Balancing Seasonal Food Web Interactions to Manage Kokanee Production in a Mixed Fishery

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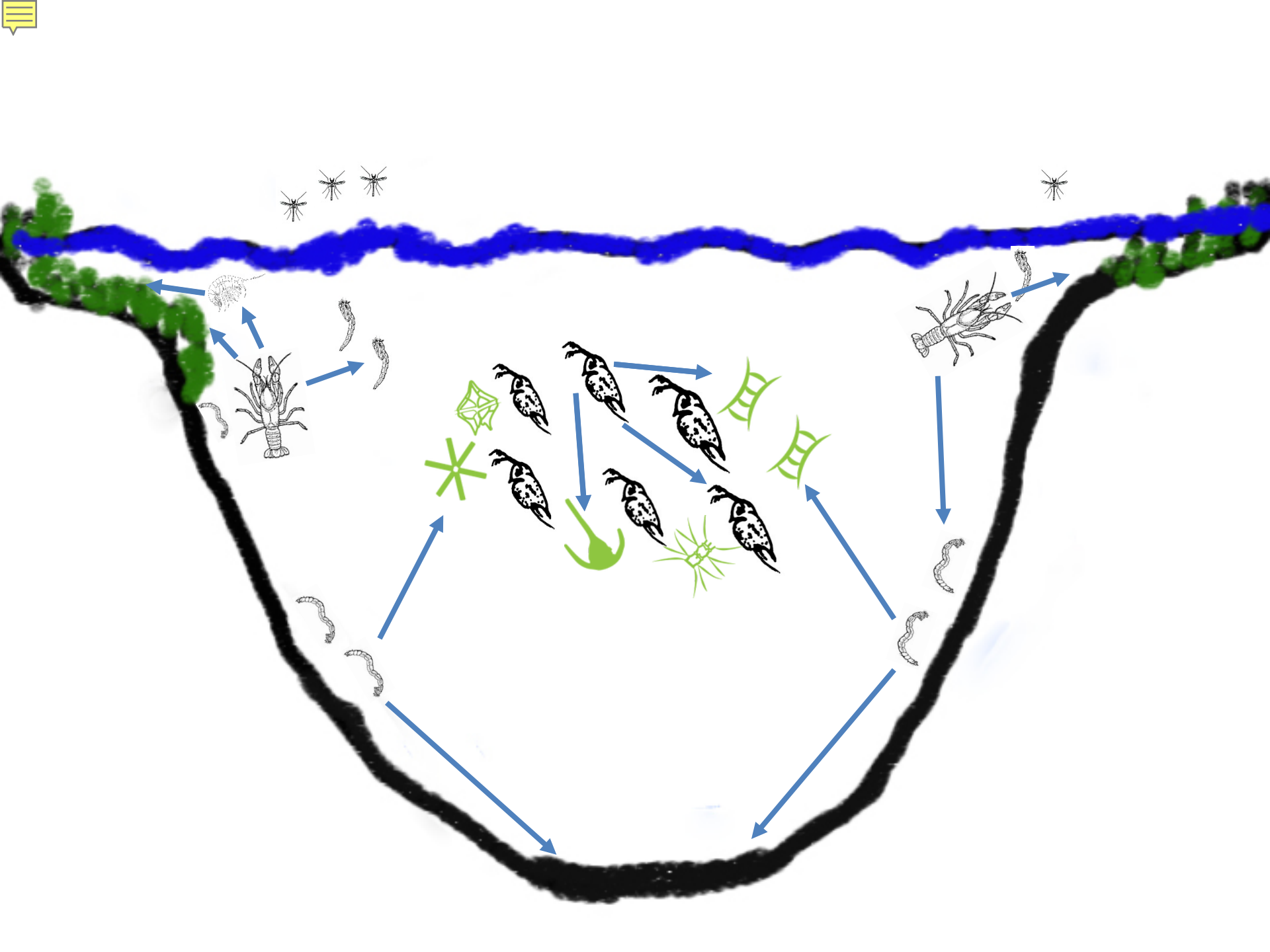
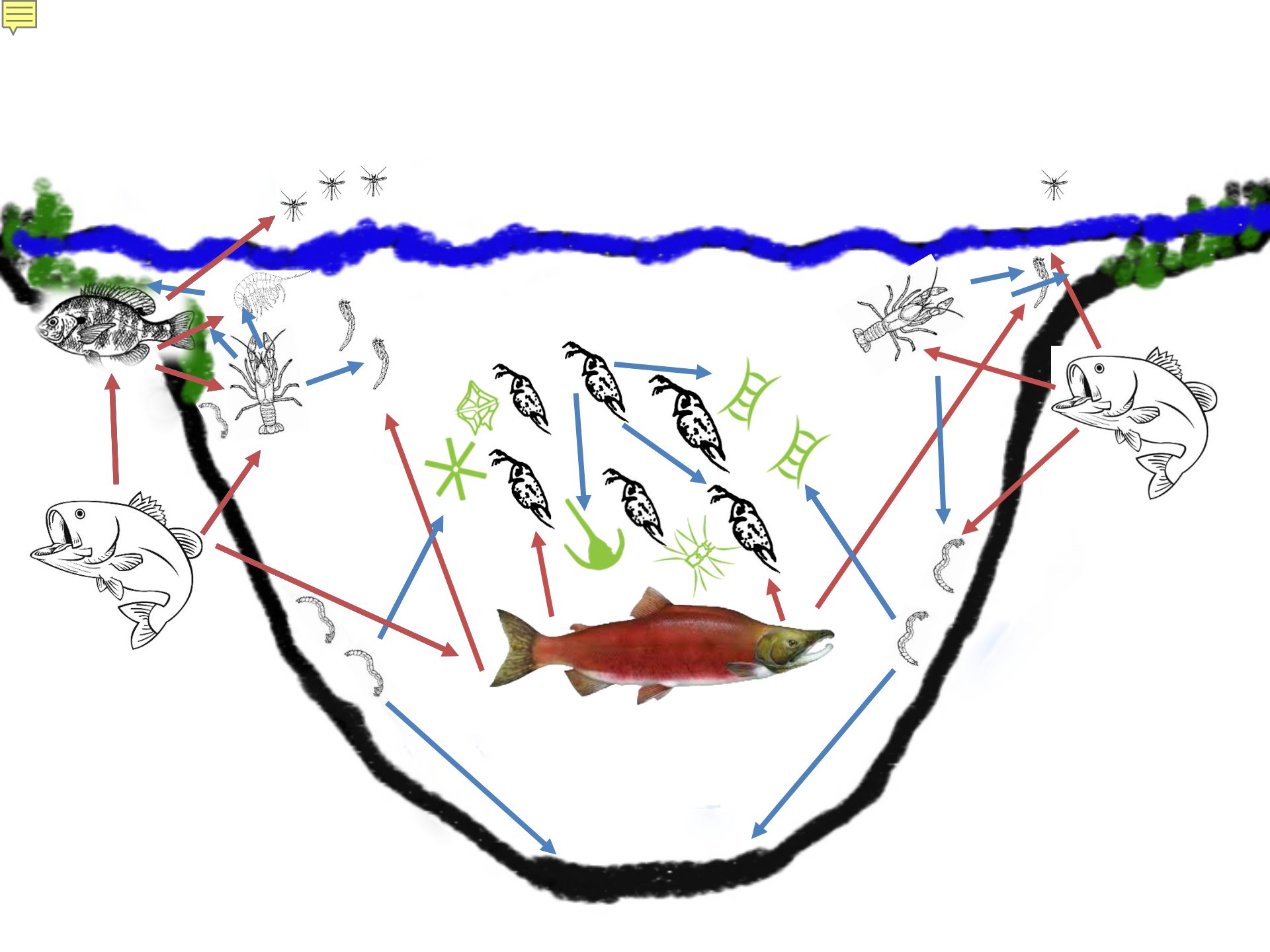
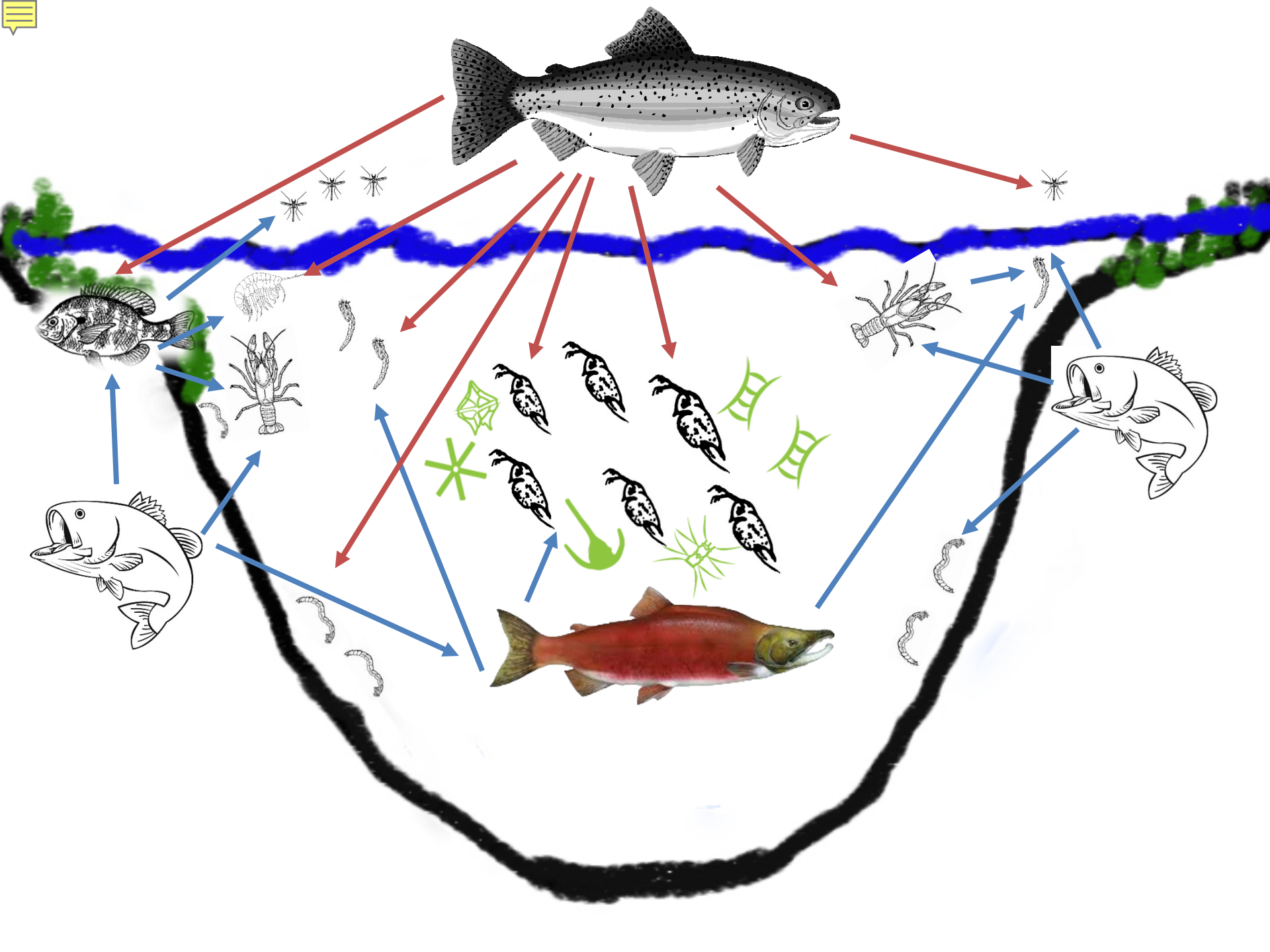
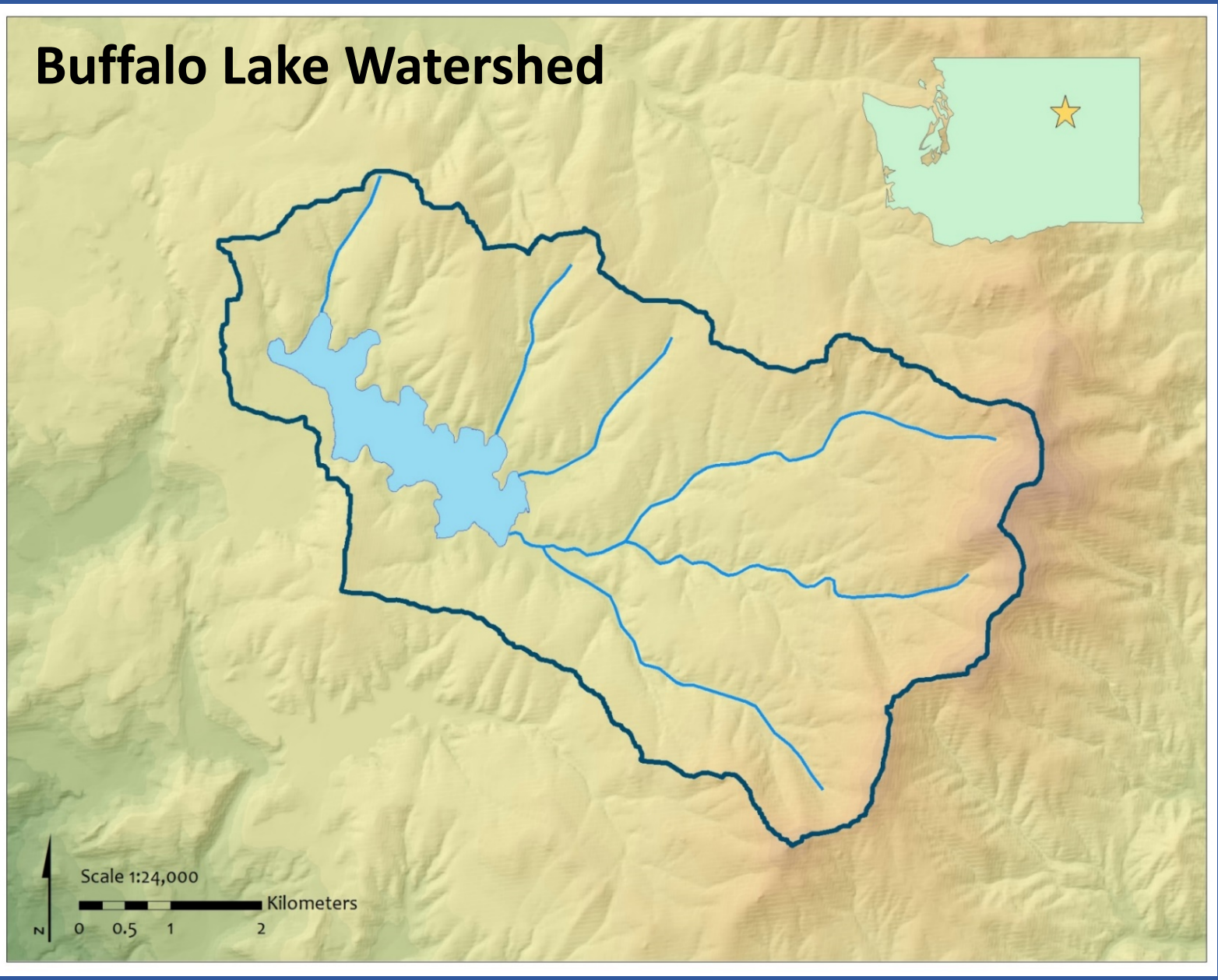






