Freshwater Mussels

LIVING PUMPS: Mussels constantly pump water to feed and breathe. They filter out suspended particles in the water. Mussels are: 1) food for fish; 2) stabilize sediments; 3) improve water clarity which can help submerged aquatic vegetation and fish habitat; 4) remove bacteria and nutrients from water; 5) accumulate contaminants

Goal and Objectives: Mussels

- Goal: Deploy mussels in tributaries to determine to what extent PCBs, pesticides, PAHs can be accumulated by aquatic organisms; accumulate from both water and sediments
- Objective 1: Compare PCB, pesticide, PAH concentrations in mussels exposed for ~90 days
- Objective 2: Evaluate condition of deployed mussels as first step for studying possibility of enhancing populations in the watershed

Approach

- Collect adult *Elliptio complanata* from Zekiah Swamp "reference" location (supports large population) and low in contaminants
- Next day deployment at Zekiah collection site and multiple locations in Anacostia watershed:
  - Year 1: 7 locations, 6 cages/location, 8 mussels/cage
  - Year 2: 9 locations, 5 cages/location, 8 mussels/cage
- Duration: ~90 days with regular monitoring: early June through Sept for bioaccumulation; then another 60 days (total ~150-d) for mussel condition

1 – Northwest Branch

2 – Northeast Branch

3 – Lower Beaverdam

