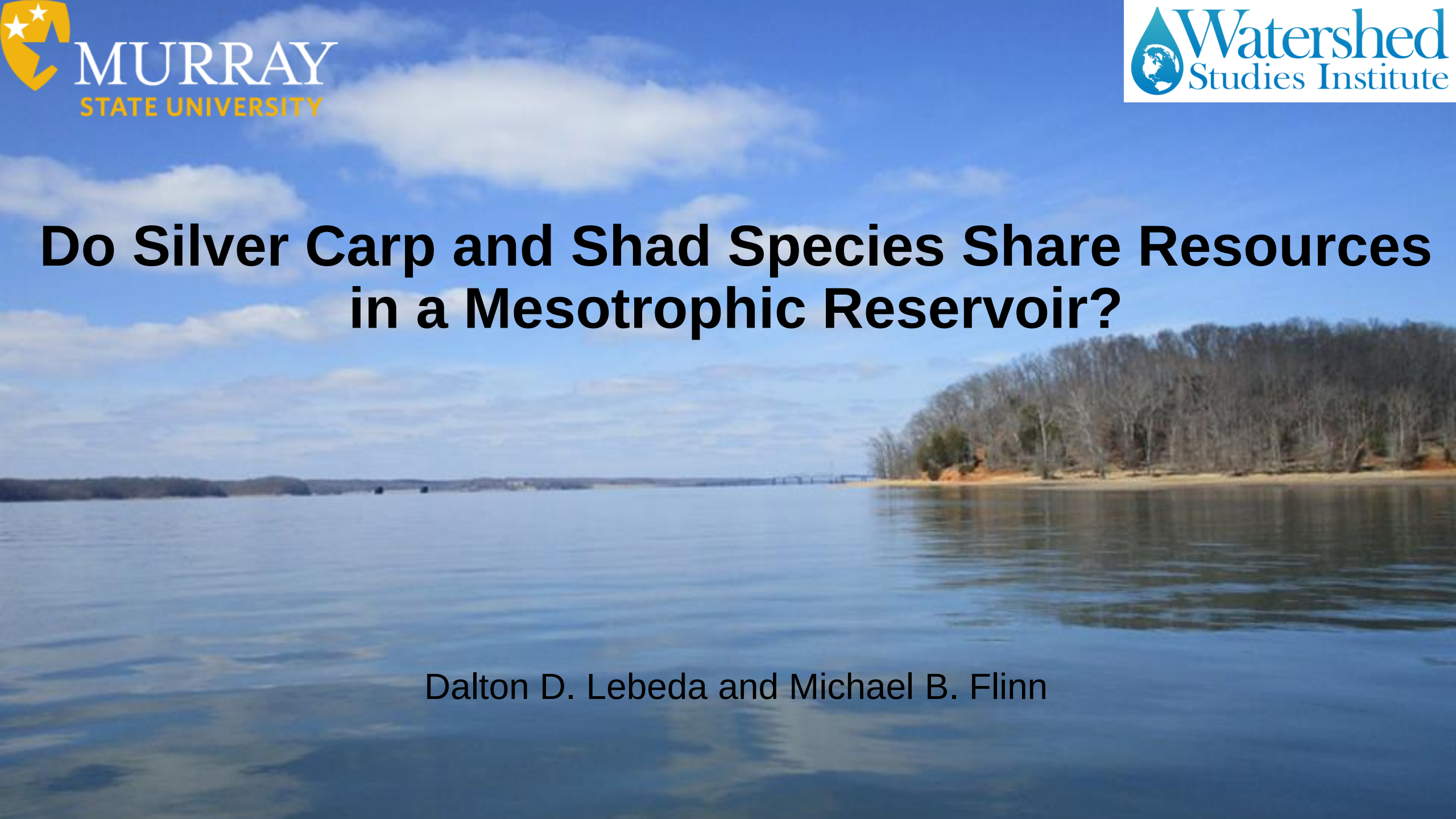
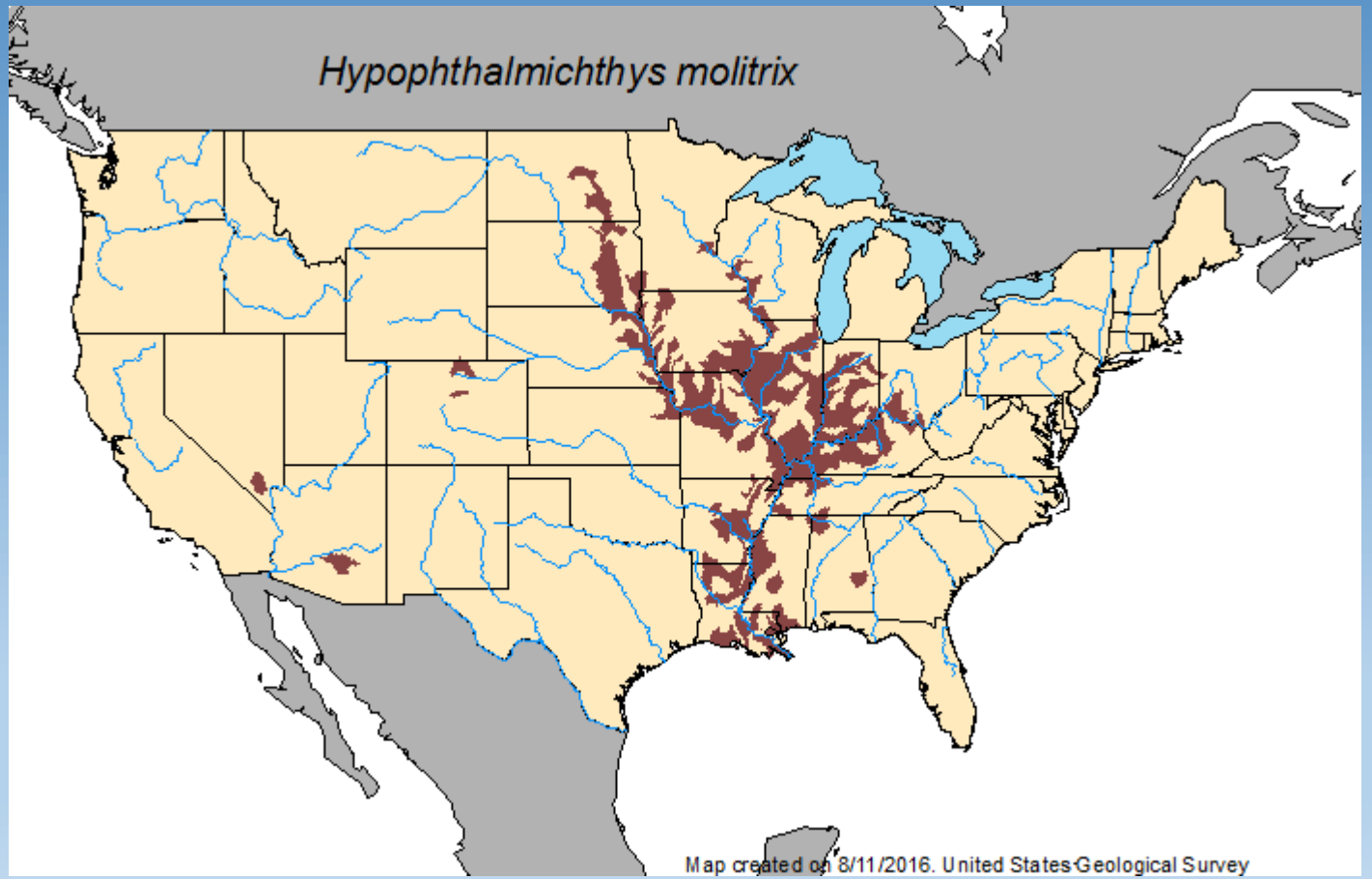


Do Silver Carp and Shad Species Share Resources in a Mesotrophic Reservoir?