No outlet!



Max Depth:

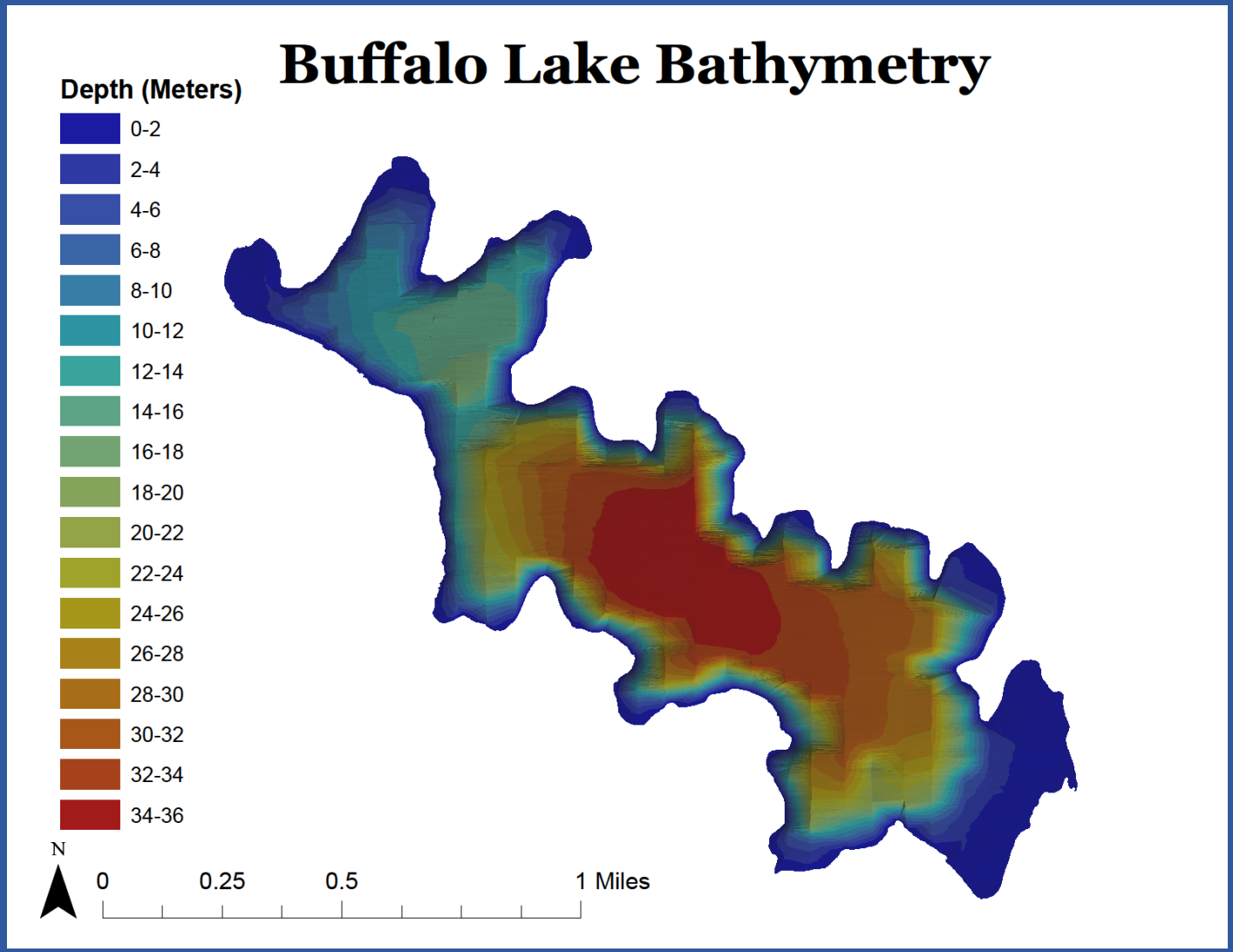
- 35m

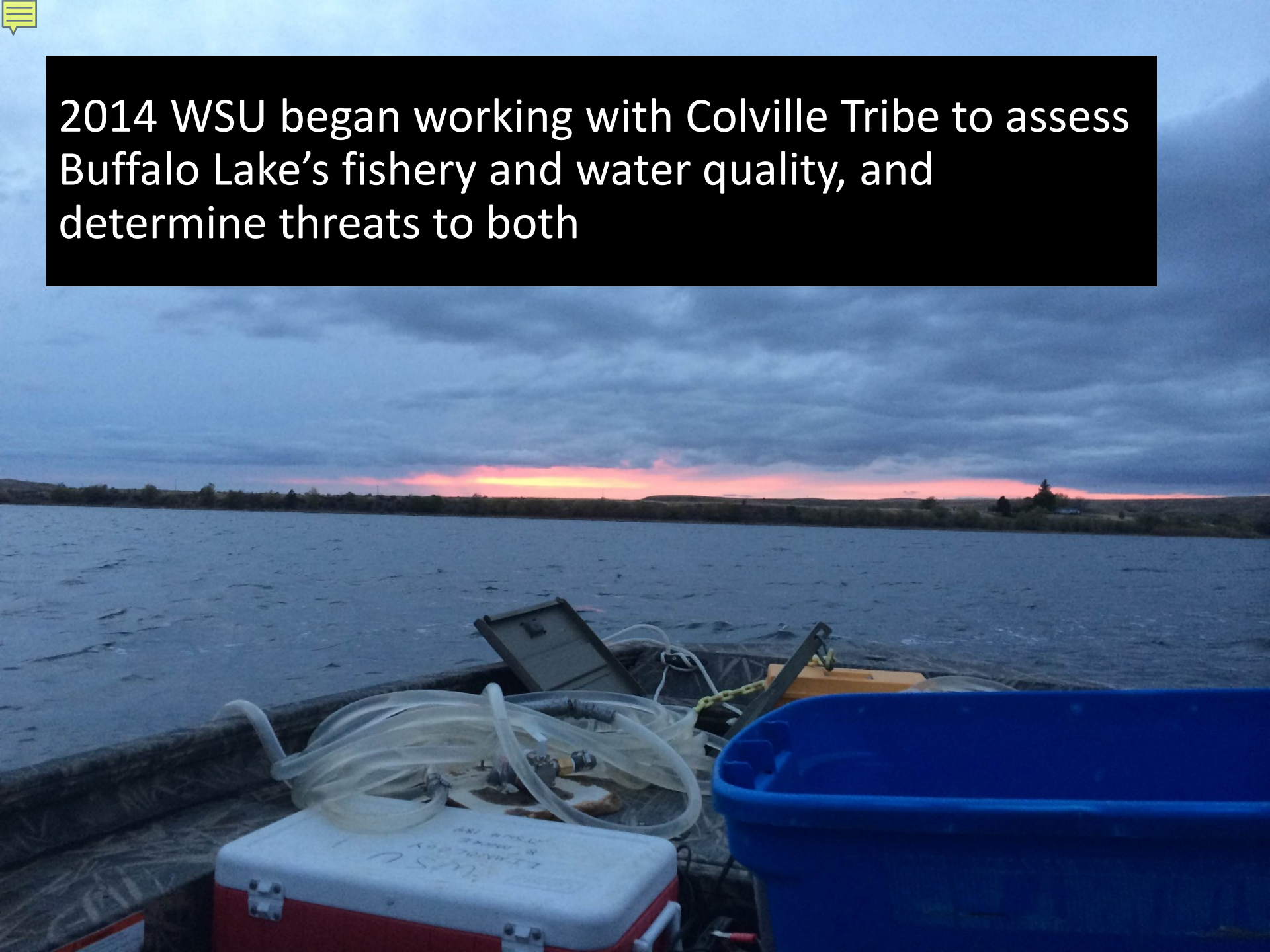
Length:

- 2 miles

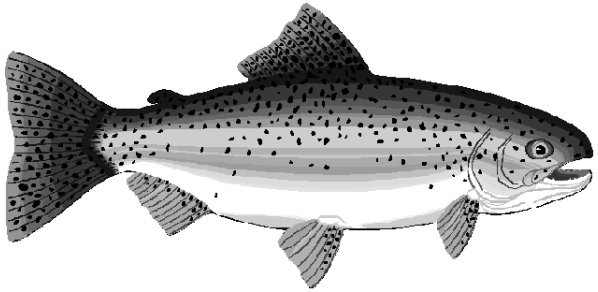
Surface Area:

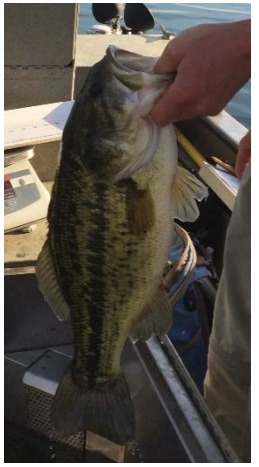
- 224 ha





2014 WSU began working with Colville Tribe to assess Buffalo Lake's fishery and water quality, and determine threats to both





Food Web Analysis

- **Our goal was to apply stomach content analysis (SCA) as a measure of resource usage, predator/prey interactions, and seasonal diet overlap for all fish in Buffalo Lake further guiding fishery management decisions.**

Methods- Fish Collection

- Quarterly 2014, 2015, 2016, & 2017
  - Gillnets/Trawl
    - Kokanee and Rainbow Trout
  - Electrofishing
    - Warmwater Fish
    - Salmonids in colder months
- 10–15 fish selected, predetermined size classes

Methods:
Stomach Content Analysis (SCA)

- Stomachs were extracted or contents obtained with gastric lavage and preserved in 70% alcohol for laboratory analysis.