4 – Watts Branch

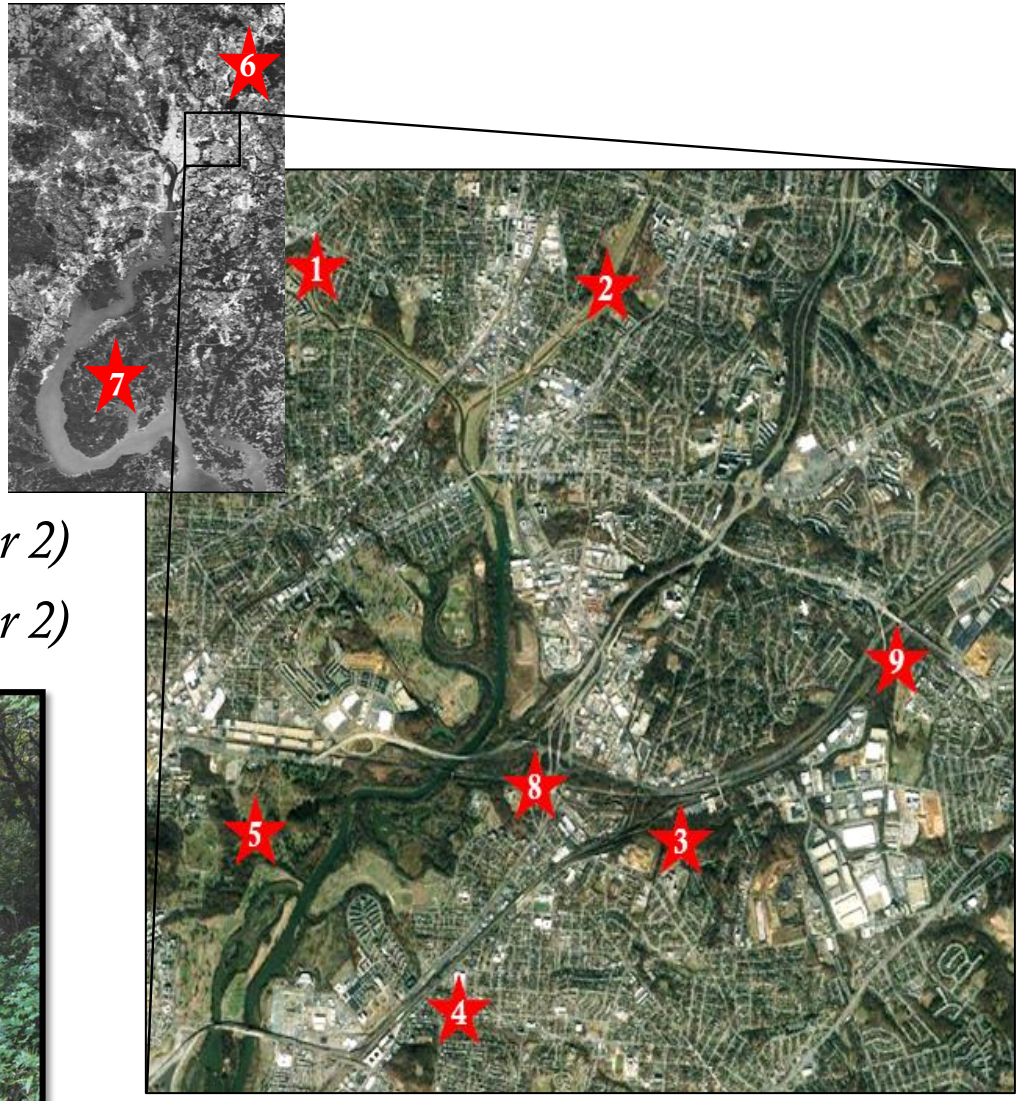
5 – Hickey Run

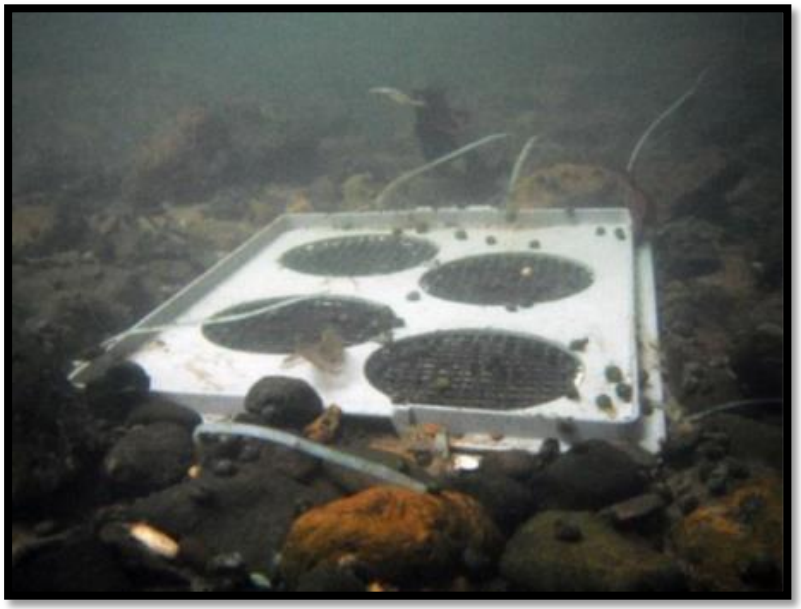
6 – Beaverdam Creek

7 – Zekiah Swamp Creek

8 – Lower Beaverdam 1 *(Year 2)*

9 – Lower Beaverdam 3 *(Year 2)*





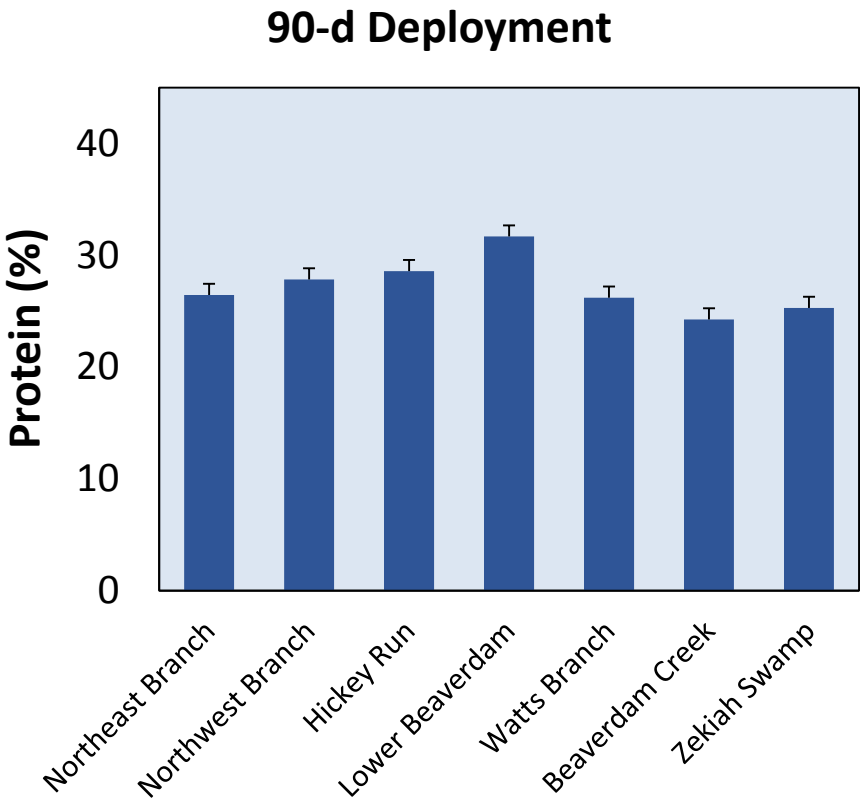
Endpoints: mussel condition

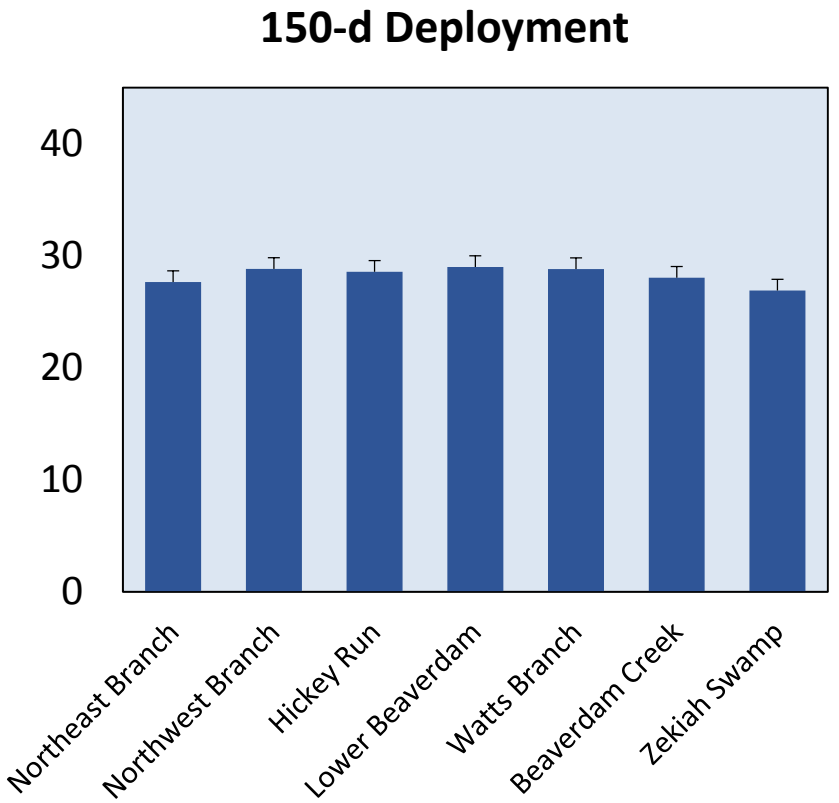
- Length, height, width, wet weight
- Carbohydrate, protein, lipid
- Glycogen is key for energy storage and successful overwintering when food availability is decreased
  - Glycogen decrease is indicator of stress
  - Measure twice: Sept (Day ~90; n=12) and additional samples held until ~day 150 (early December) (n=12)