Dalton D. Lebeda and Michael B. Flinn

Background

- Invasive planktivorous fish species
- Introduced in 1971 for biofiltration and aquaculture (Cremer and Smitherman, 1980)
- Distributed throughout the Mississippi River Basin (Kolar et al. 2005)

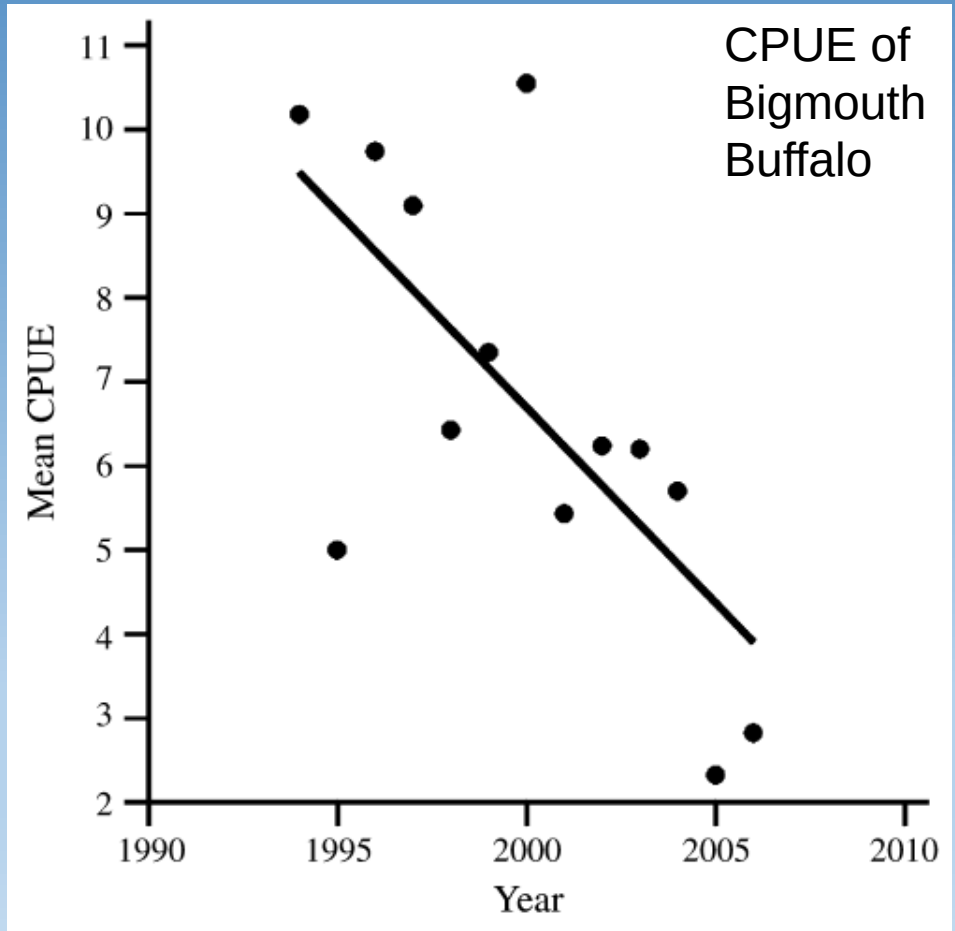


nas.er.usgs.gov

Interactions in the Illinois River

- Reduced body condition of native planktivores (Irons et al. 2007)
  - Bigmouth Buffalo *(Ictiobus cyprinellus)*
  - Gizzard Shad *(Dorosoma cepedianum)*

- Gut content overlap with native planktivores (Sampson et al. 2009)



Irons et al. 2007

Silver Carp in Kentucky Lake

- Kentucky Lake is the largest reservoir east of Mississippi River
- First reported in Kentucky Lake in 2004 (USGS 2015)
- What do we know about Silver Carp in Kentucky Lake?
  - Feed on plankton
  - Successful reproduction

Dorosoma cepedianum

tpwd.texas.gov

Dorosoma petenense

www.arkansasstripers.com

Hypophthalmichthys molitrix

www.miseagrant.umich.edu

Research Goals

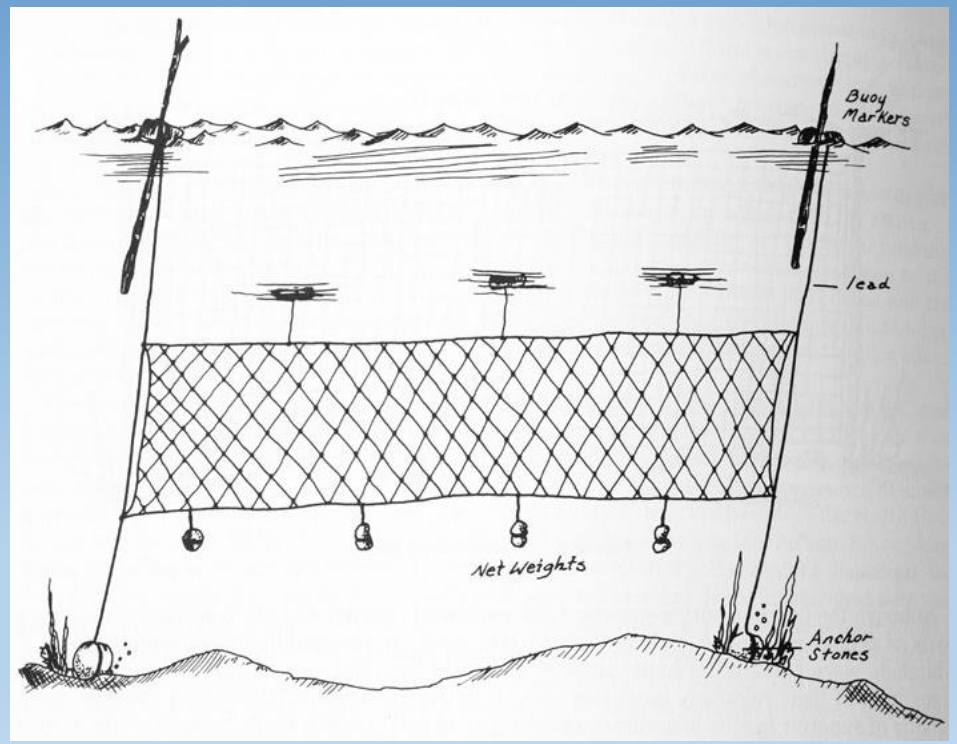
1. Potential for competition between Silver Carp and shad species

2. Life stages affect the potential for competition
   - Juvenile vs Adult
   - Determined by age (<1 = juvenile)

3. Seasonal differences affect the potential for competition
   - Spring (March, April, May)
   - Summer (June, July, August)

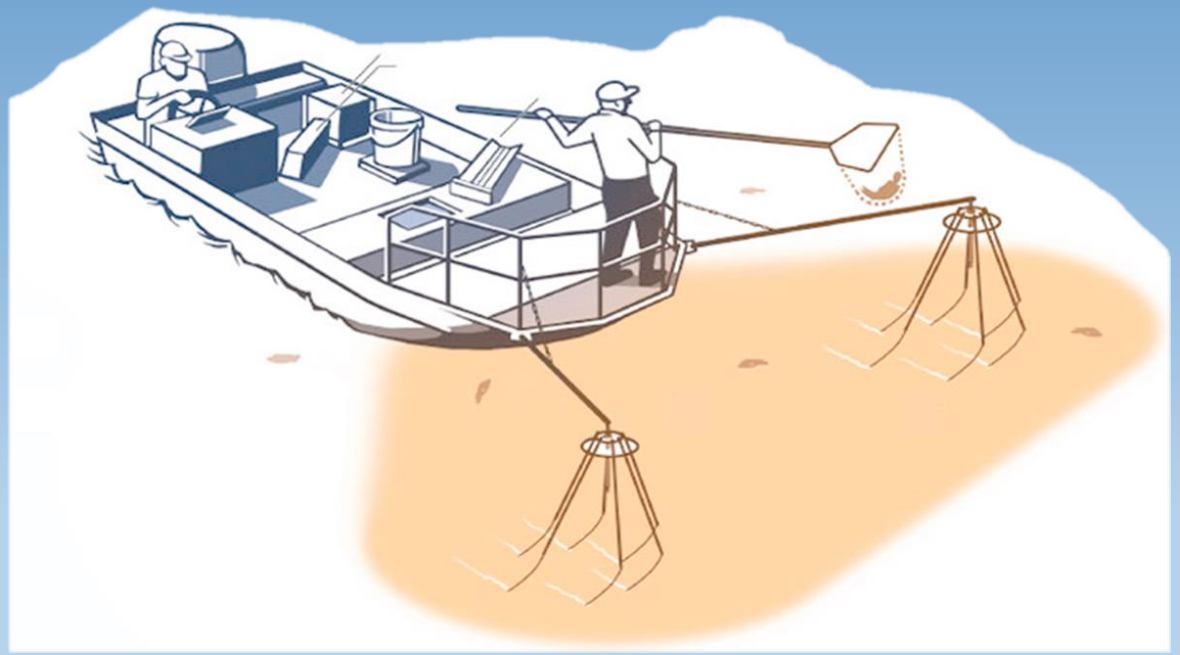
Methods: Sampling

Gill Netting



publications.newberry.org

Boat Electrofishing



Virginia Department of Game and Inland Fisheries

Methods: Sample Processing

- Measured length, weight, and extracted aging structures and tissue samples from fish
- Tissue samples were dried at 50˚C
- Tissue samples analyzed at Southern Illinois University-Carbondale