- Prey species present were identified to order and wet weight biomass estimated using length-weight regressions of measured prey items found (Benke et al. 1999, Dumont et al. 1975)

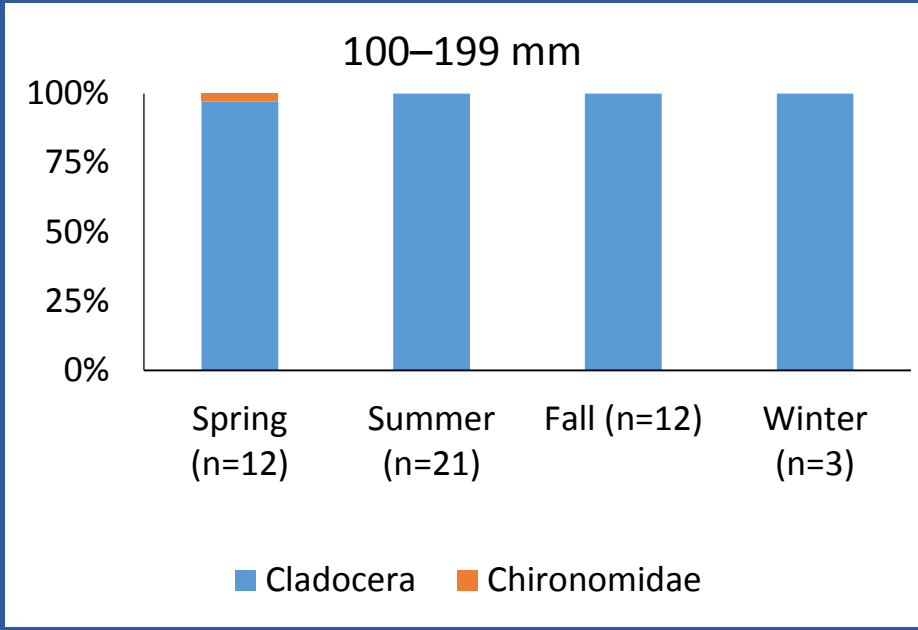
- Percent by weight was calculated for each prey item present to determine proportional diet composition of all fish species. Fish with empty stomachs were omitted from analysis

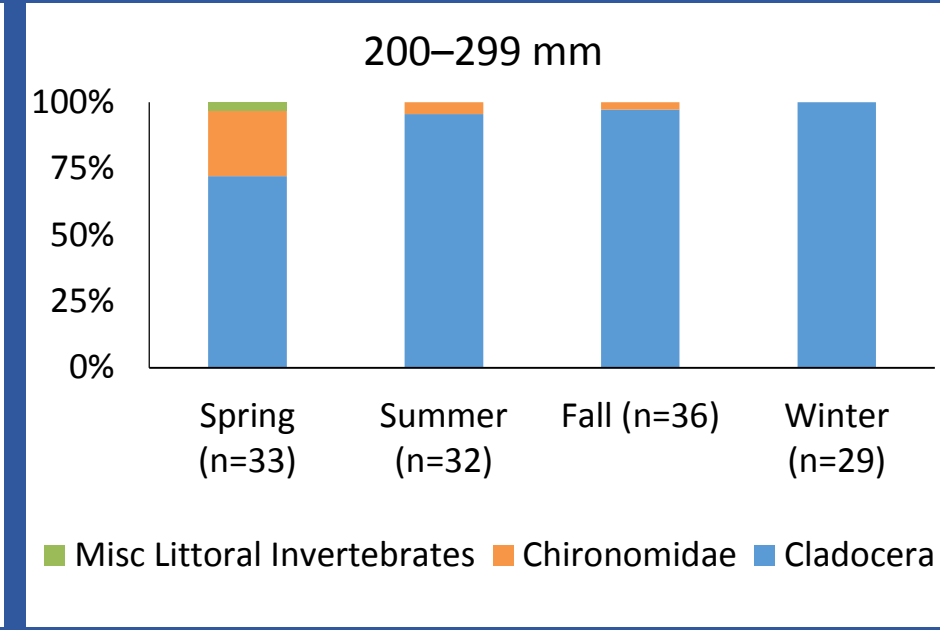
Data Analysis-

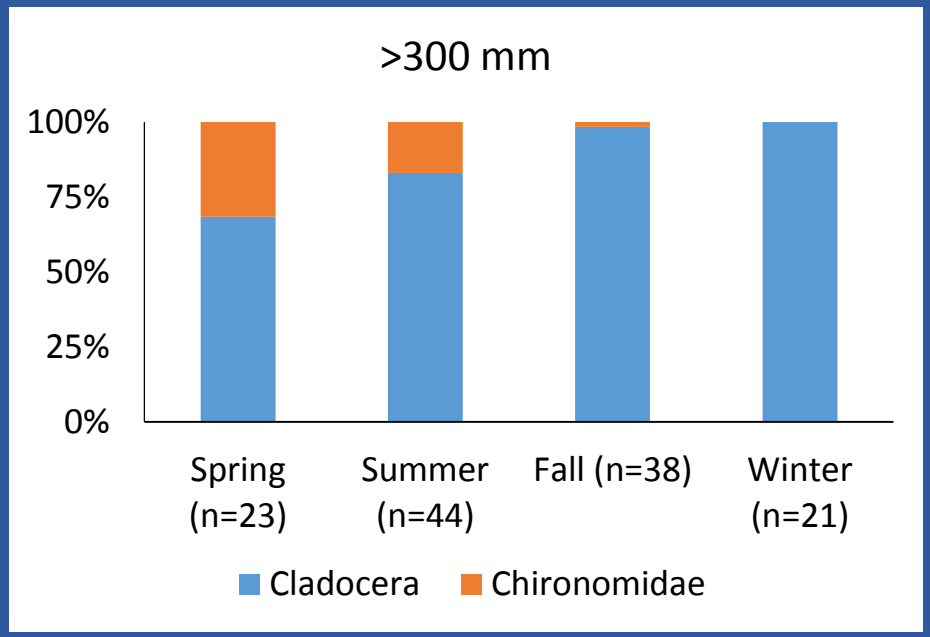
- Schoener's Diet Overlap Index (SDOI) to determine biologically significant overlap between
  - Kokanee/Rainbow Trout
  - Kokanee/Black Crappie
  - A value greater than 60 indicates significant biological overlap (Schoener 1970, Wallace 1981)

- Seasonal variation in Cladocera consumption
  - Rainbow Trout & kokanee
  - Difference between seasons & years tested using glm