Survival and condition results

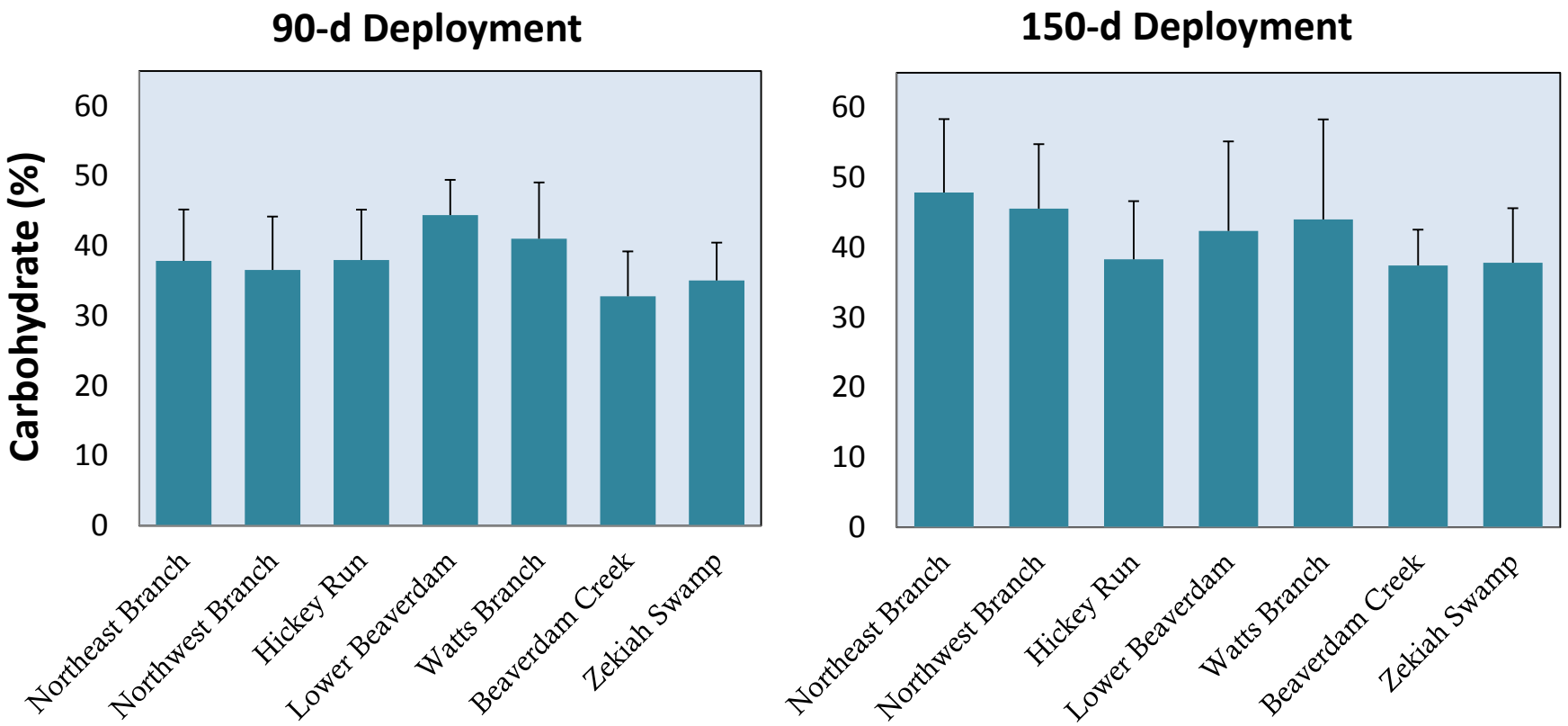
- Year 1: > 99% survival; a single mussel from Northeast Branch was dead at 90-d
- Year 2: > 99% survival; two mussels from Northeast Branch were dead at 90-d (several lost from Lower Beaverdam 2 at 150-d)
- Mussel length, total/tissue weight: no apparent difference:
  - Between deployment sites
  - Between Pre-, 90-d, and 150-d mussels
  - Yr 2: in progress

Yr 1: Protein (% dry wt)

