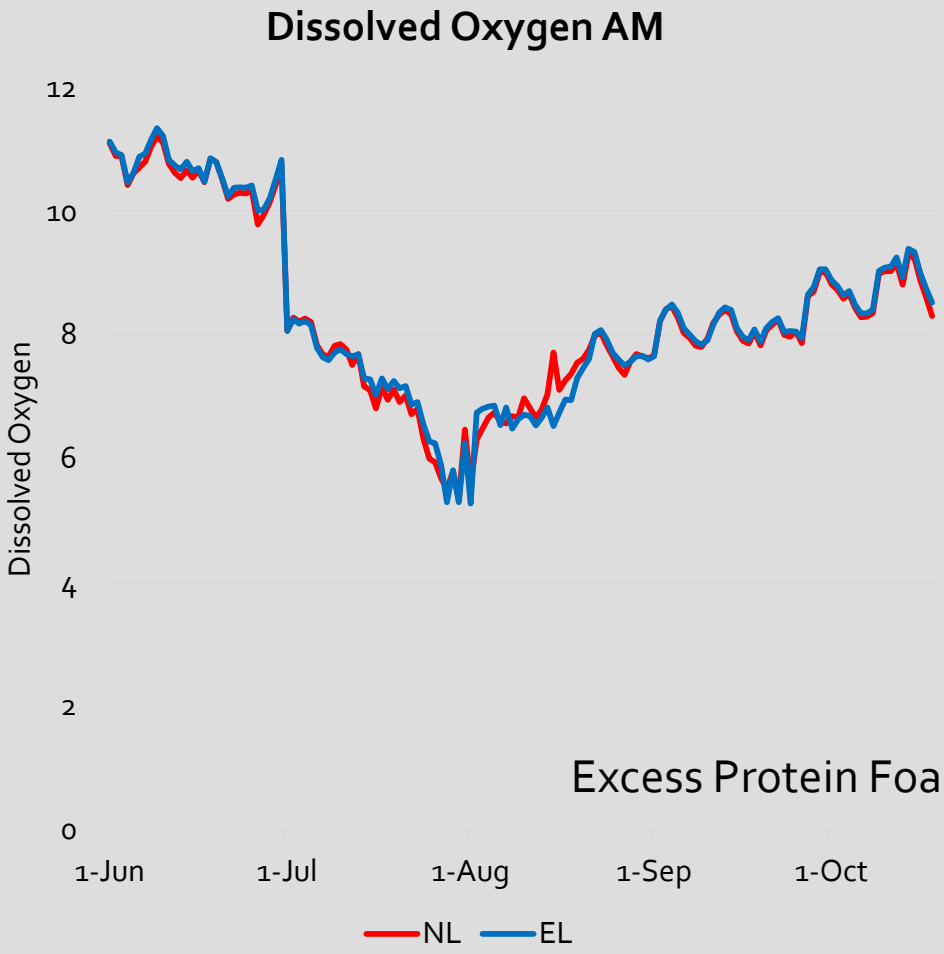
Water Quality

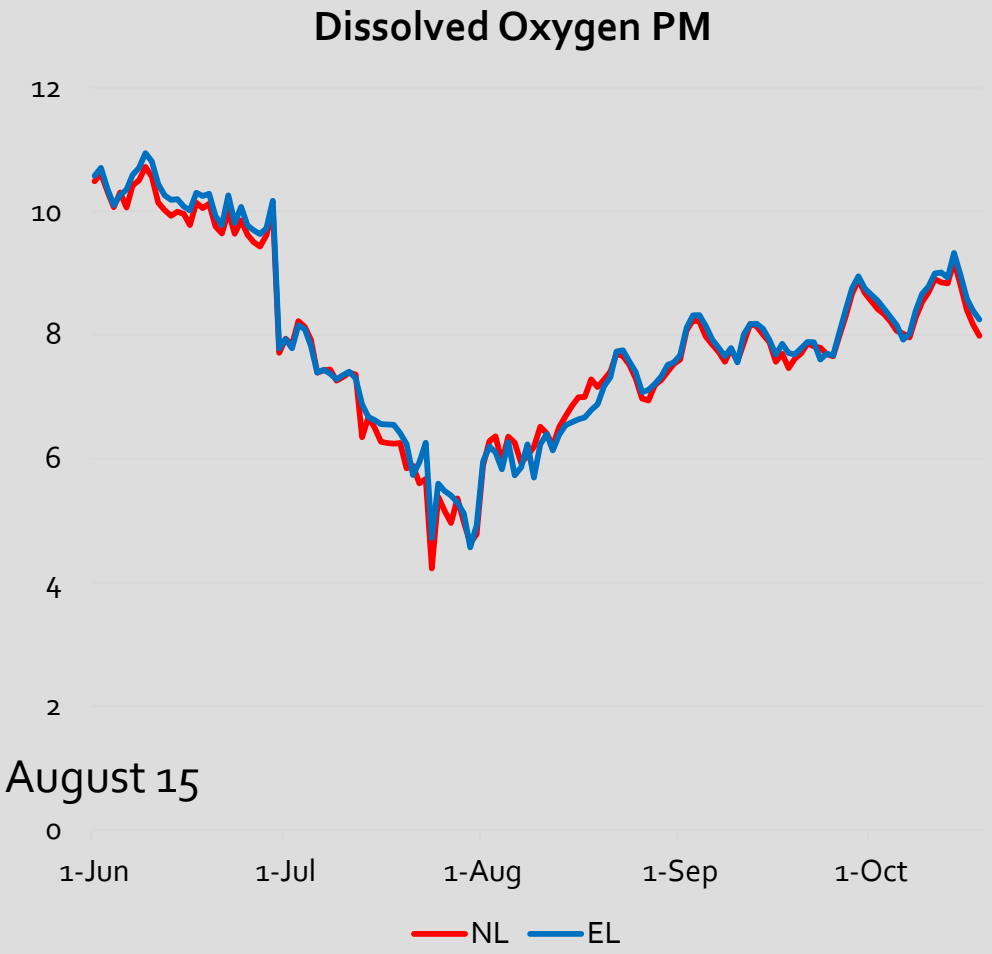


Water Quality



Water Quality

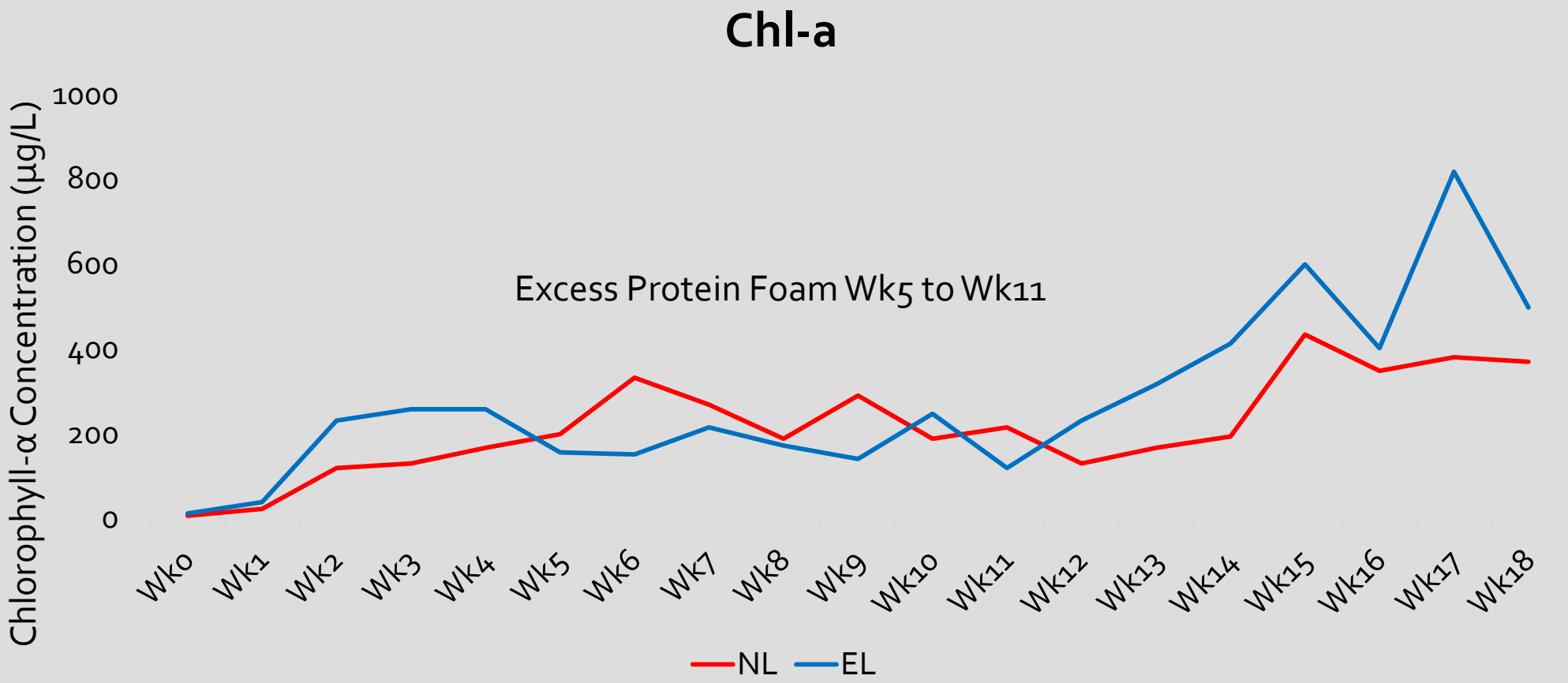




Excess Protein Foam July 1 to August 15

There were no significant differences between treatments when looking at dissolved oxygen (p-value= 0.99) throughout the growing period.