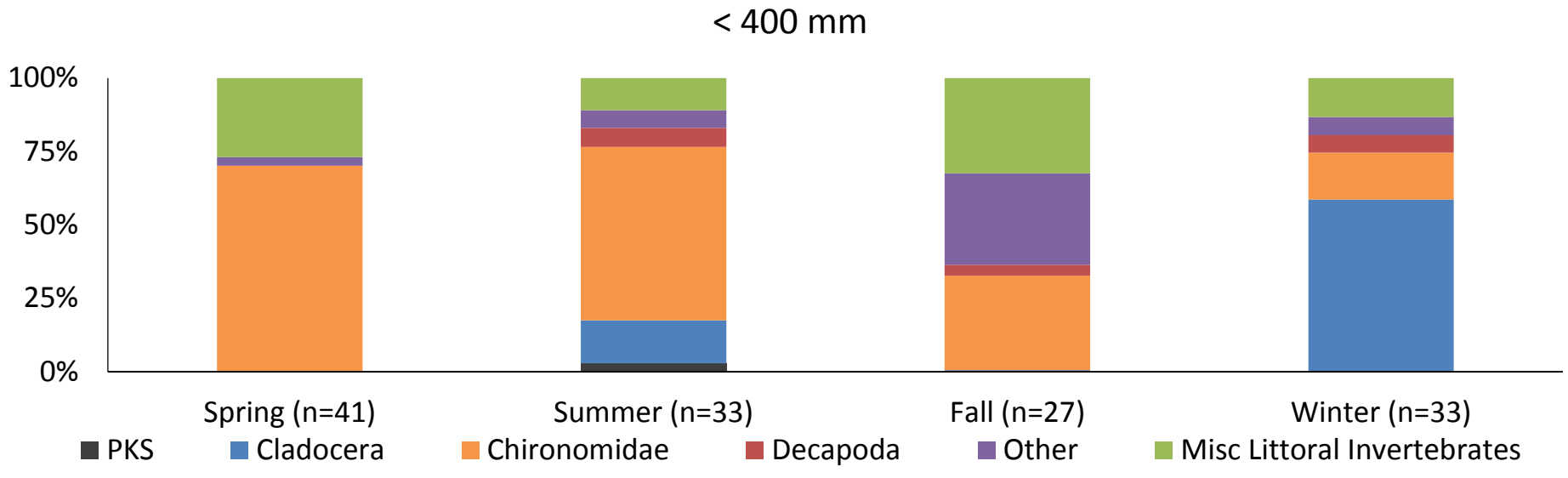
2014–2017 Kokanee SCA: % weight

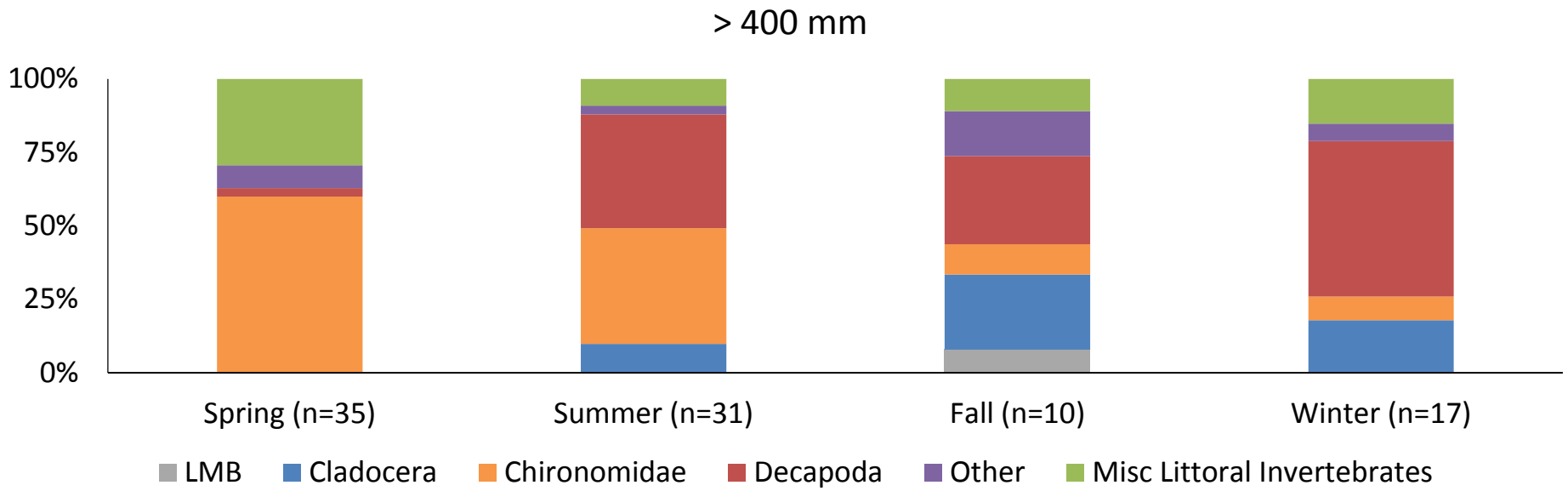




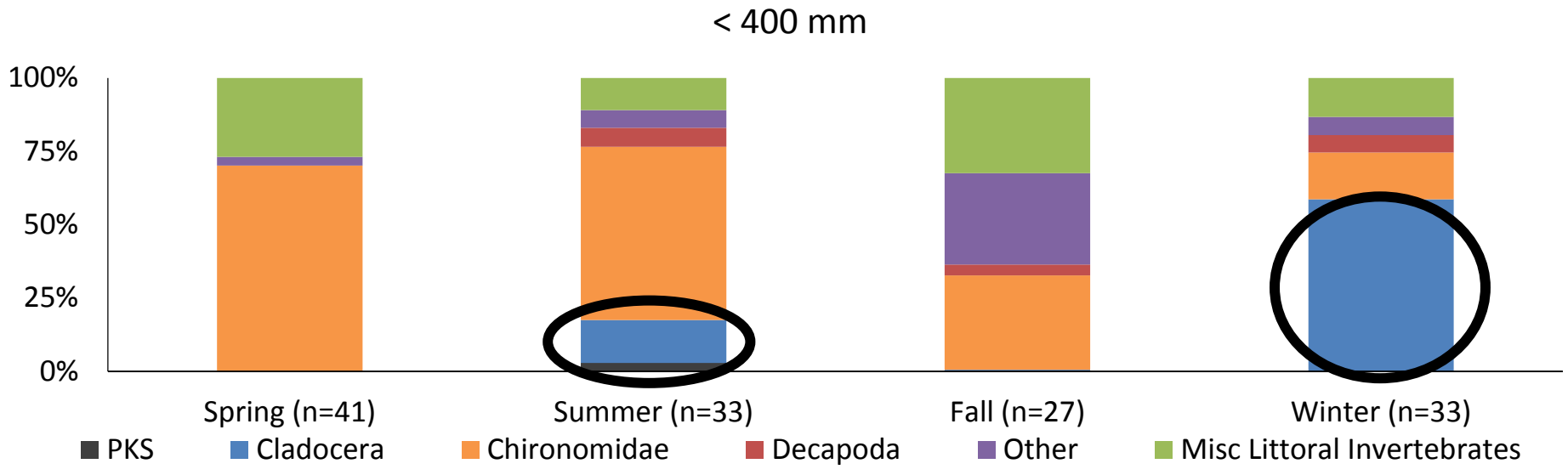


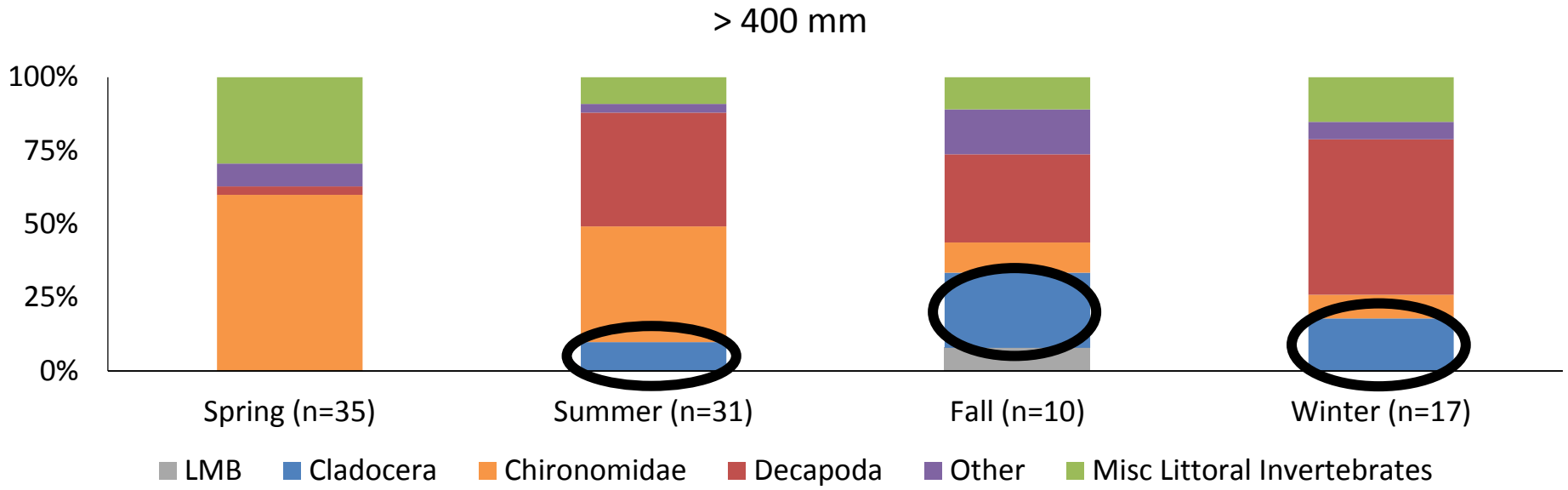
2014–2017 Rainbow Trout SCA: % weight



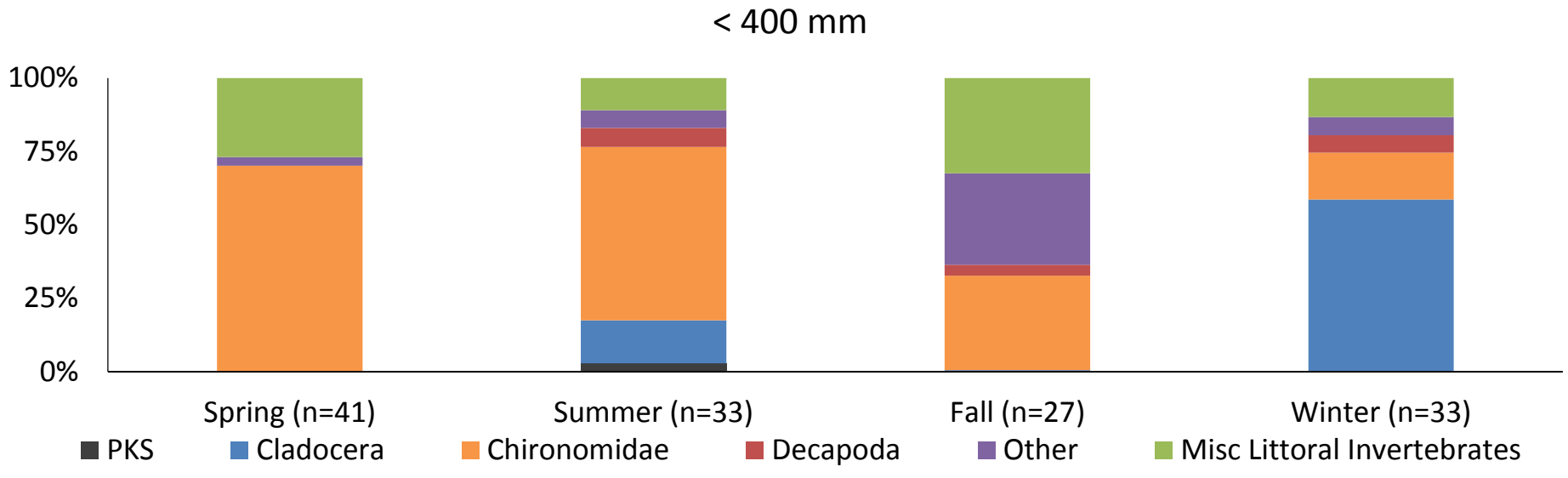


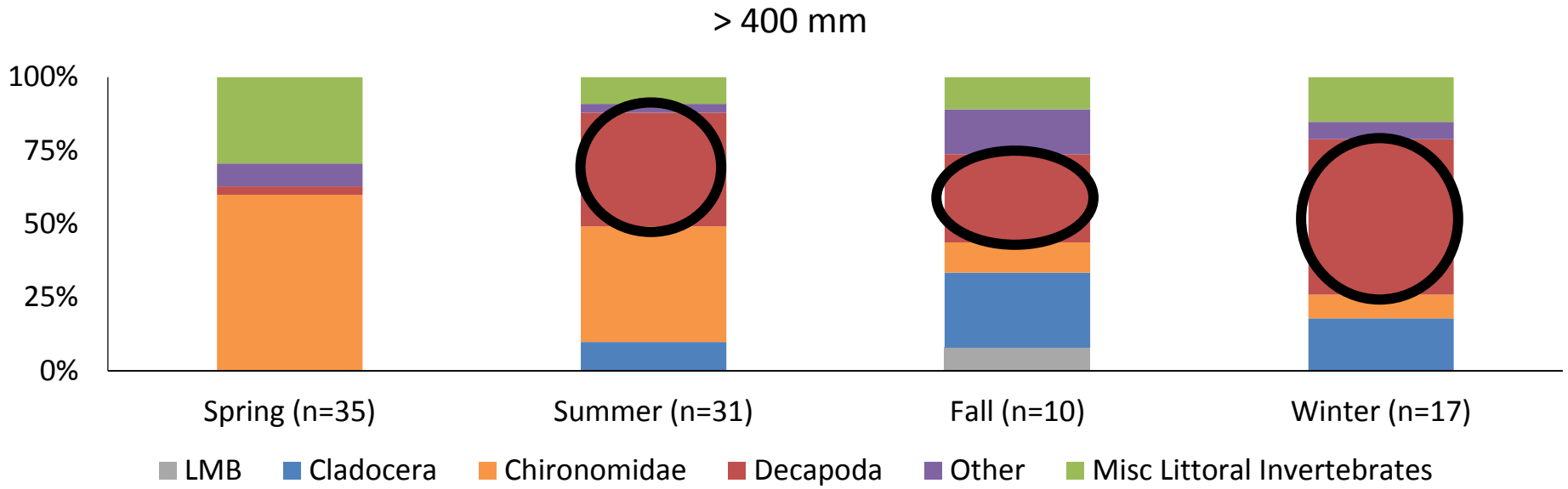
2014–2017 Rainbow Trout SCA: % weight



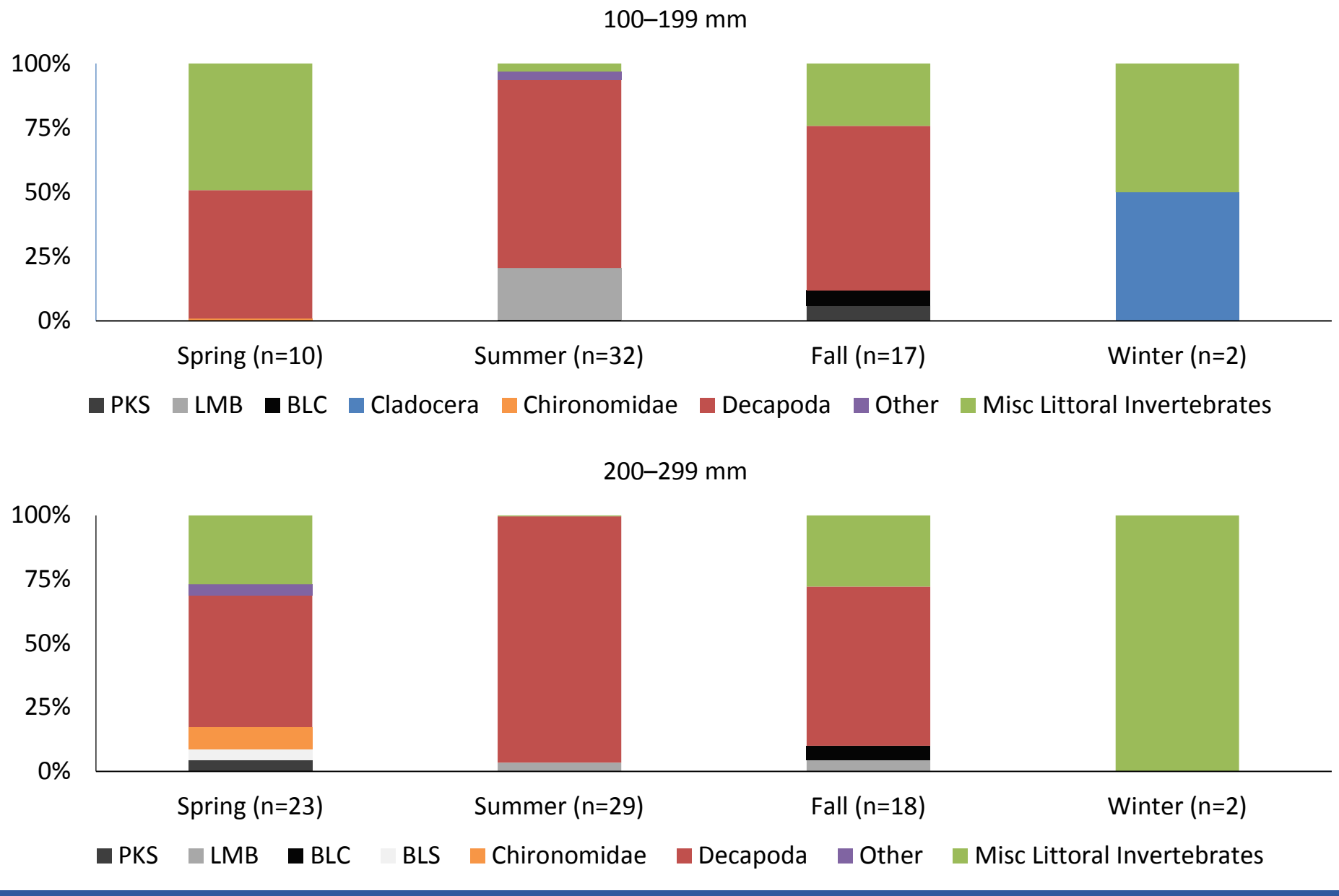