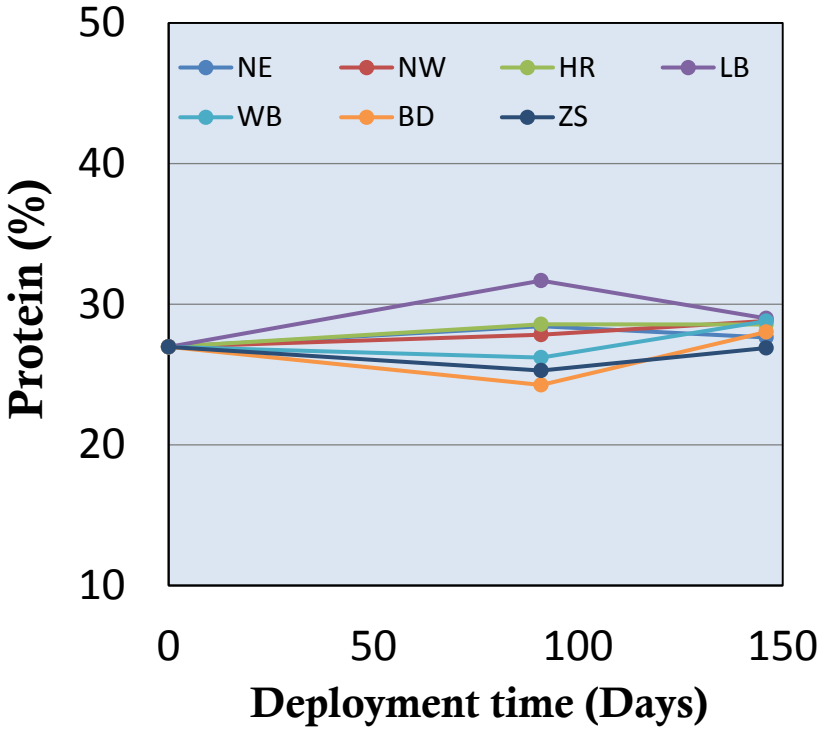


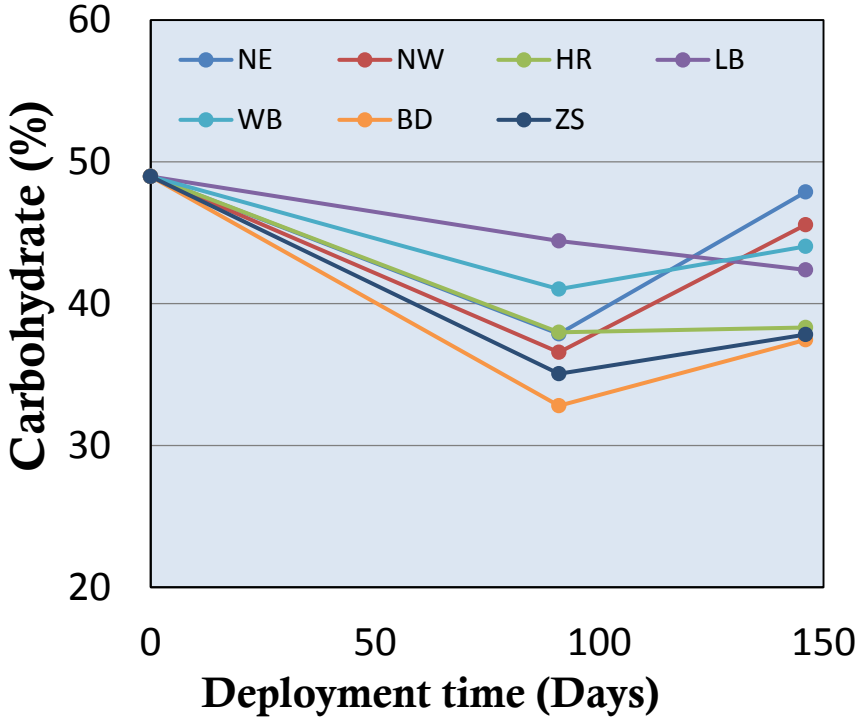


Yr 1: Carbohydrate (% dry wt)



Yr 1: Protein /Carbohydrate Trends





Comparison to historical trends (Gray and Kreeger, 2014)