Water Quality

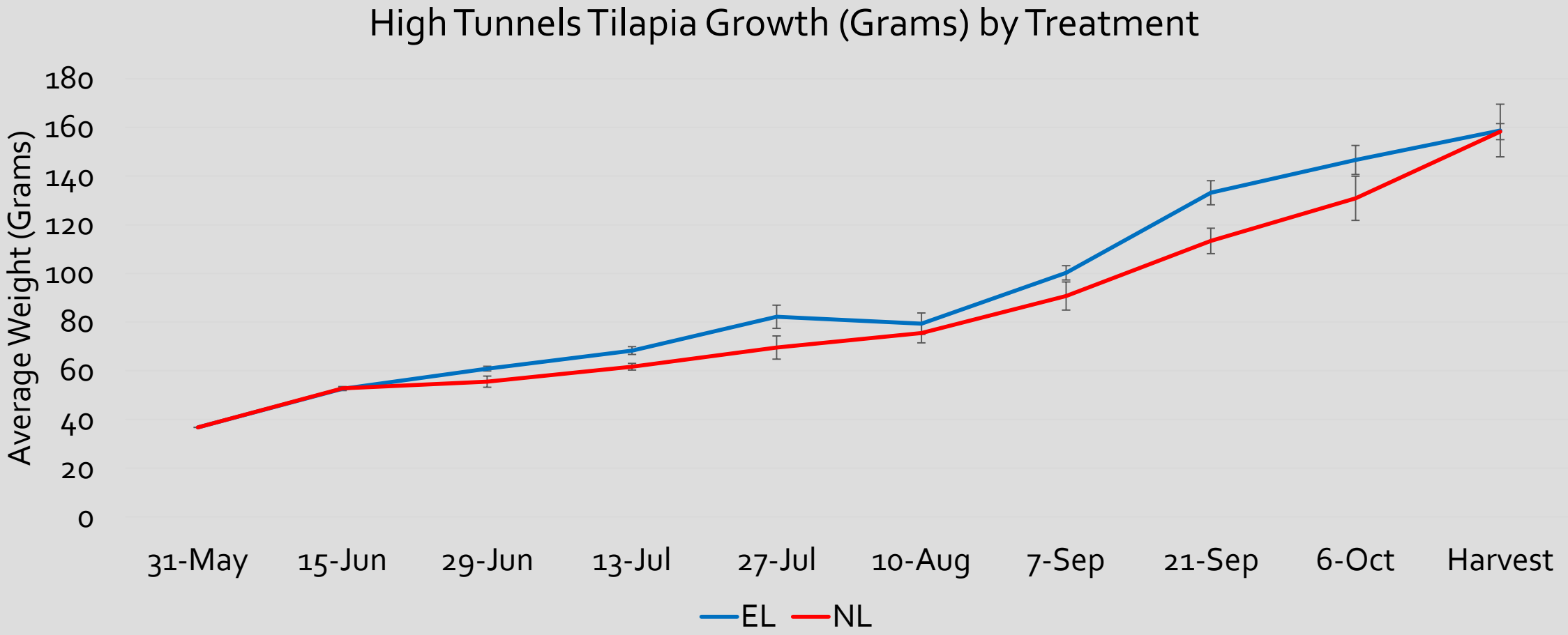


There was no significant difference between treatments when looking at Chlorophyll-α concentration (p-value= 0.971) throughout the growing period.

Fish Harvest

- Harvested in mid-October
  - ~140 day growing season
  - Average harvest size 158.5 grams
- "Pan-sized" tilapia were provided to vendors and restaurants.

Average Harvest Weight



No significant difference was measured between treatments (p-value= 0.967)

Production Metrics

Treatment	Feed Conversion Rate	Specific Growth Rate	Survival	Biomass Production (kg/m^3)
EL	2.17 ± 0.22	0.88 ± 0.09	0.54 ± 0.27	14.10 ± 0.96
NL	2.14 ± 0.26	0.87 ± 0.03	0.53 ± 0.23	14.03 ±0.30

There was no significant difference between treatments with FCR (p-value= 0.931) or SGR (p-value= 0.967).

Questions?

- I would like to thank Dr. Ray, The KSU Aquaculture Production Sciences Lab, and Kentucky State University for their help and support during this project.