2014–2017 Rainbow Trout SCA: % weight

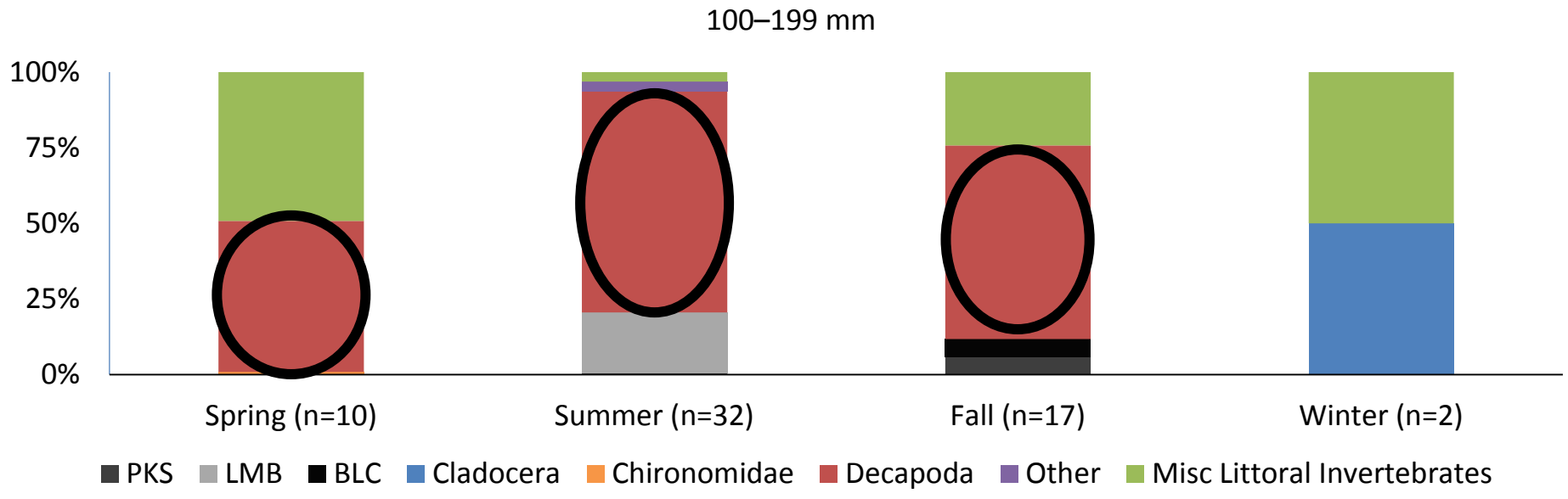


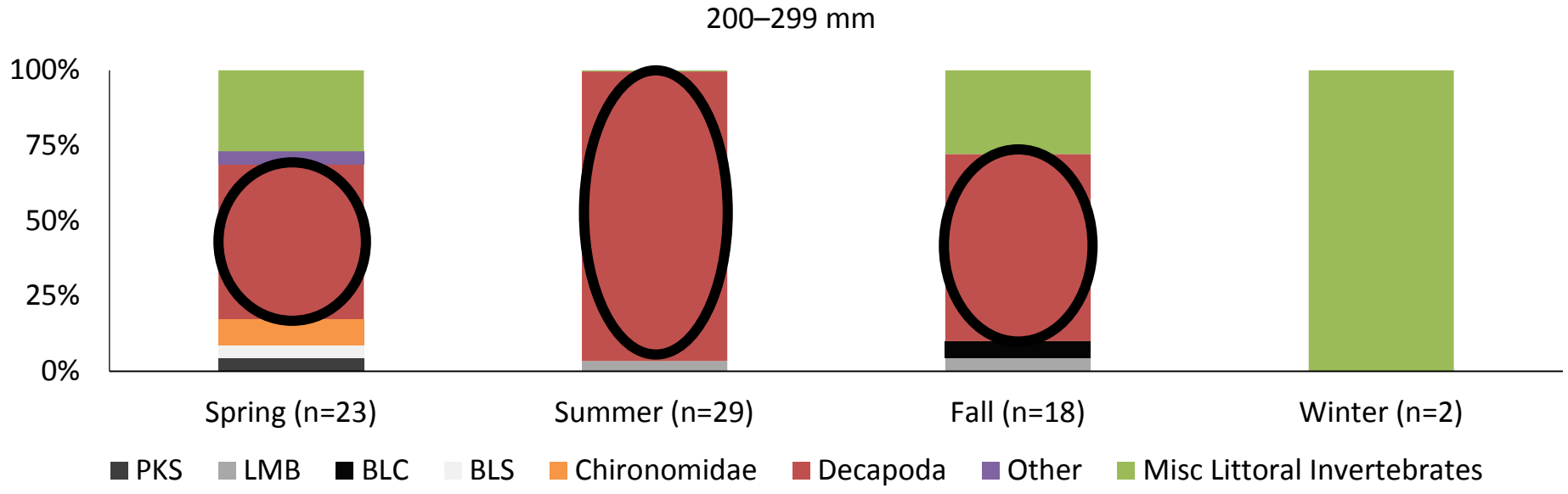


2014–2017 Largemouth Bass SCA: % weight

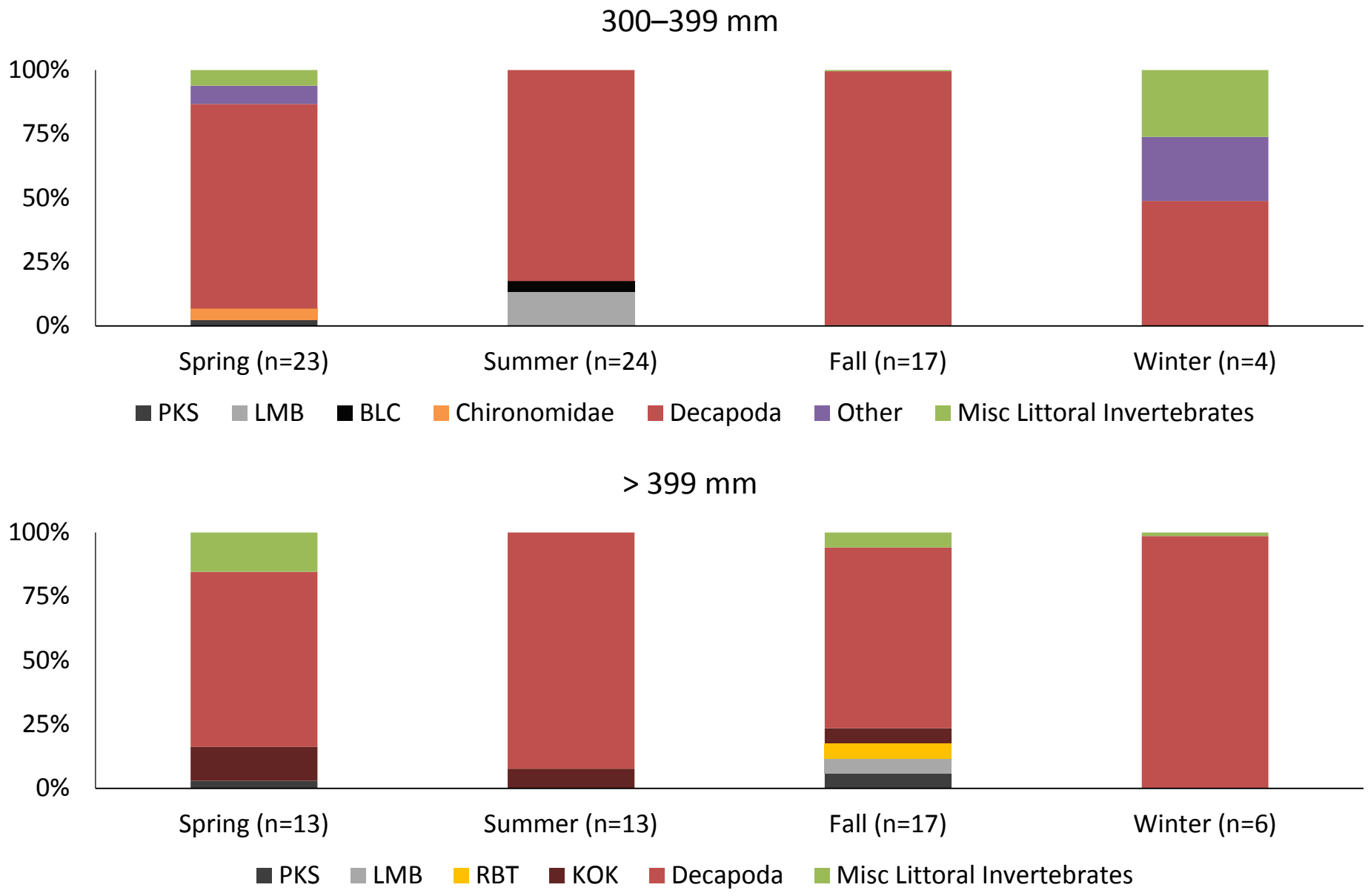


2014–2017 Largemouth Bass SCA: % weight

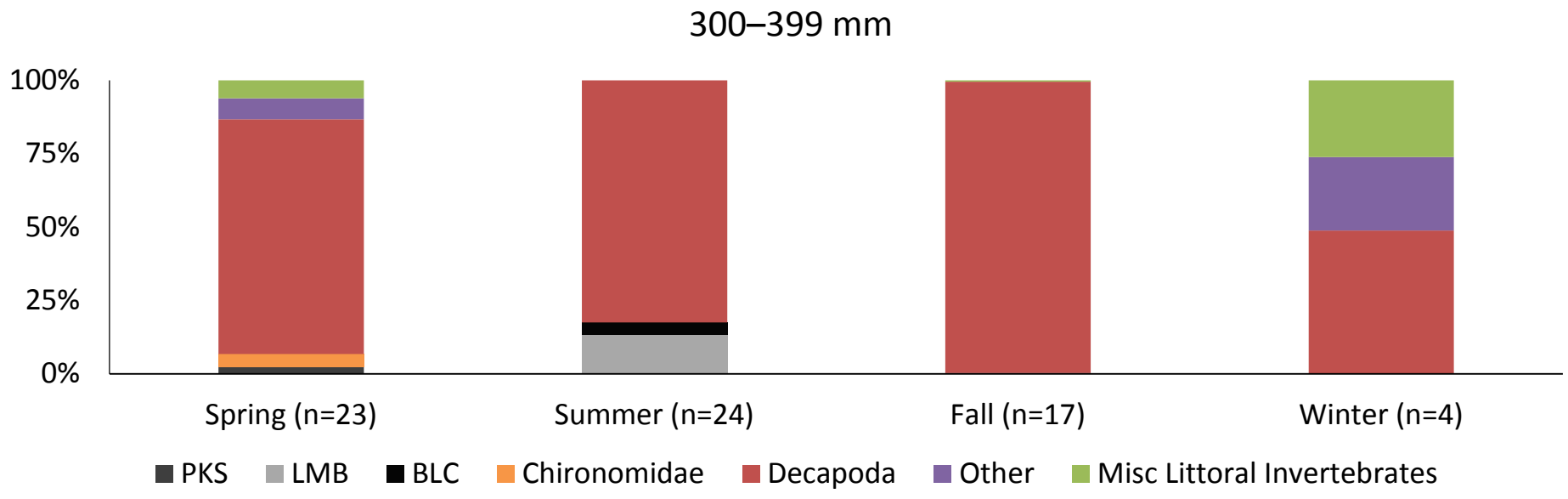


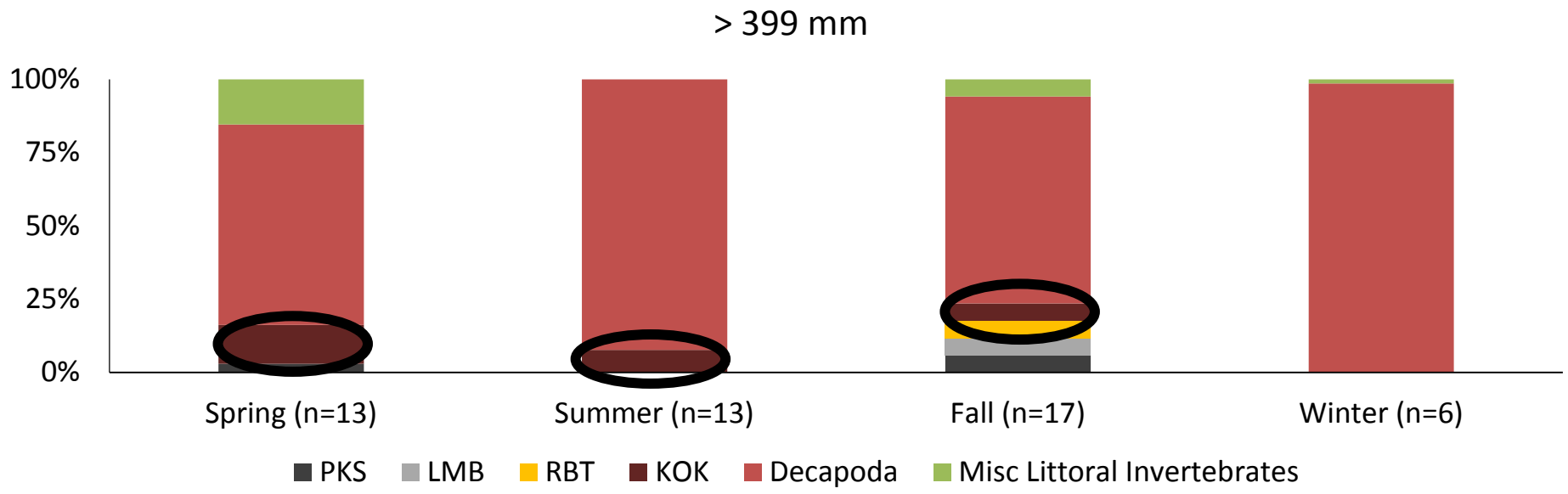


2014–2017 Largemouth Bass SCA: % weight

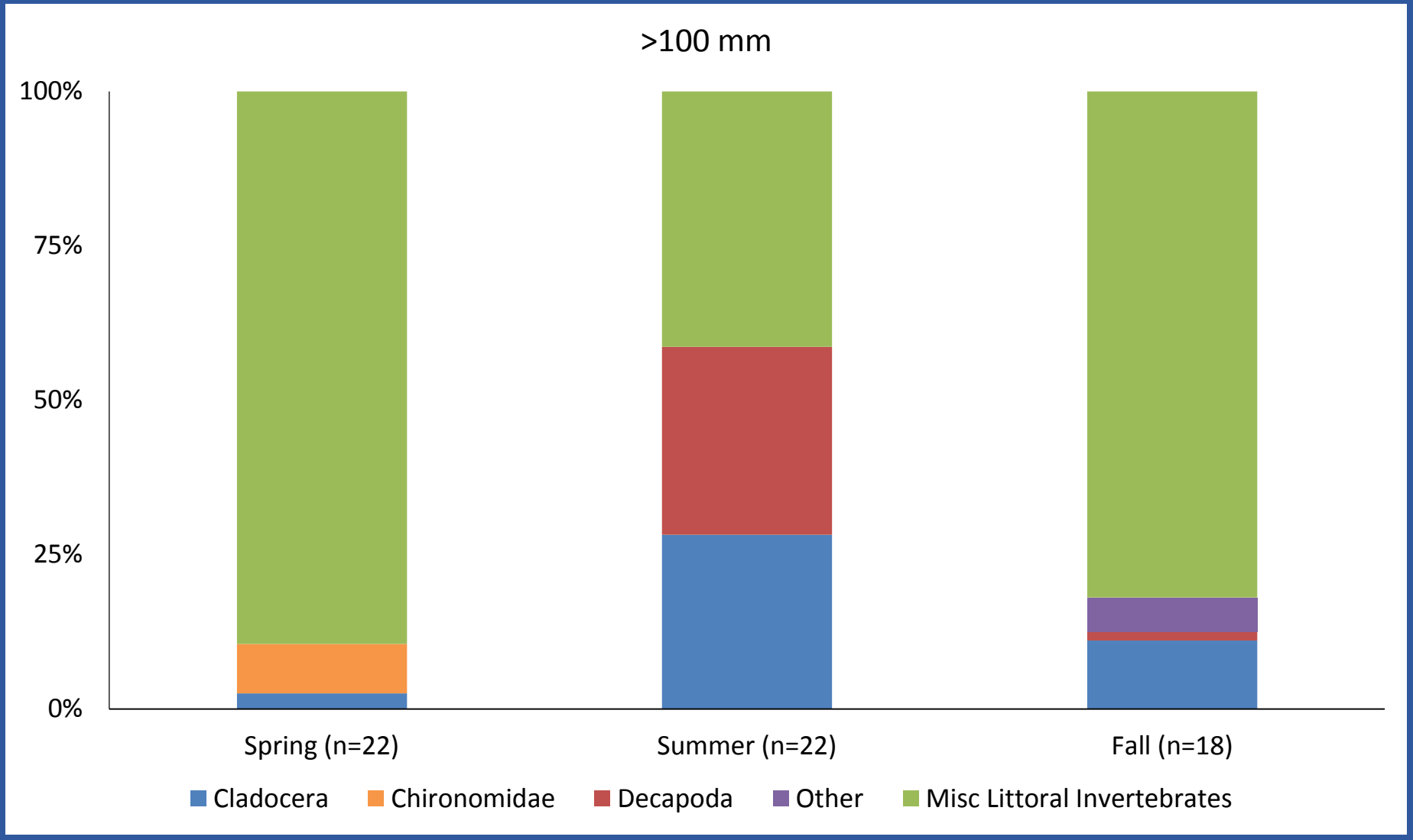


2014–2017 Largemouth Bass SCA: % weight