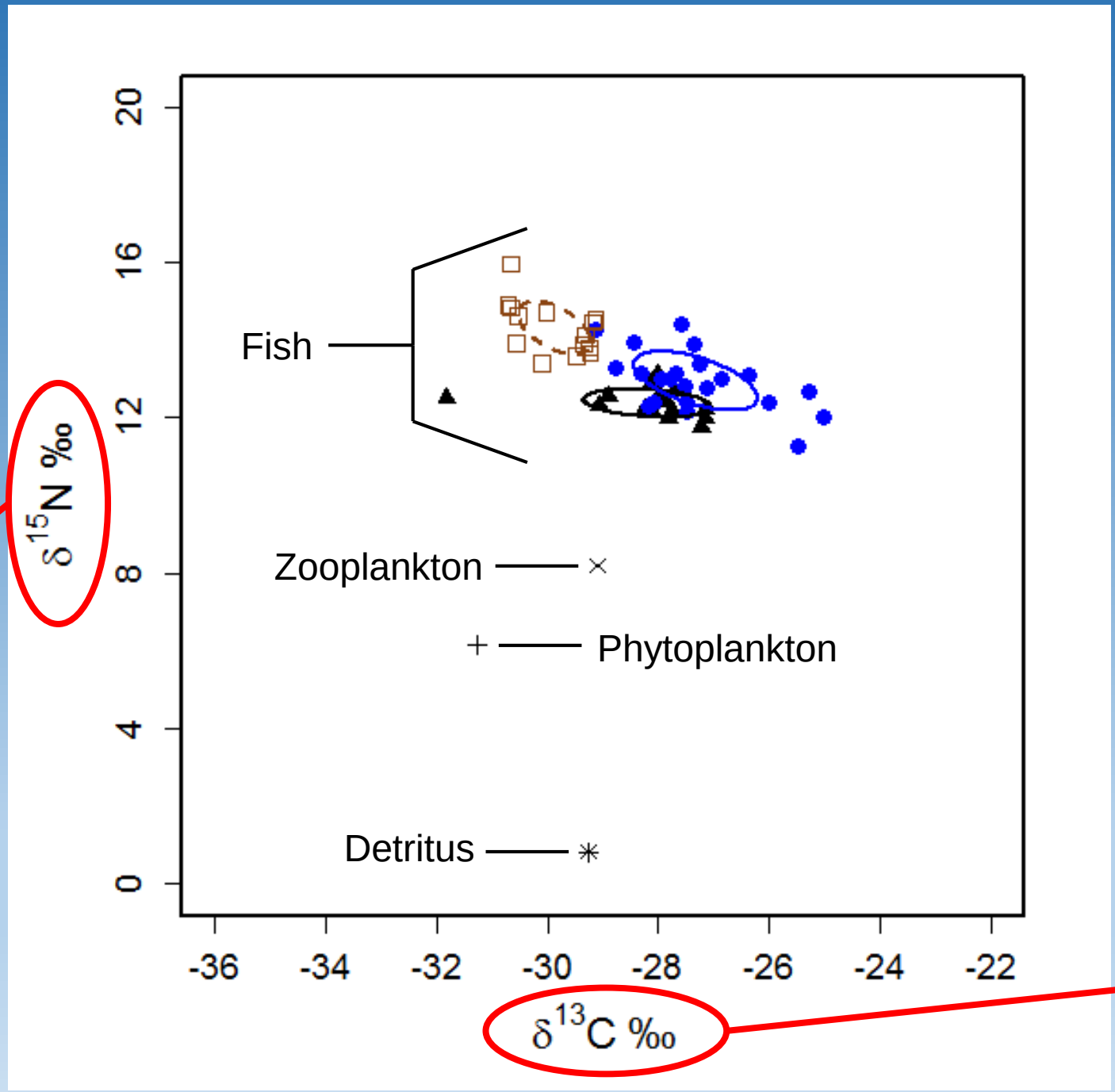
Photo Credit: Allison Lebeda

Analysis

- Analyzed stable isotope samples for carbon ($\delta^{13}C$) and nitrogen ($\delta^{15}N$) ratios

- Plot core isotopic niche ellipses (40% of data) (Jackson et al. 2011)
  - Controls for small sample size (≥ 10)
  - Stable Isotope Bayesian Ellipses in R (SIBER)

- Isotopic niche is tightly correlated with trophic niche
  - Allows an estimate of shared resource use



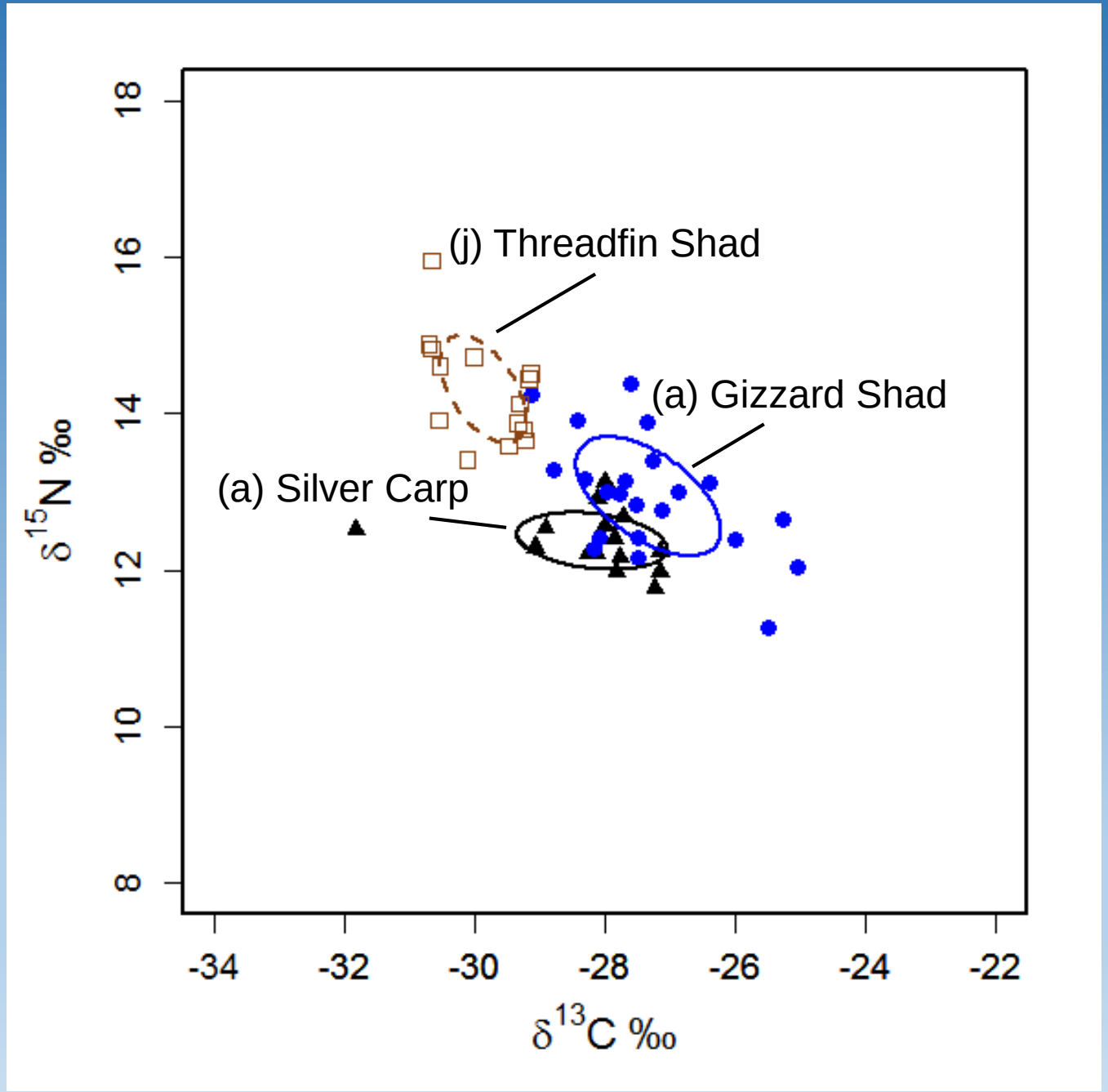
Determine trophic position

Range of resource use (phytoplankton, detritus, etc.)

