

An aerial photograph showing the extensive Chesapeake Bay watershed. The image captures a complex network of rivers and streams flowing into the bay, surrounded by a mix of forested land, agricultural fields, and urban areas. The water in the bay is a dark, deep blue, contrasting with the lighter, textured land. The title text is overlaid in the upper center of the image.

# **Food Web Drivers for Ecosystem-based Fisheries Management of the Chesapeake Bay**

Howard Townsend,  
NOAA Chesapeake Bay Office  
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# Food Web QET

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“Sustainable use of exploited species will depend, at least in part, upon inclusion of multispecies fisheries management based largely on food web dynamics...”

*Fisheries Ecosystem Planning for Chesapeake Bay*  
(Chesapeake Bay Fisheries Ecosystem Advisory Panel 2006)

# Purpose



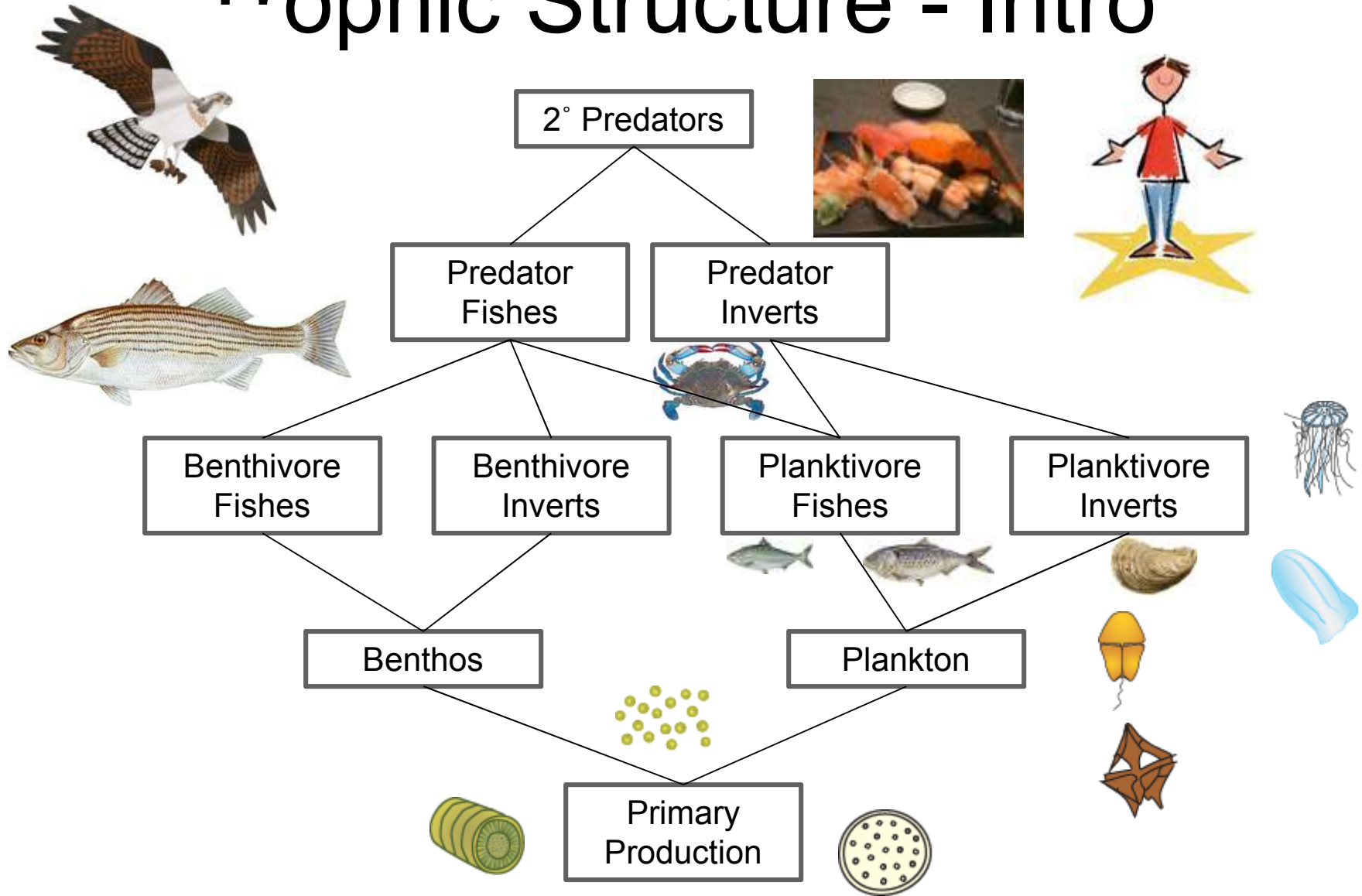
- Provides and evaluation and integration of the key food web drivers for the focal Chesapeake Bay species for EBFM
  - Key drivers: Trophic Structure, Forage/Prey, Competition, and Predation.