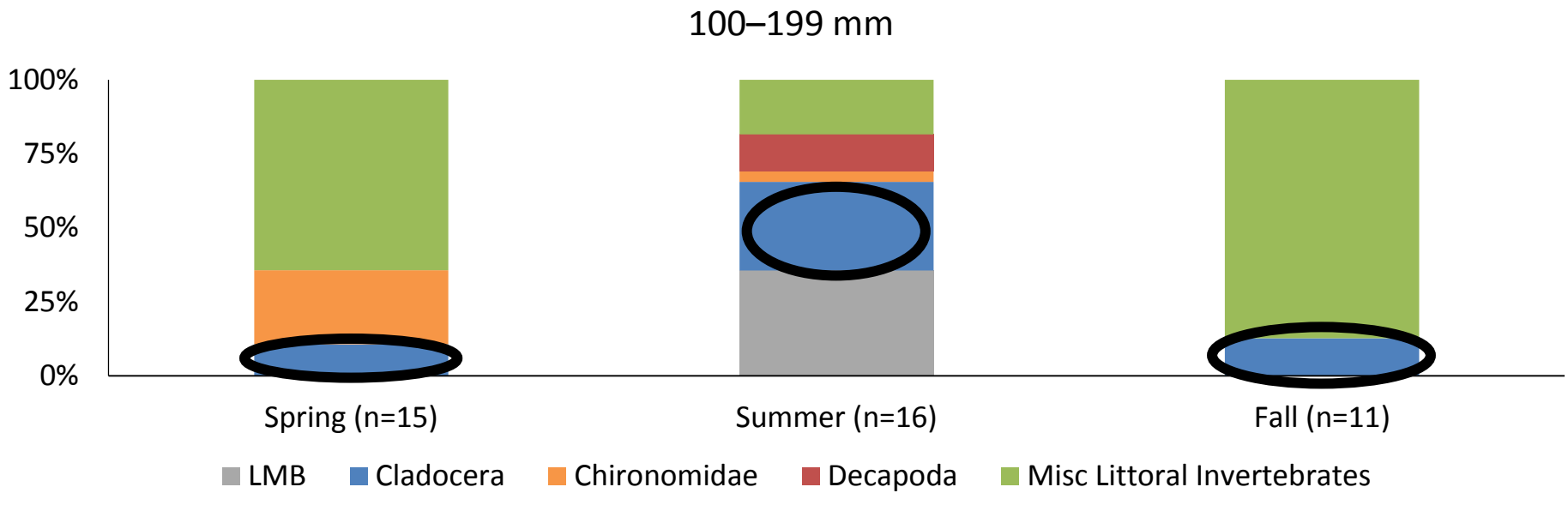


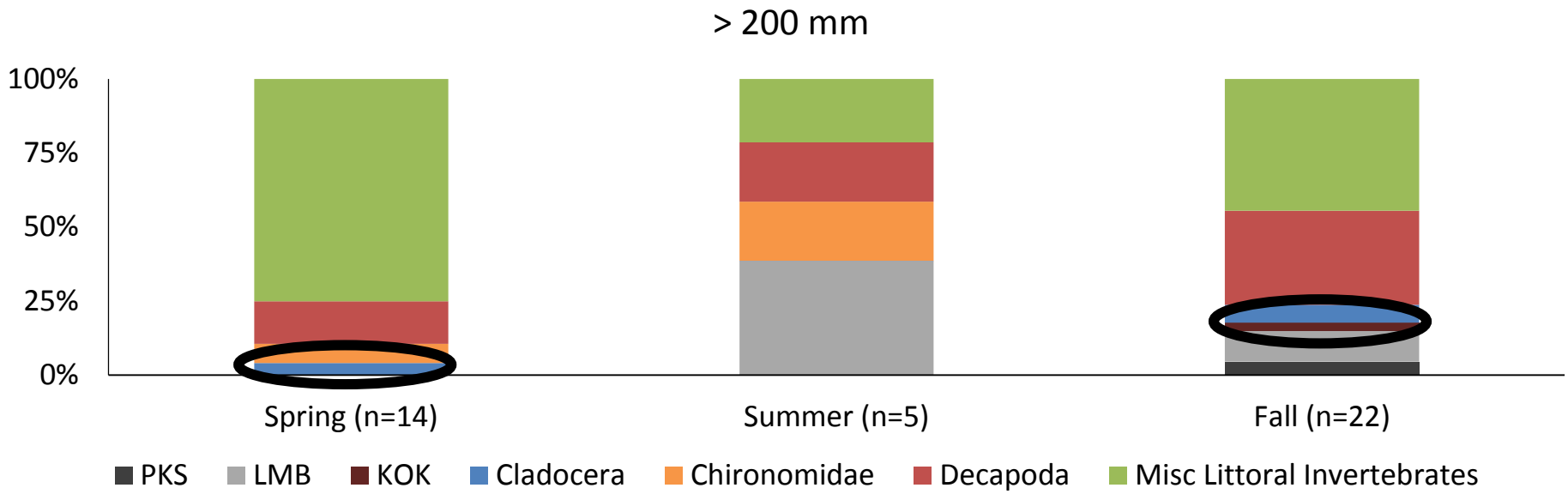


2014–2017 Pumpkinseed Sunfish SCA: % weight

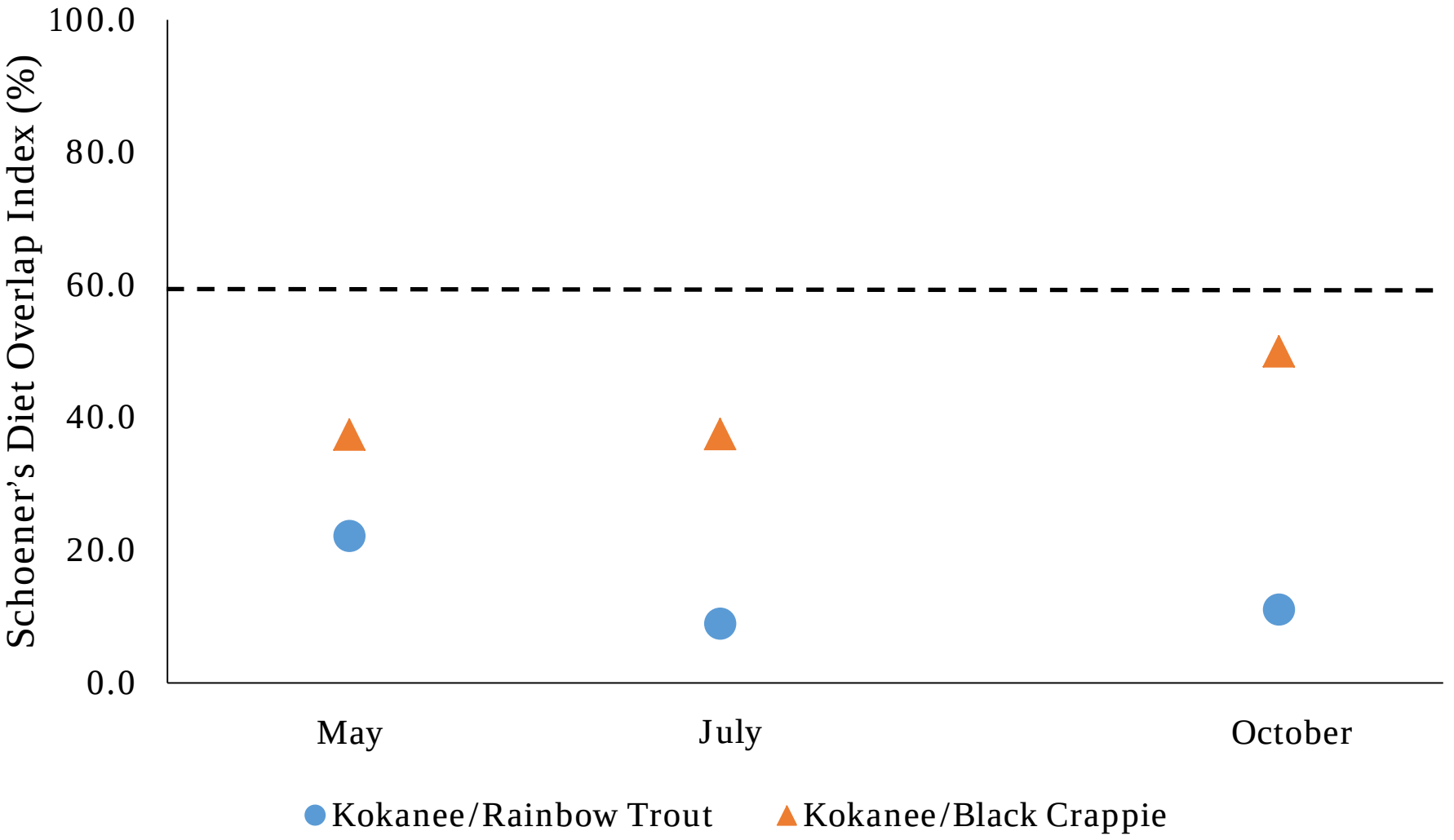


2014–2017 Black Crappie SCA: % weight

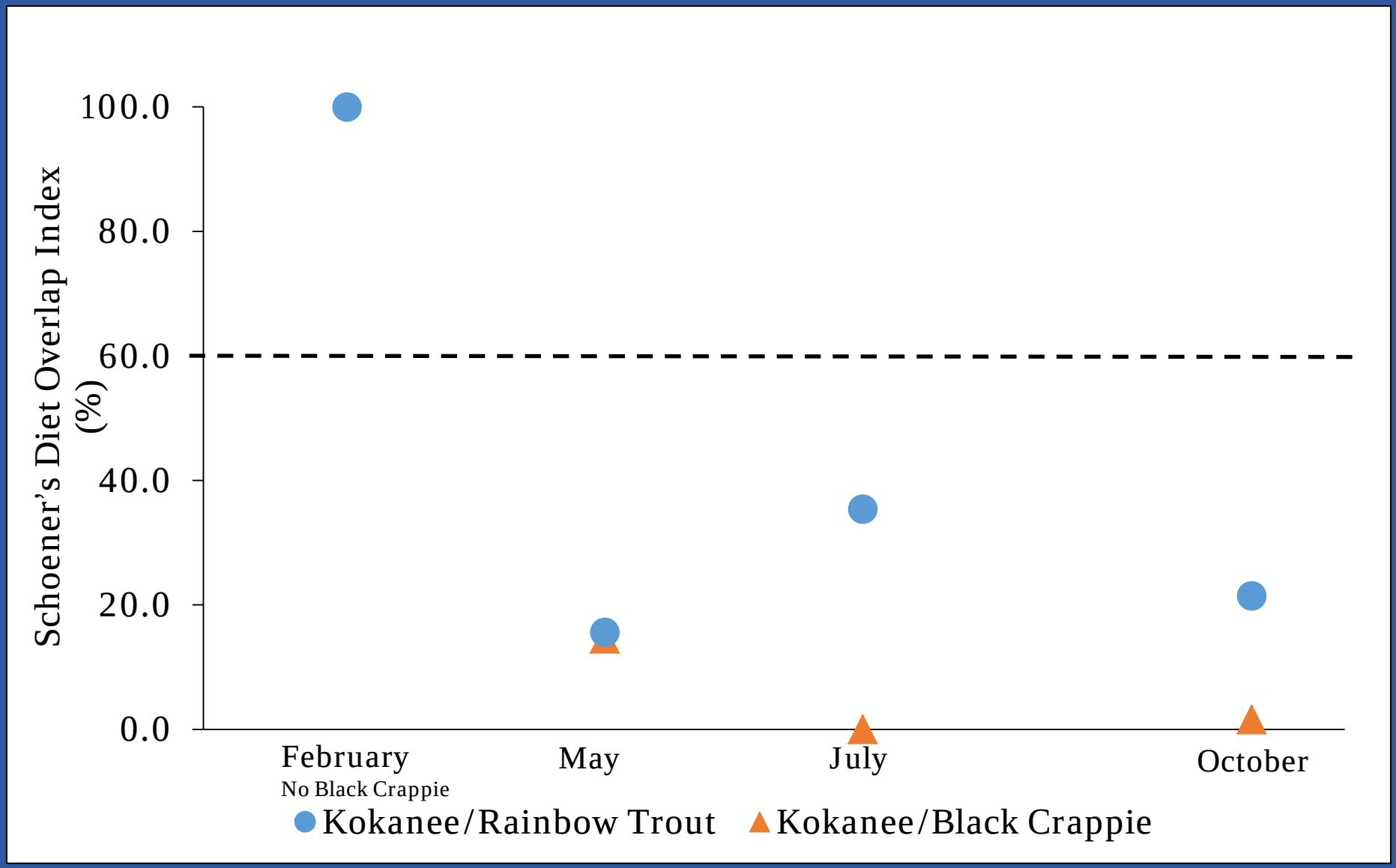




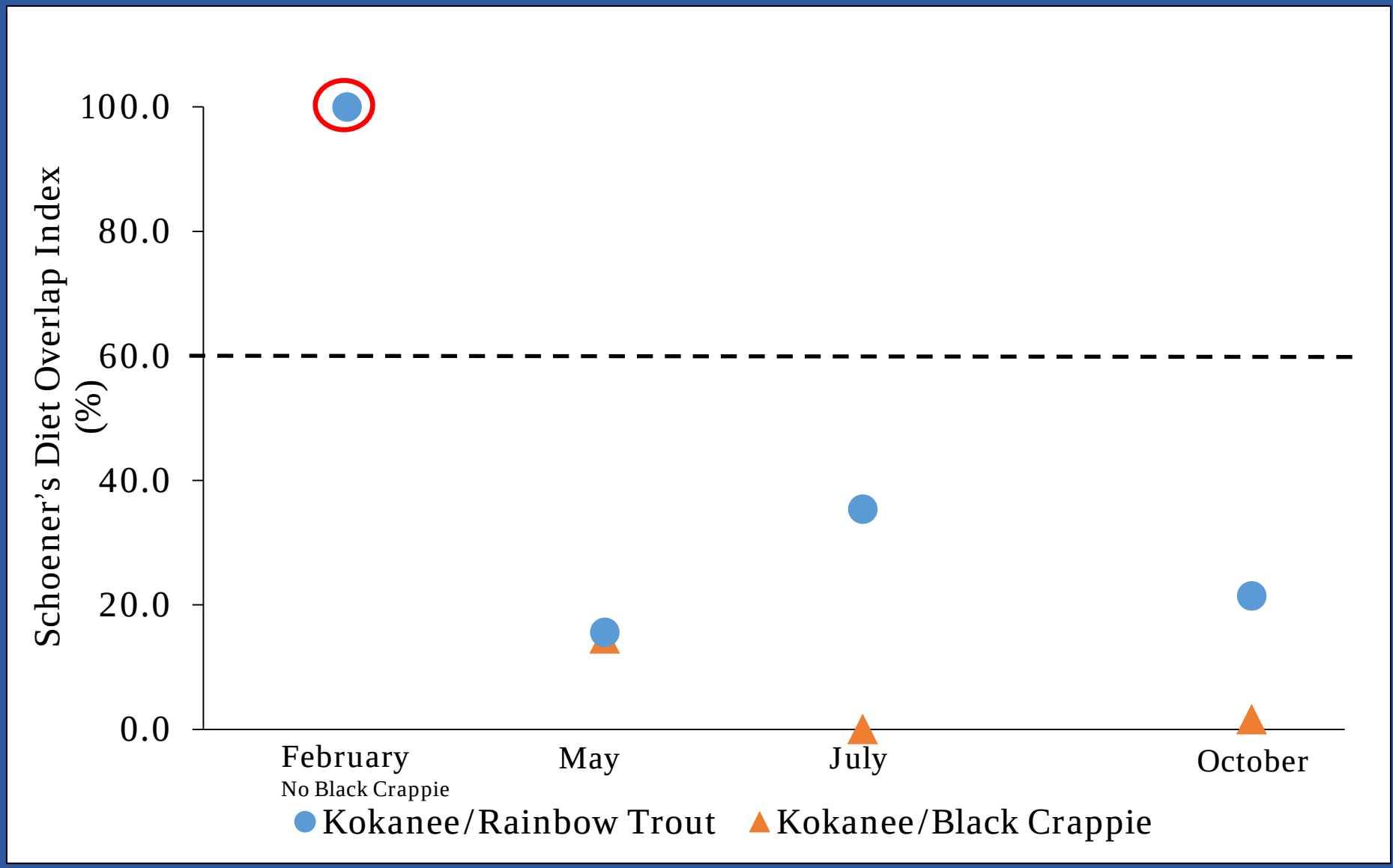
2014 SDOI


Schoener's Diet Overlap Index (%)
100.0
80.0
60.0
40.0
20.0
0.0
May
July
October
Kokanee/Rainbow Trout