Spring

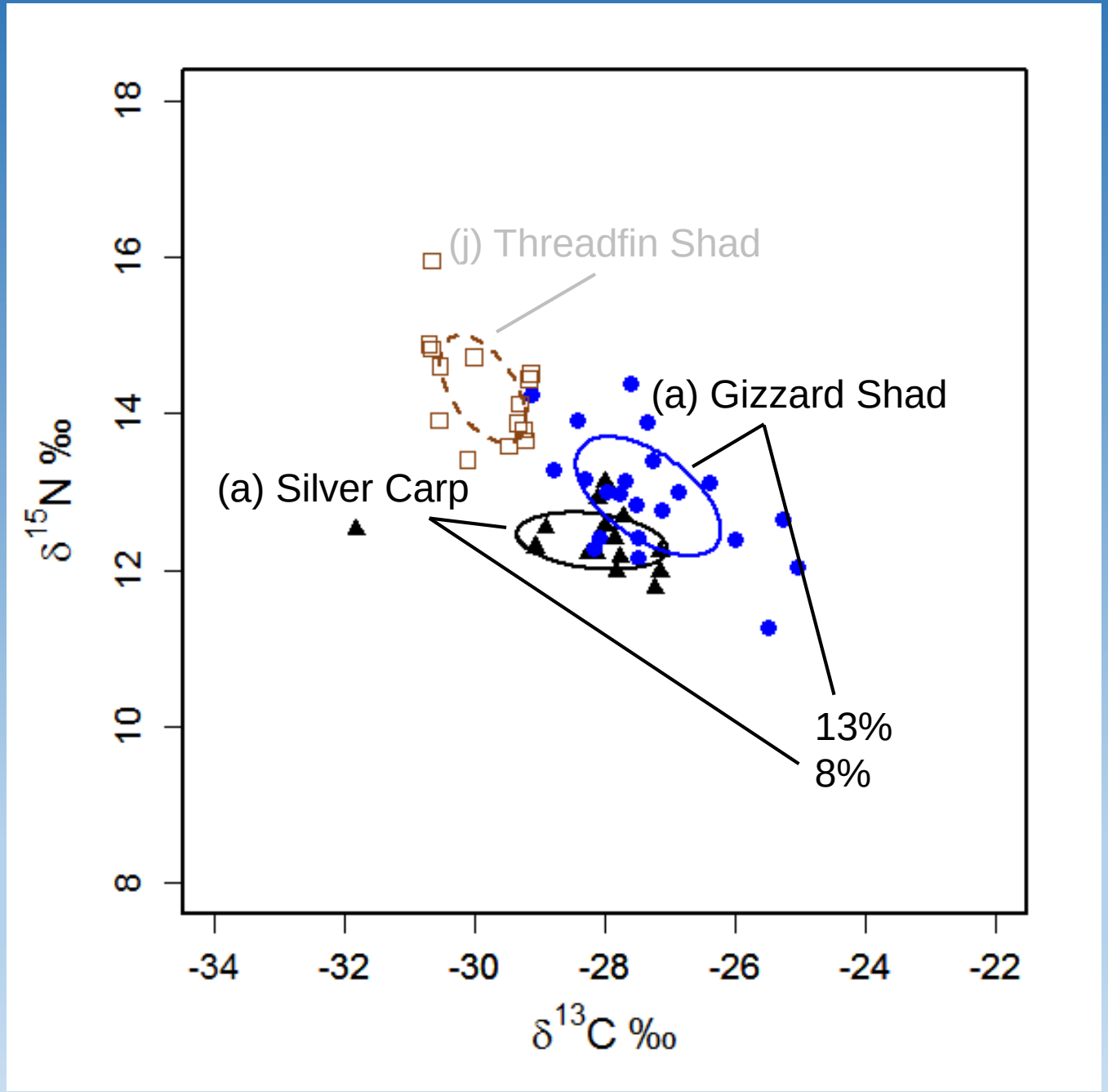
- Niche overlap does not equate to diet overlap
  - Indicate biologically important resources

- Adult Silver Carp and juvenile Threadfin Shad do not share resources



Spring

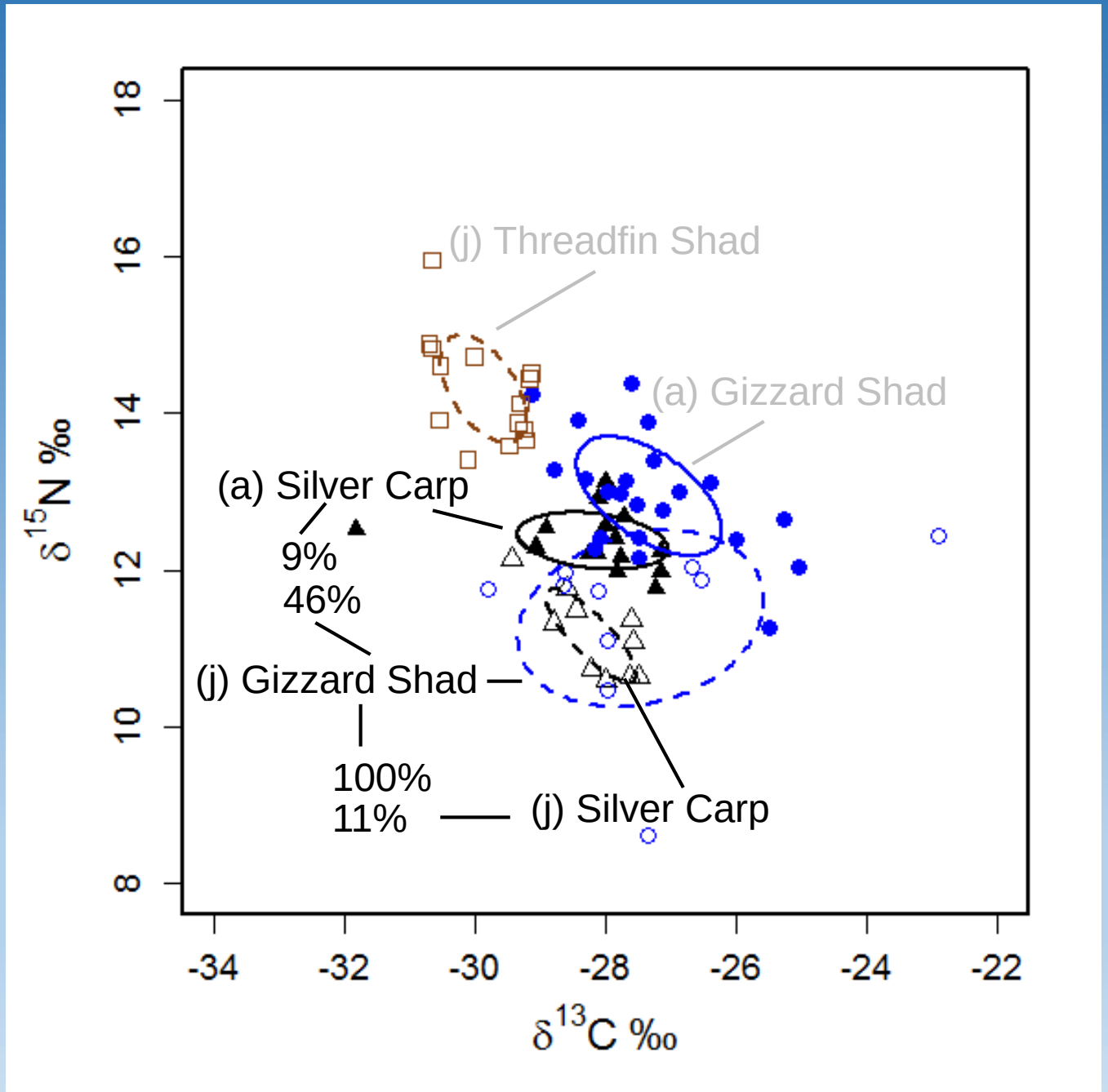
- Adult Silver Carp and adult Gizzard Shad share resources
- What about juvenile fish?