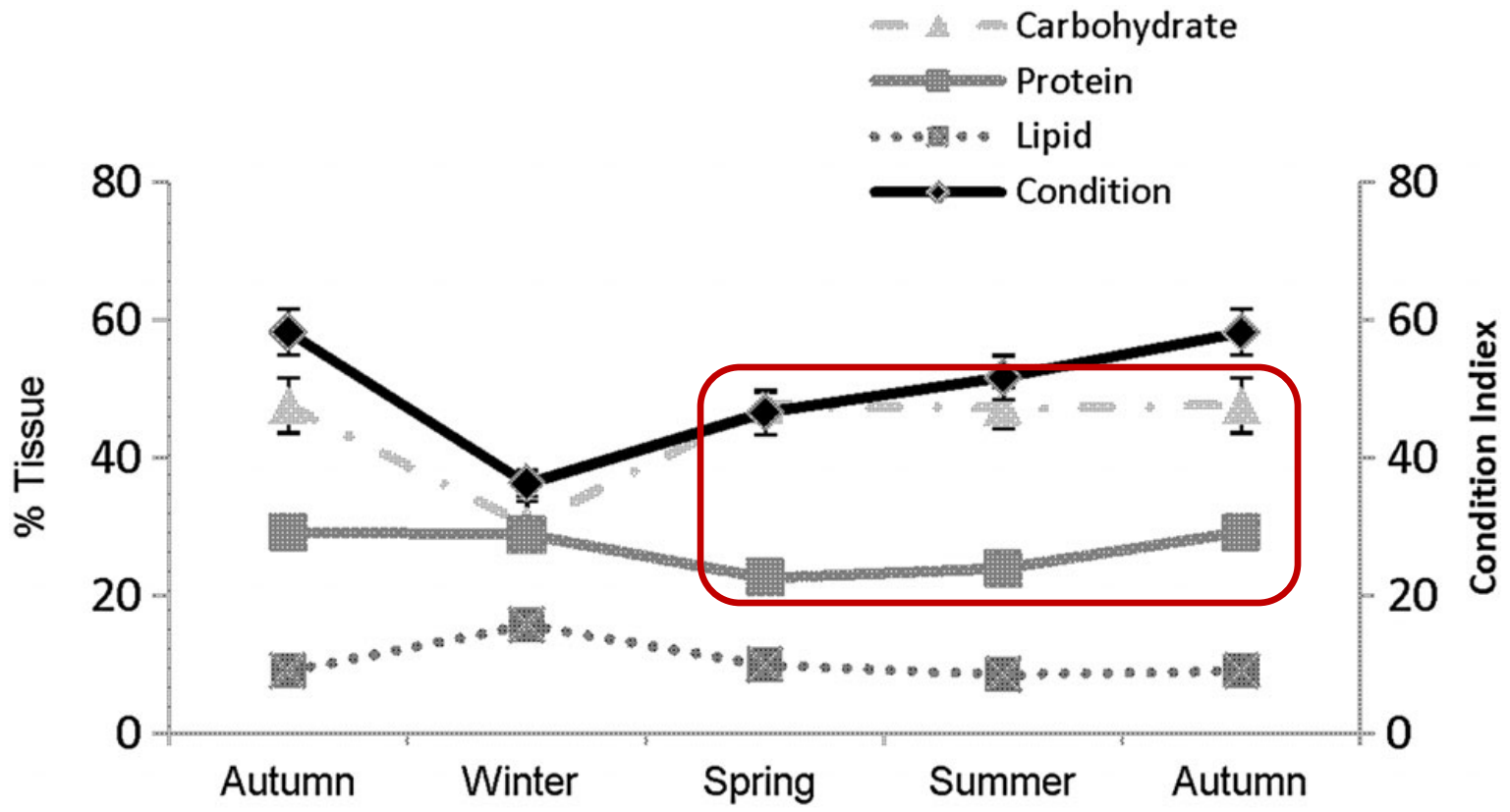
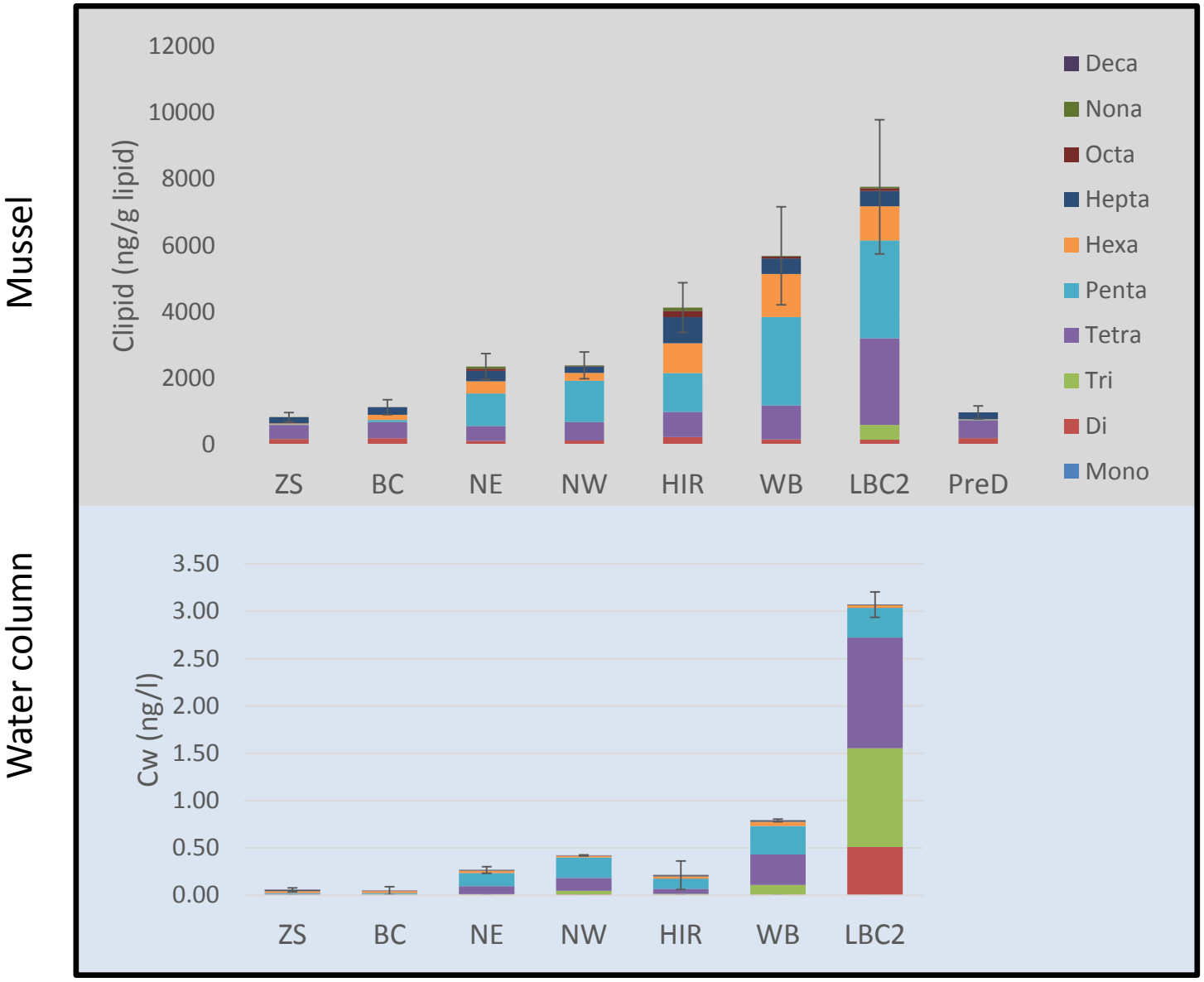
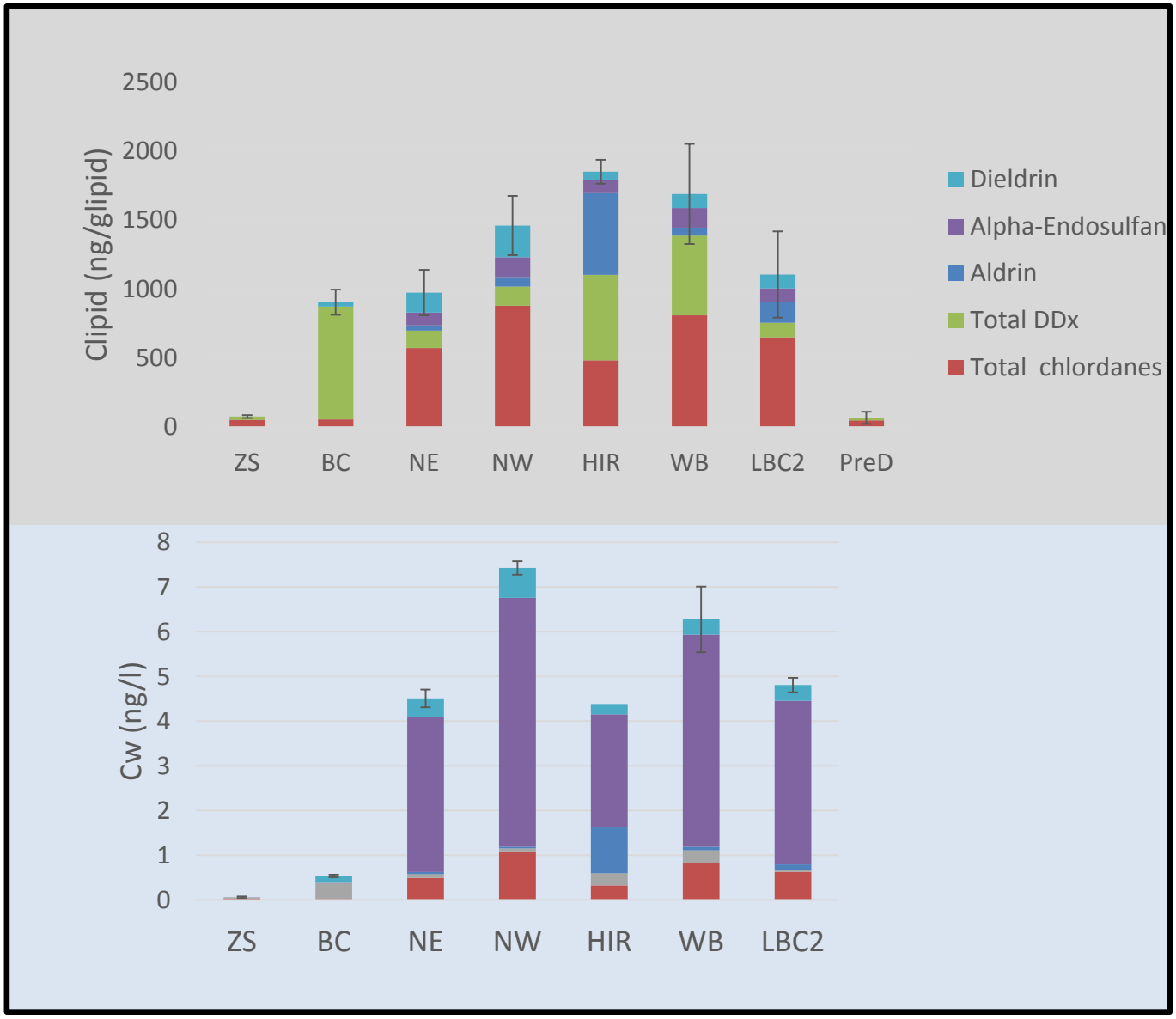


Figure 5. Seasonal variation in the condition index, protein content, carbohydrate content, and lipid content (with standard error bars) of Elliptio complanata pooled from caged mussel data from Ridley Creek, Middle Branch White Clay Creek, East Branch

PCBs in mussel



Pesticides in mussel



PAHs (parent and alkyls) in mussel