Kokanee/Black Crappie

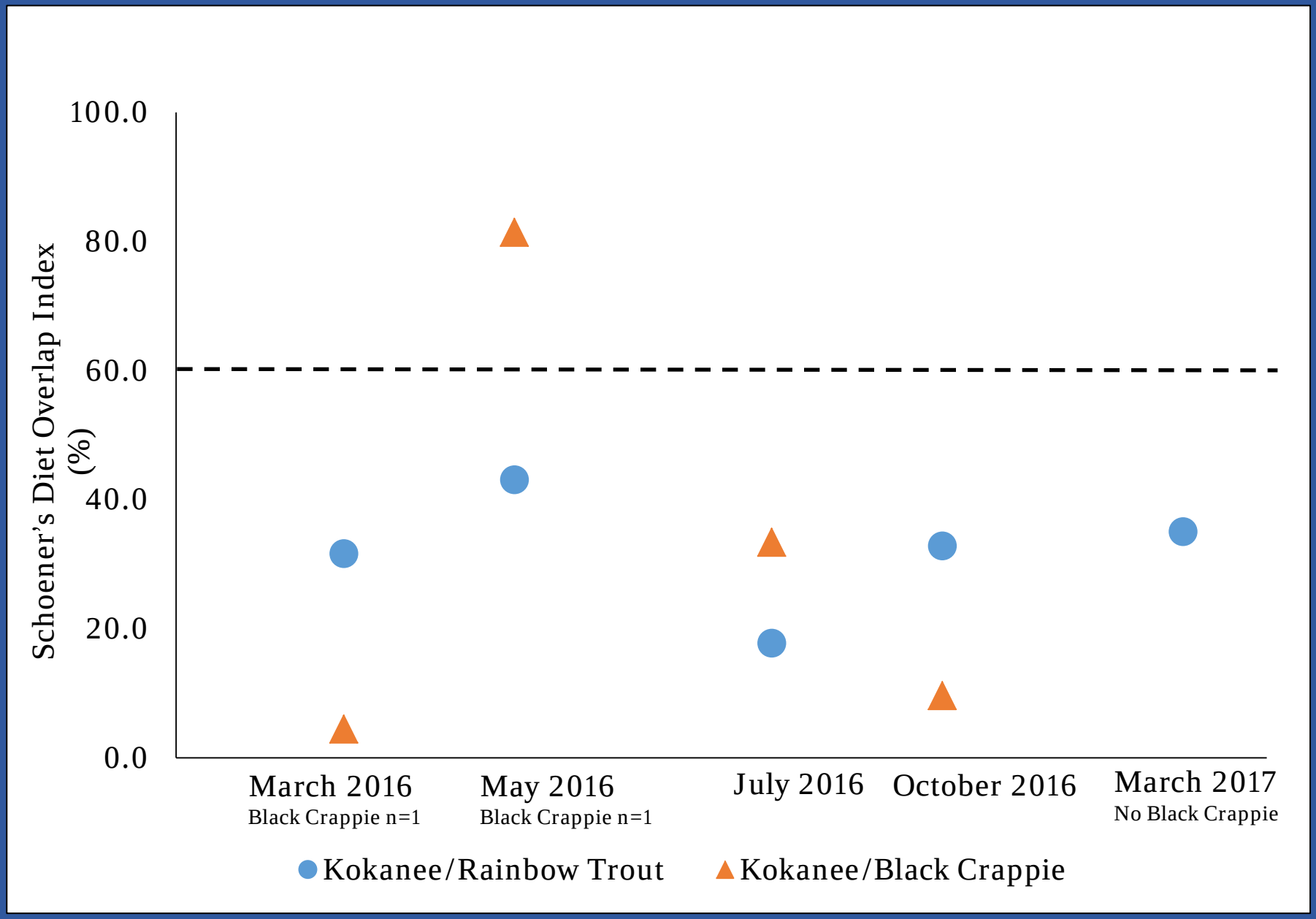
2015 SDOI


Schoener's Diet Overlap Index (%)
100.0
80.0
60.0
40.0
20.0
0.0
February
No Black Crappie
May
July
October
Kokanee/Rainbow Trout
Kokanee/Black Crappie

2015 SDOI

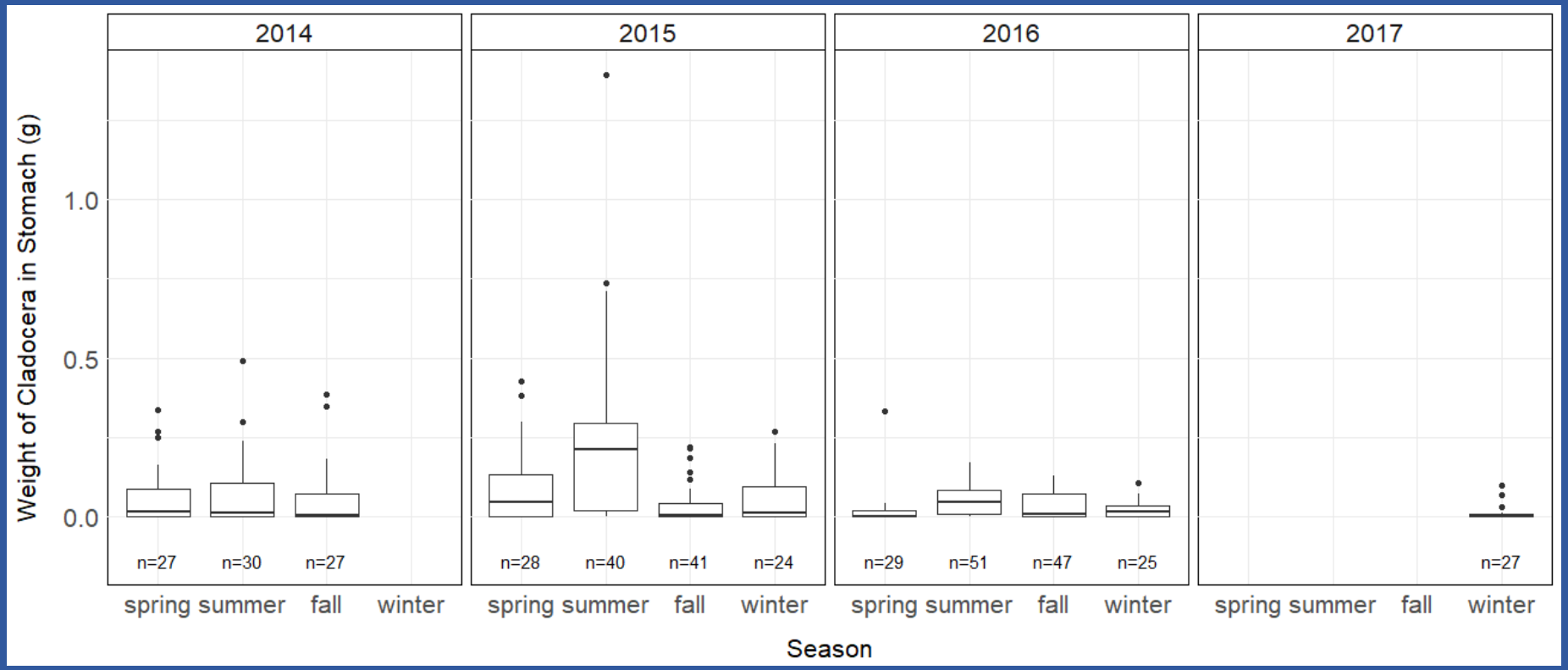

Schoener's Diet Overlap Index (%)
100.0
80.0
60.0
40.0
20.0
0.0
February
No Black Crappie
May
July
October
Kokanee/Rainbow Trout
Kokanee/Black Crappie