Spring

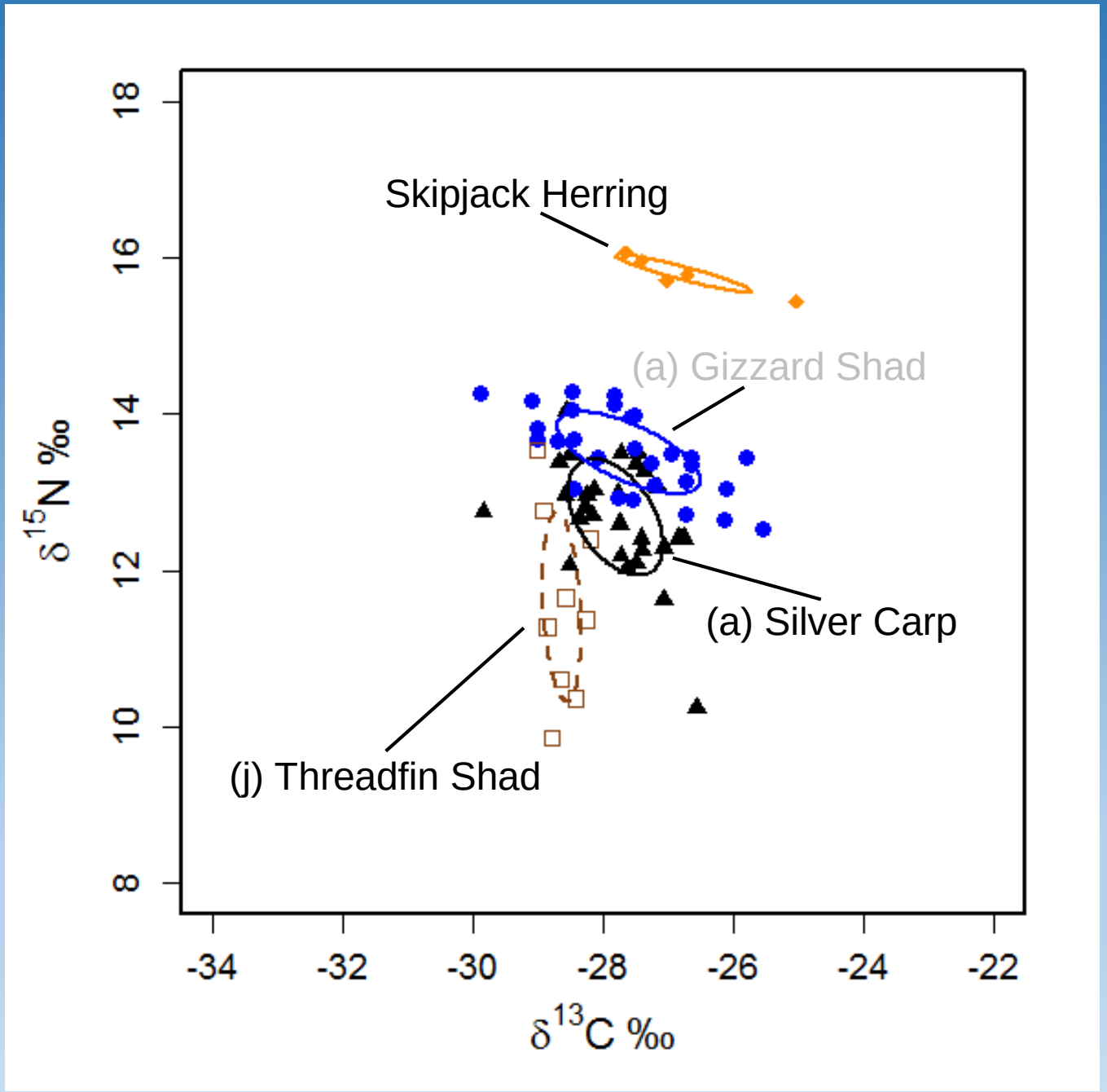
- Juvenile Silver Carp and juvenile Gizzard Shad share resources

- Adult Silver Carp and juvenile Gizzard Shad share resources



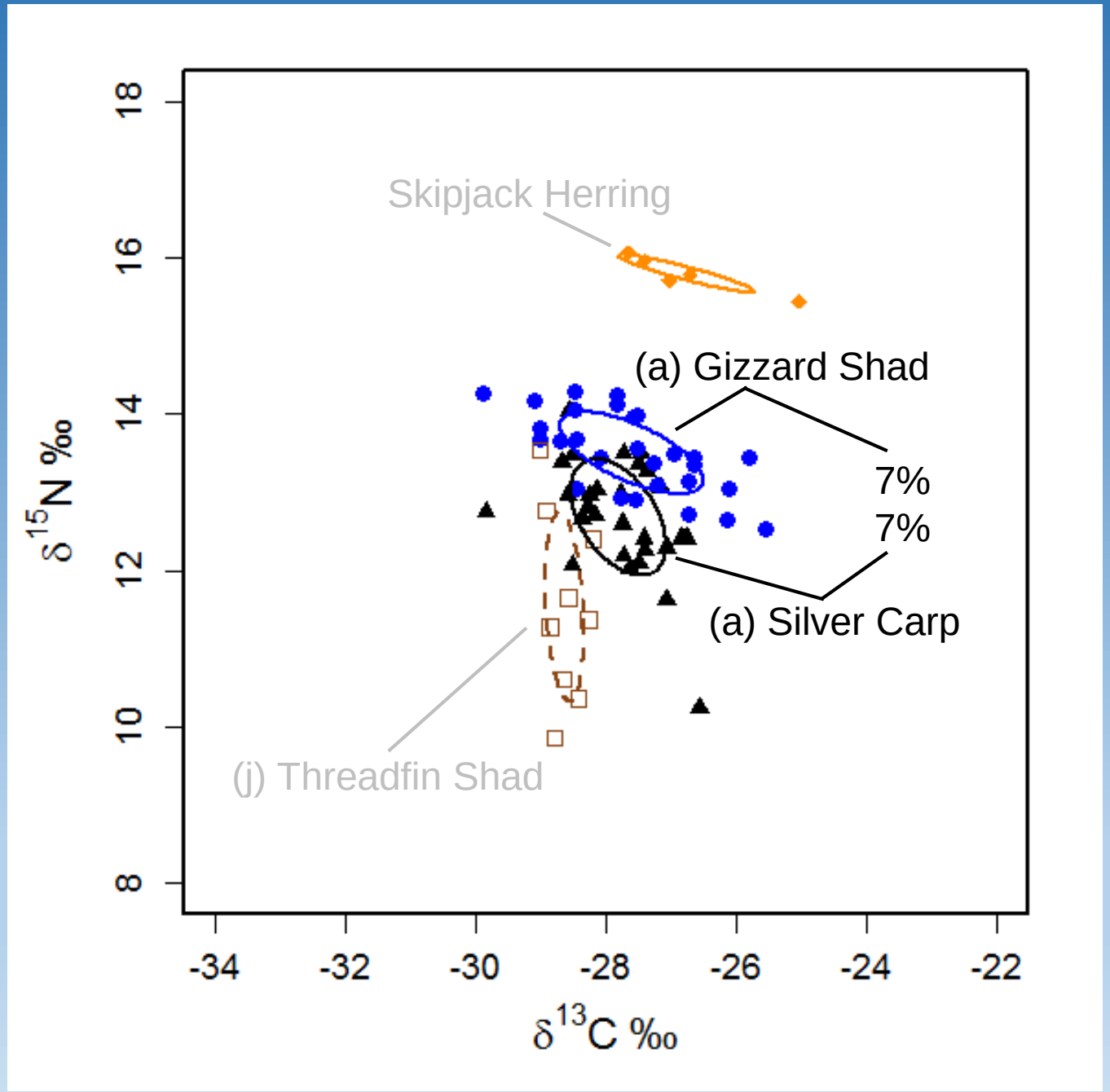
Summer

- No overlap between adult Silver Carp and juvenile Threadfin Shad
  - Trophic positions are similar



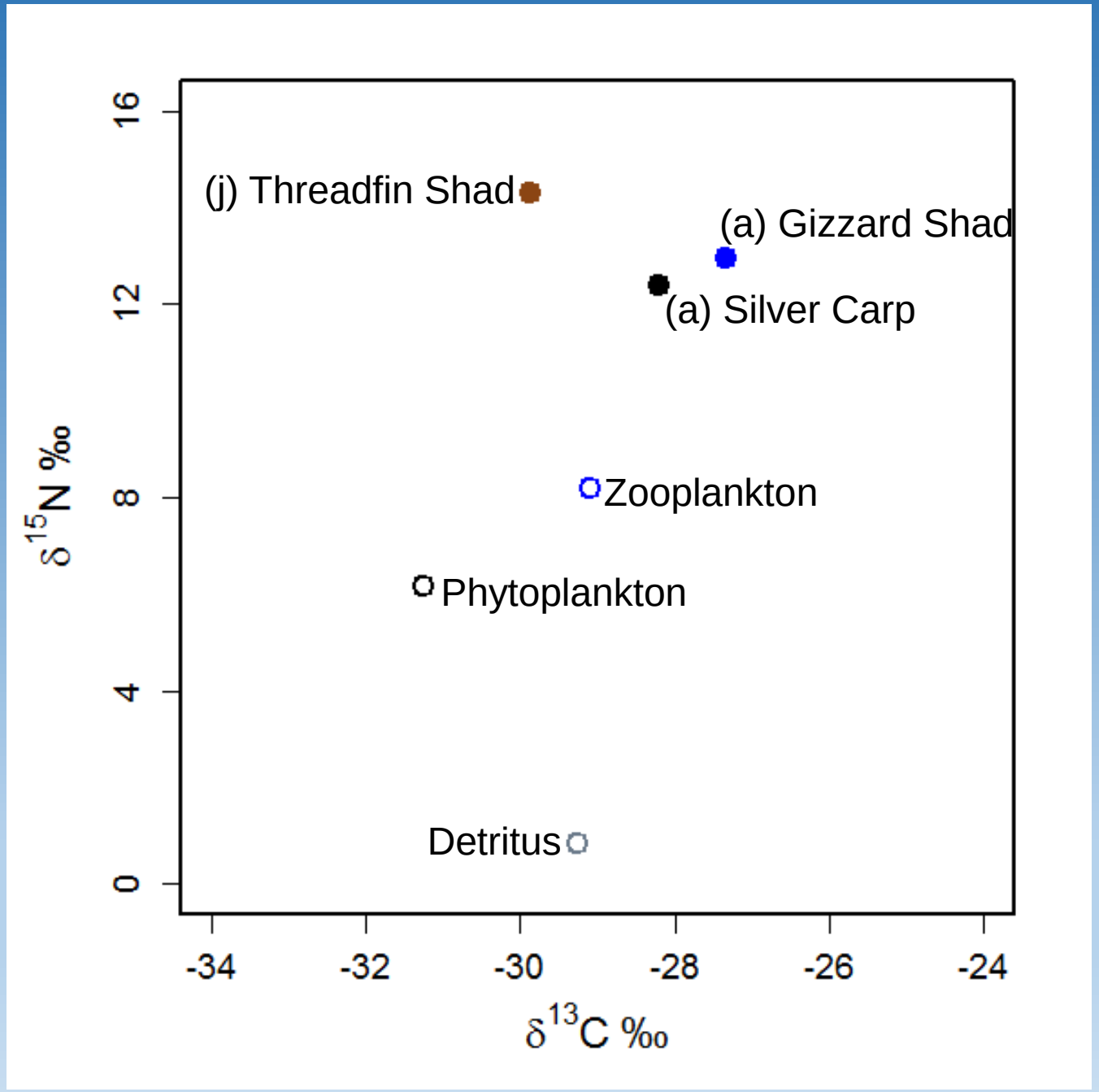
Summer

- No overlap between adult Silver Carp and juvenile Threadfin Shad
  - Trophic positions are similar
- Adult Silver Carp share resources with adult Gizzard Shad



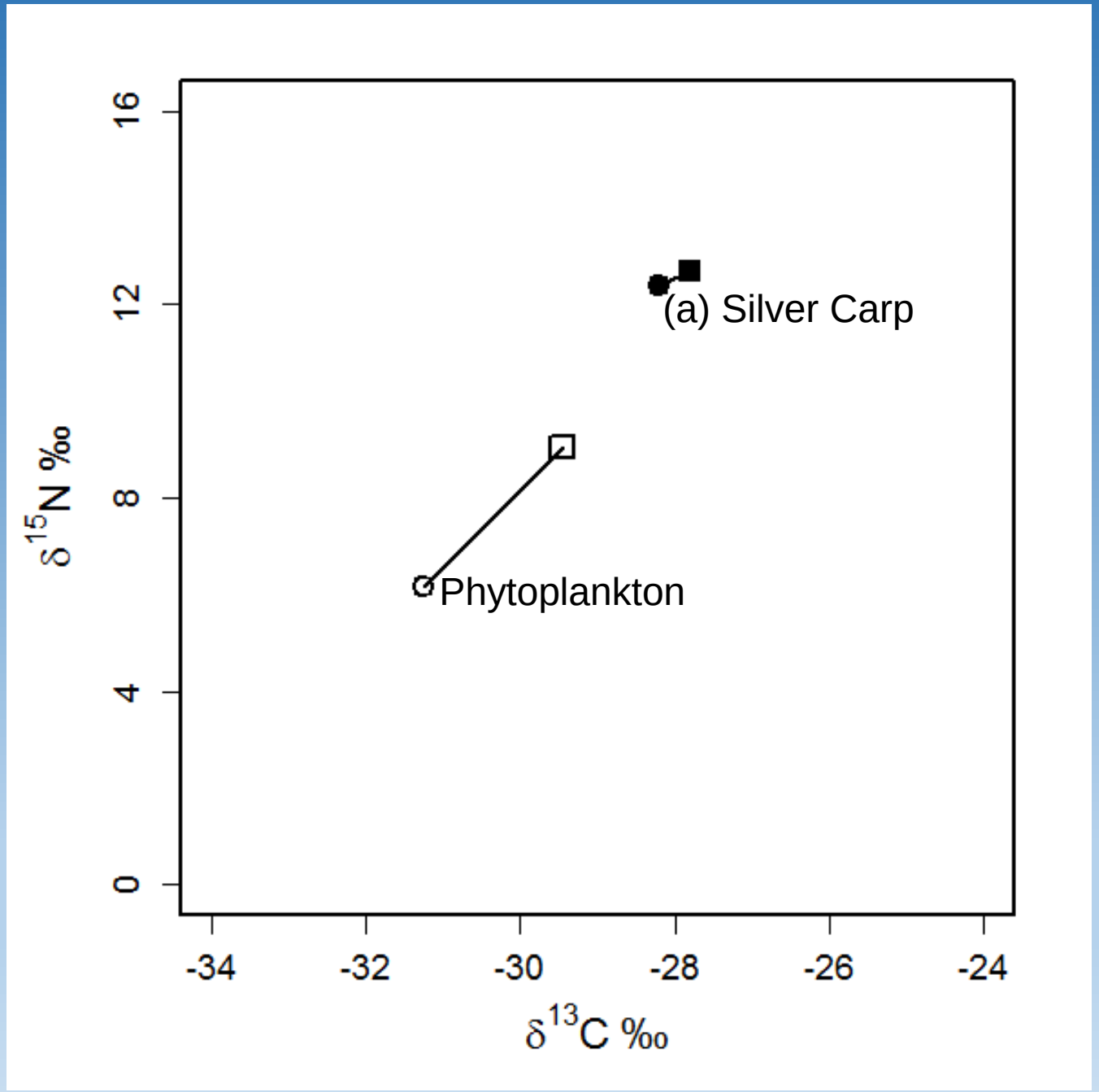
Seasonal Shifts

- Centroid locations of each group in the spring
- Path direction indicates what is contributing to diet