2016 & 2017 SDOI



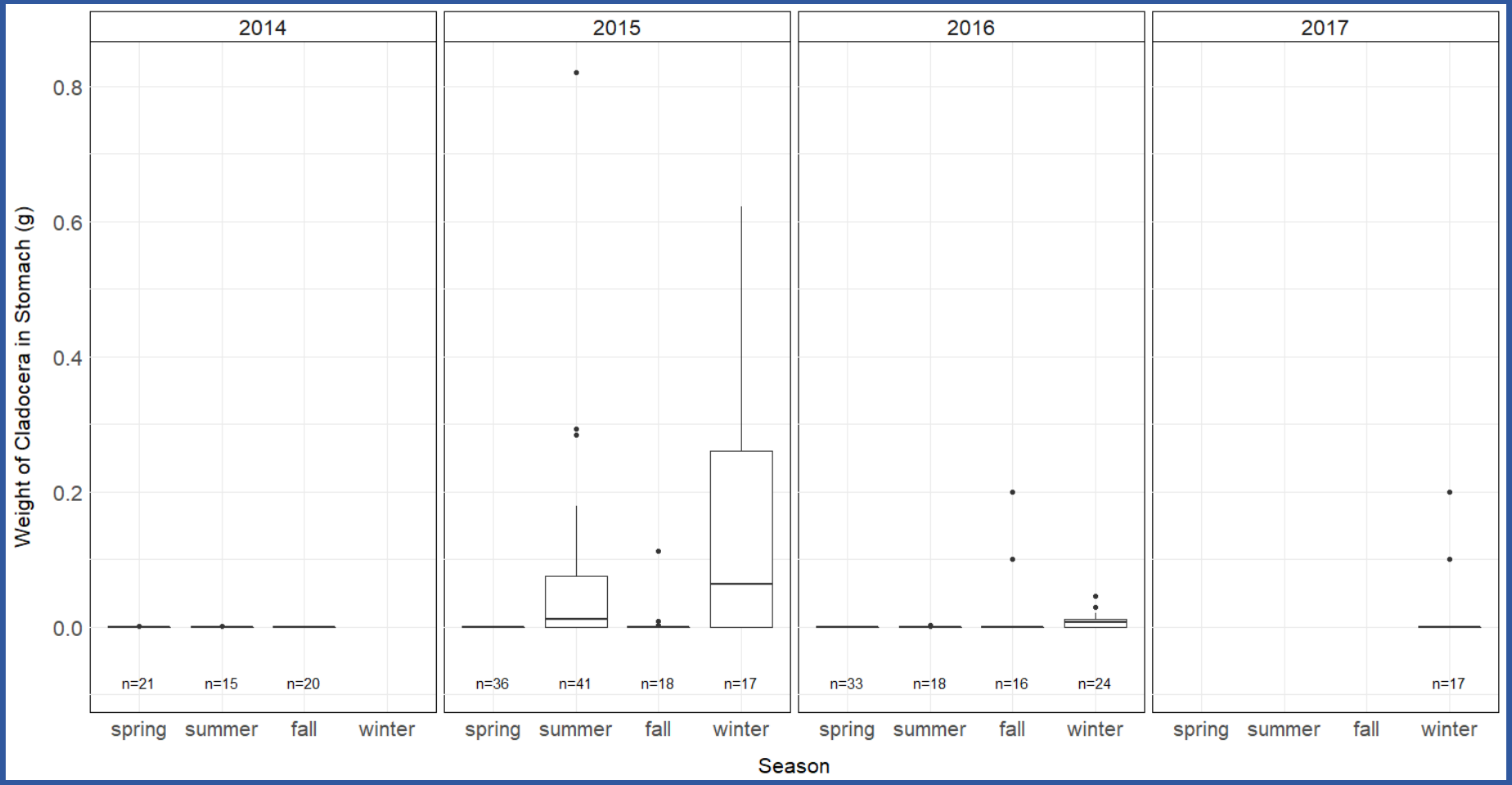
Kokanee Cladocera consumption

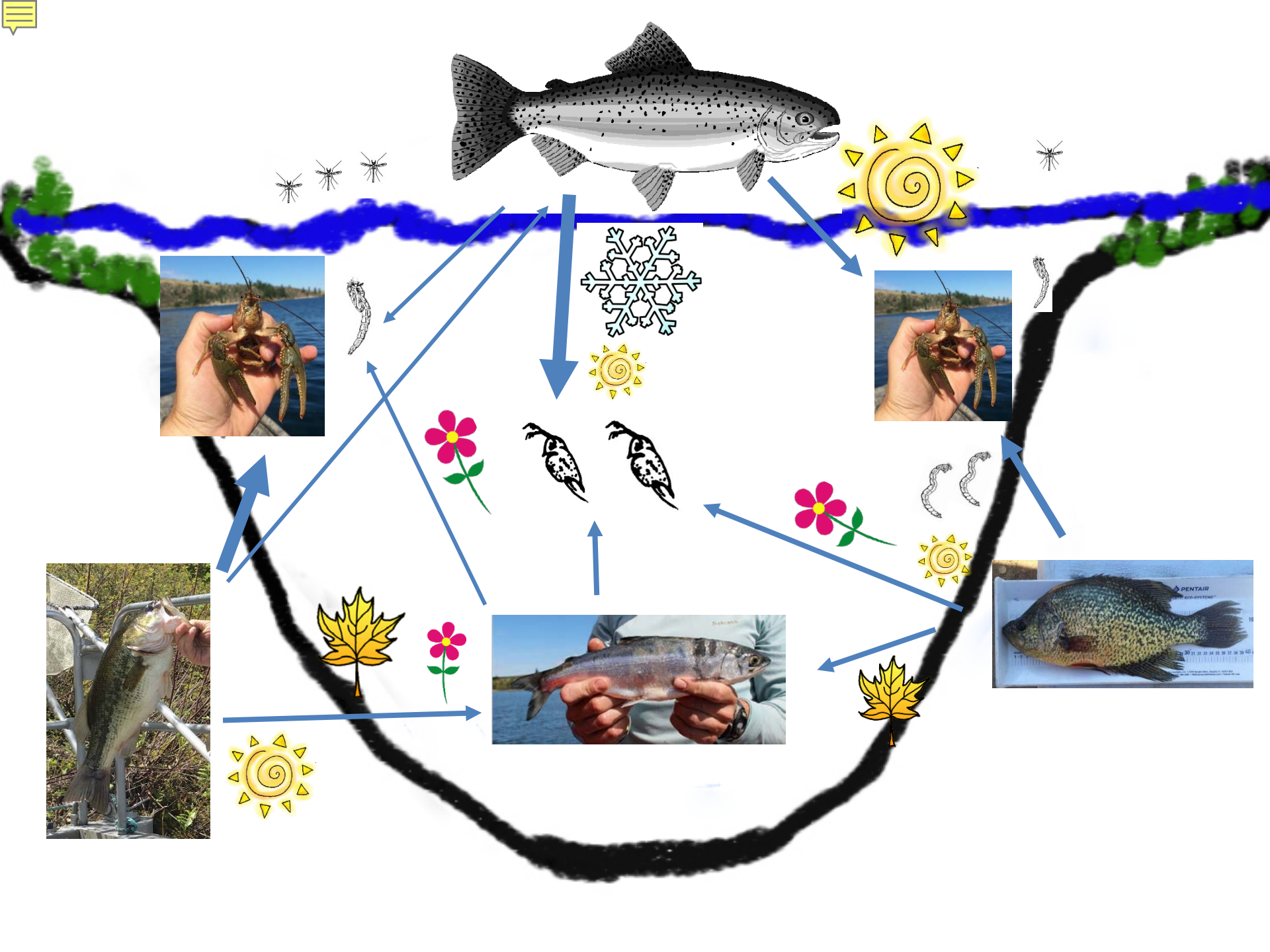
Significant summer 2015 ($p < 0.001$)



Rainbow Trout Cladocera consumption

Significant, summer (P=0.035) & winter (P<0.001) 2015



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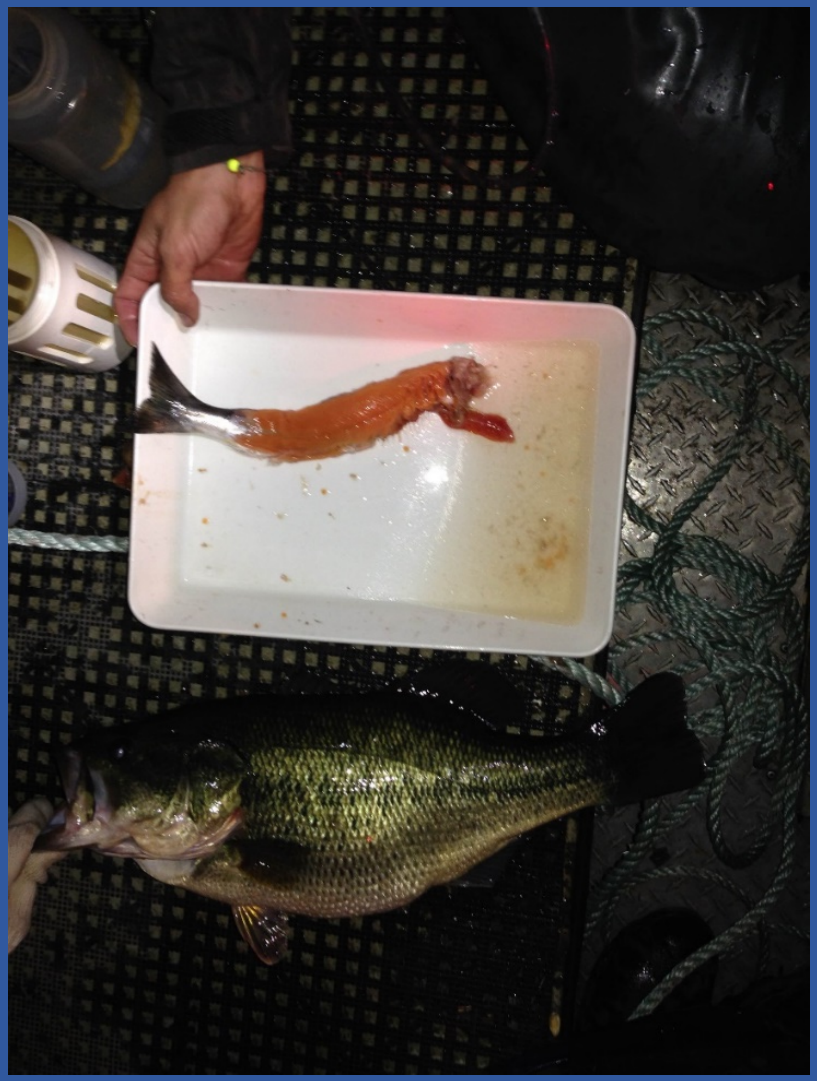
Moving Forward: Bioenergetics

- Bioenergetics modeling for consumption of:
  - Zooplankton by Kokanee
  - Zooplankton by Rainbow Trout
  - Kokanee by bass
- Use Consumption to aid in determining competition

Quantify Predator-Prey Relationships

- Prey biomass
  - Crayfish & Zooplankton
- Zooplankton consumption
  - Determine surplus zooplankton
    - Simulate Rainbow trout stocking strategies
- Kokanee Predation
  - Connect Kokanee consumption with Largemouth Bass and Kokanee populations to determine predation threat
  - Harvest bass to limit predation



Thank you & Questions

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