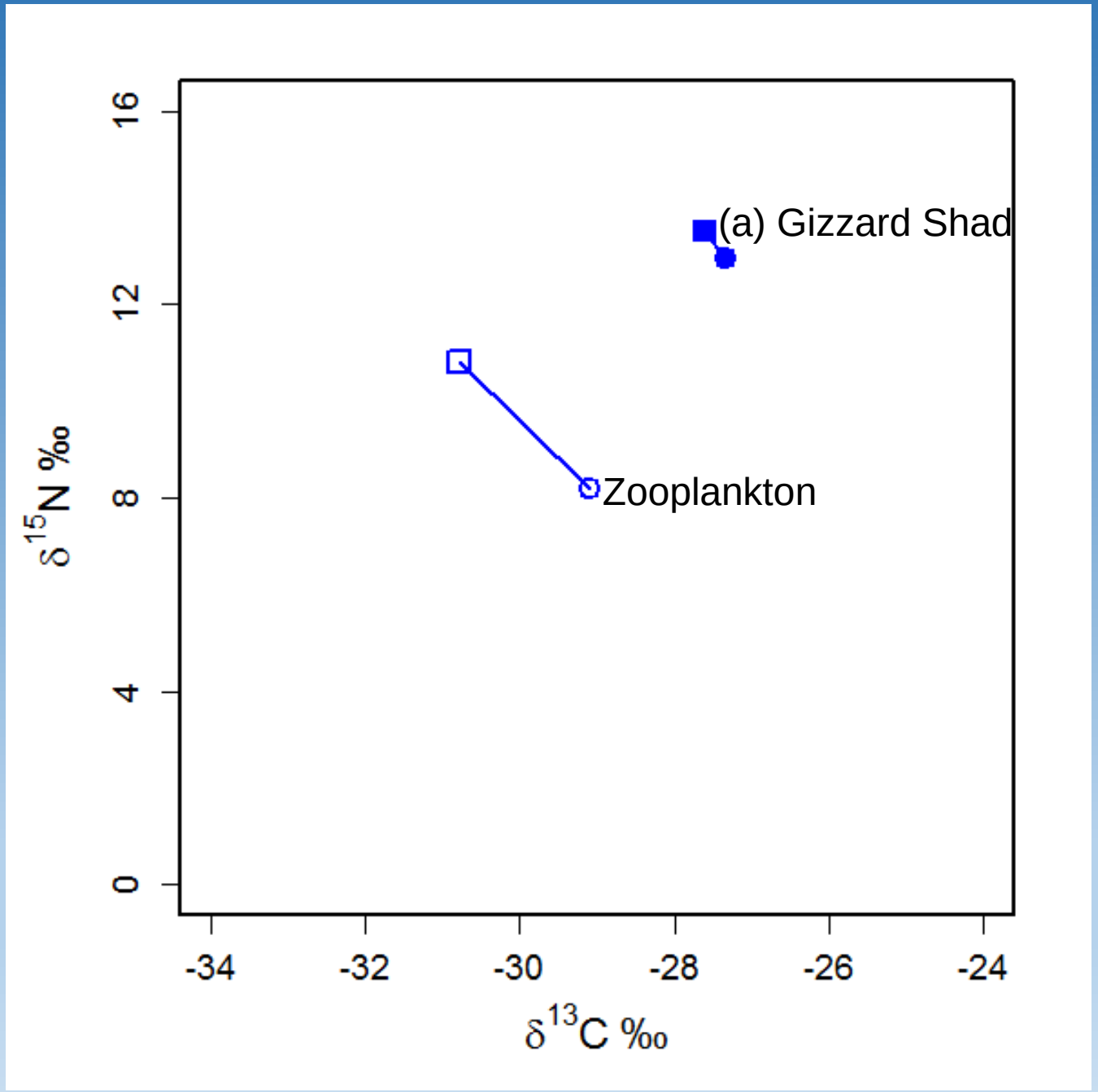
Seasonal Shifts

- Adult Silver Carp and phytoplankton have similar path directions
- Phytoplankton = primary diet item



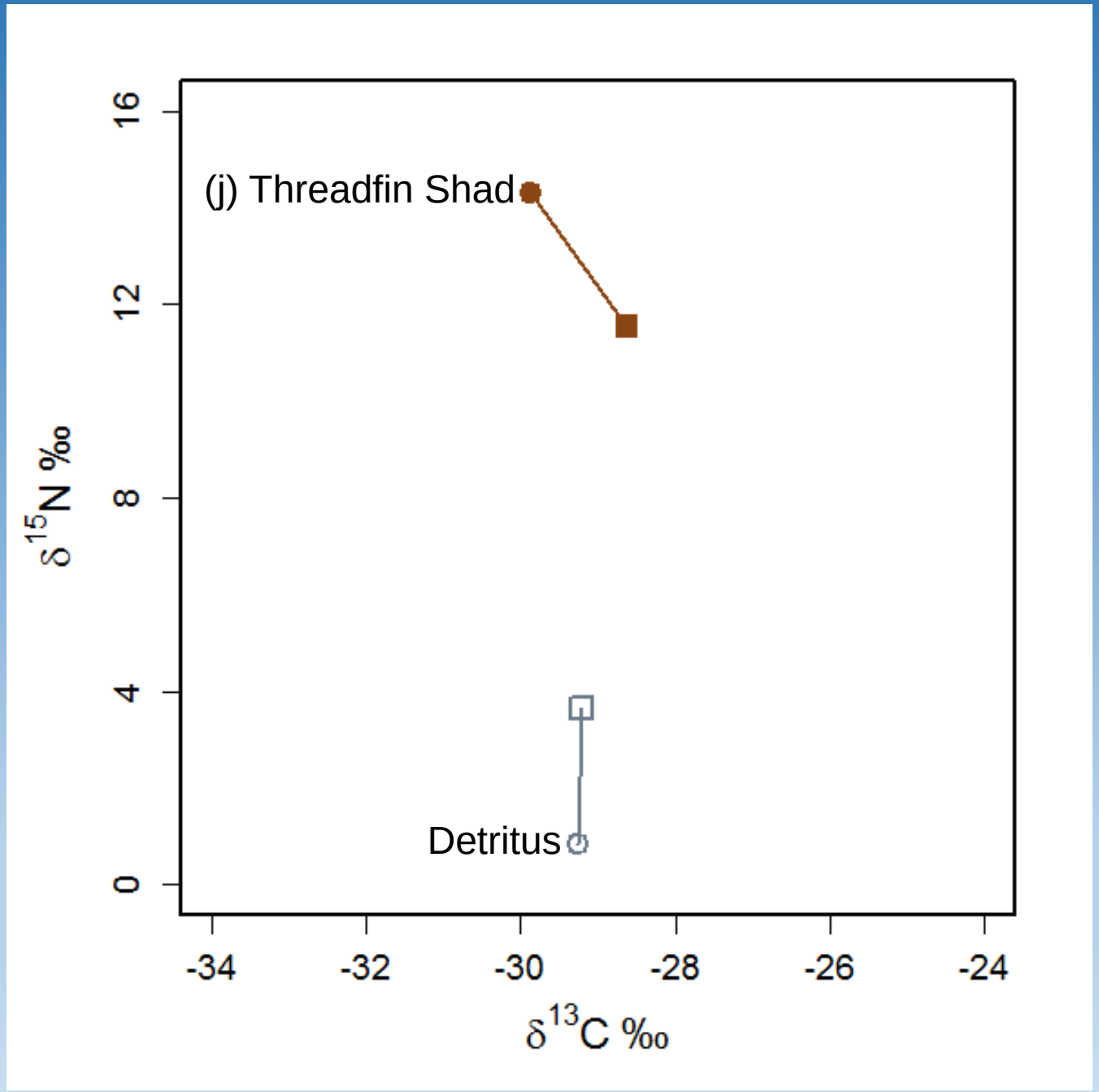
Seasonal Shifts

- Adult Gizzard Shad and zooplankton have similar path directions
- Zooplankton = primary diet item



Seasonal Shifts

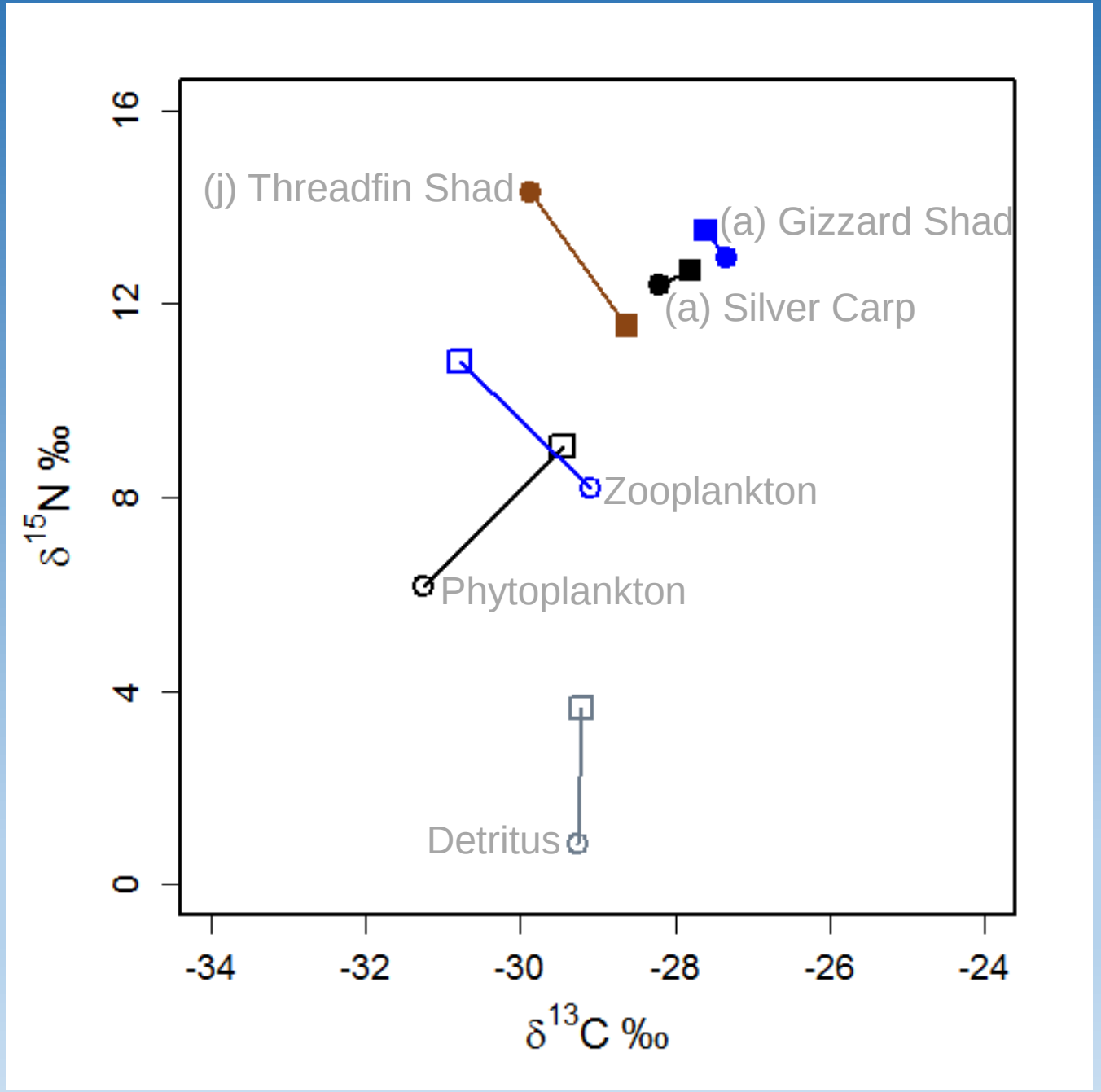
- Juvenile Threadfin Shad do not follow path directions of end members
- **Juvenile Threadfin Shad switch feeding mechanisms**



Seasonal Shifts

- Groups become more enriched in nitrogen ($\delta^{15}N$) during the summer

- One exception, juvenile Threadfin Shad



Conclusions

Question 1 (Potential for competition)

- Yes, adults and juveniles share resources

Question 2 (Life stage affect the potential for competition)

- Yes, juvenile fish much more likely to compete

Question 3 (Seasonal differences affect isotopic niche overlap)

- Yes (Significant?)
- Slightly greater chance of shared resource use in the Spring

Management Implications

- Shad are primary consumers
  - Success of fishery depends on shad
- Provided information on feeding phenology
- **Target juvenile Silver Carp to reduce competition**

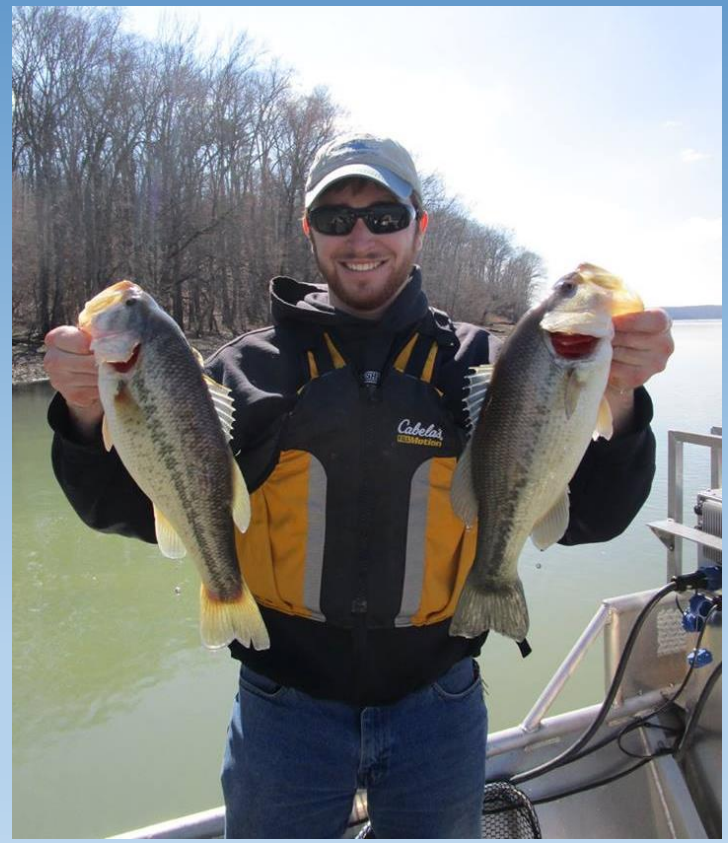


Photo Credit: Allison Lebeda

What don’t we know?

- Silver Carp population size?
  - Exponential population growth phase

- Resource availability?
  - More productive in the spring
  - Less productive in the summer

http://blueplanetsociety.blogspot.com

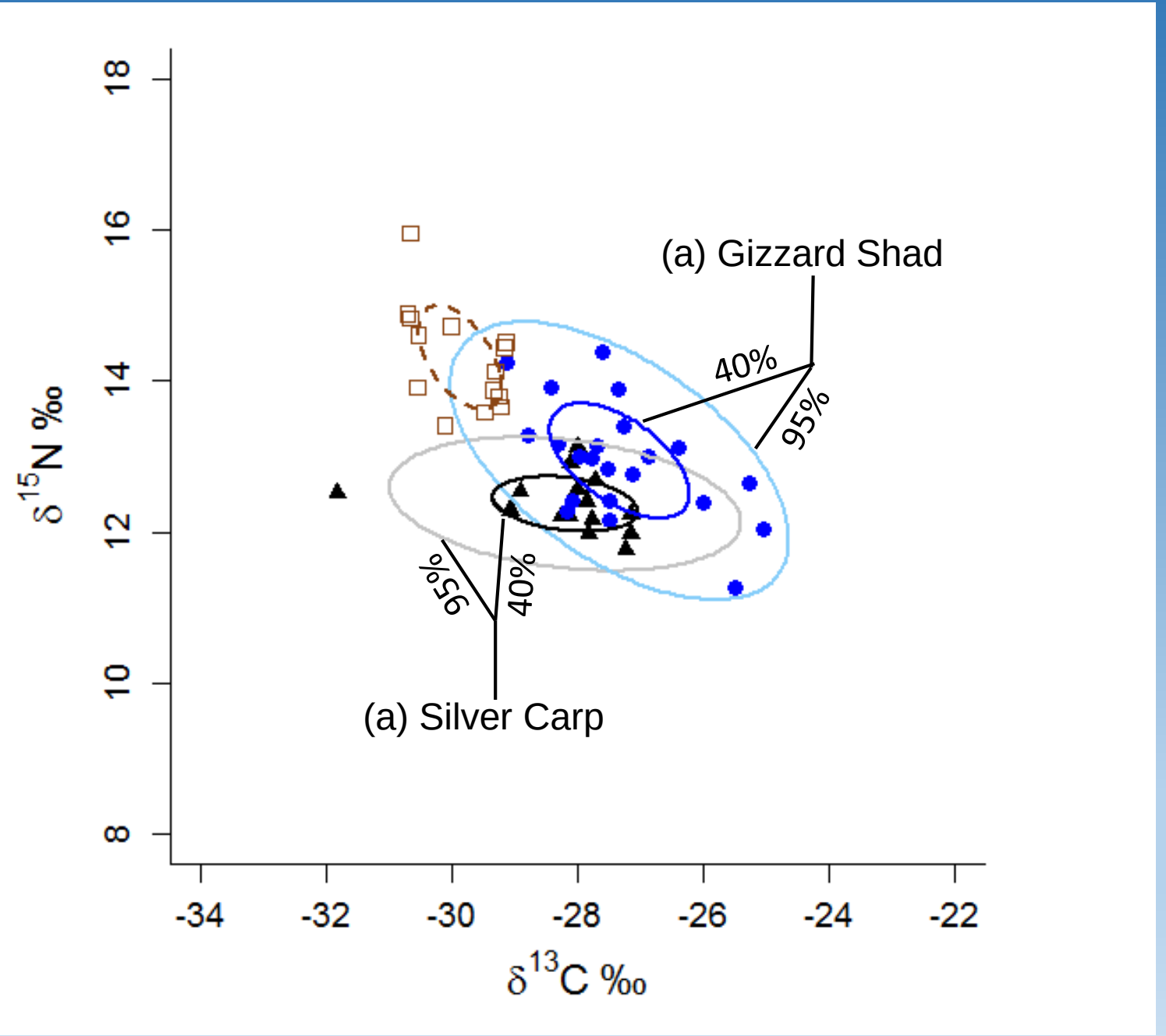
Acknowledgements

Field and lab help: Allison Lebeda, Brad Hartman, Ben Tumolo, Jessica Morris, Christy Soldo, Nathan Tillotson, Brad Richardson, Matt May, Tanner Evans, Carla Rothenbuecher, Ben Kimball, Alex Vaisvil, Josh Revell

Project Funding: Larry D. Pharris Memorial Wildlife Fund; Watershed Studies Research Institute Grants; Dr. Morgan Emory Sisk Jr. Memorial Scholarship; Jones College of Science, Engineering, and Technology Travel Grants

Questions?


WATCH OUT-THAT ASIAN CARP IS EYEING YOUR LUNCH!
SCHOOL XING
jimhunt.us
VISIT ecomythsalliance.org


(a) Gizzard Shad
40%
95%
95%
40%
(a) Silver Carp
18
16
14
12
10
8
-34
-32
-30
-28
-26
-24
-22
δ15N ‰
δ13C ‰