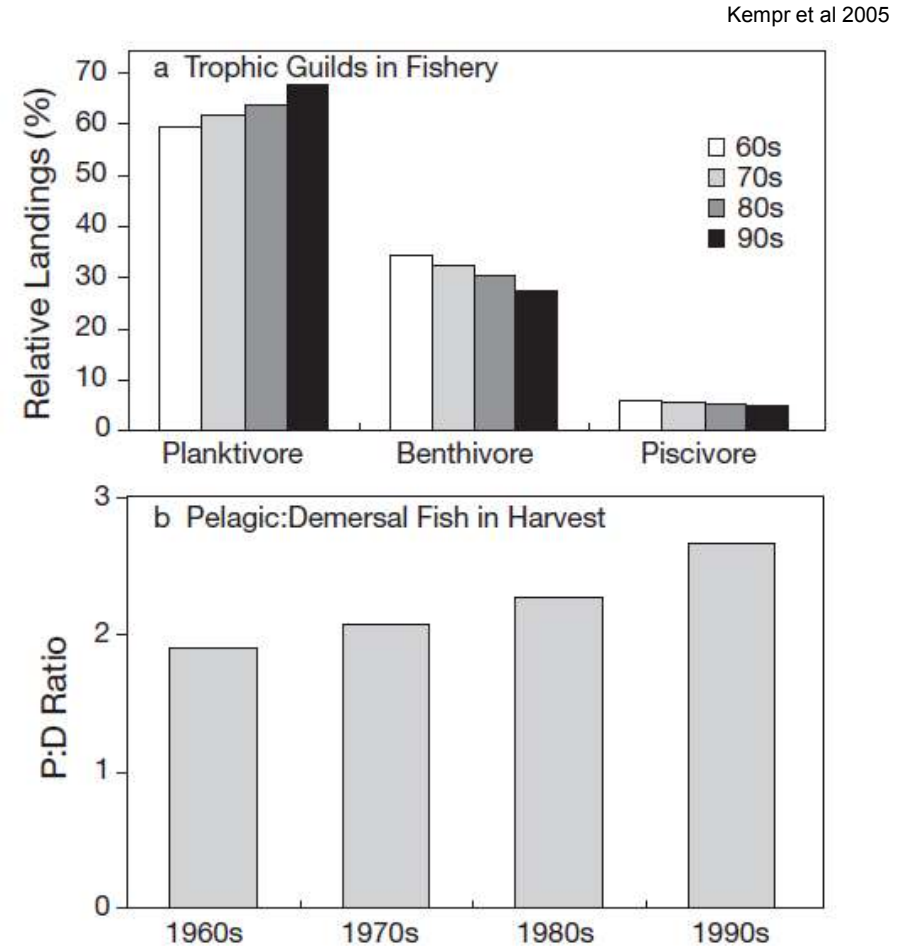
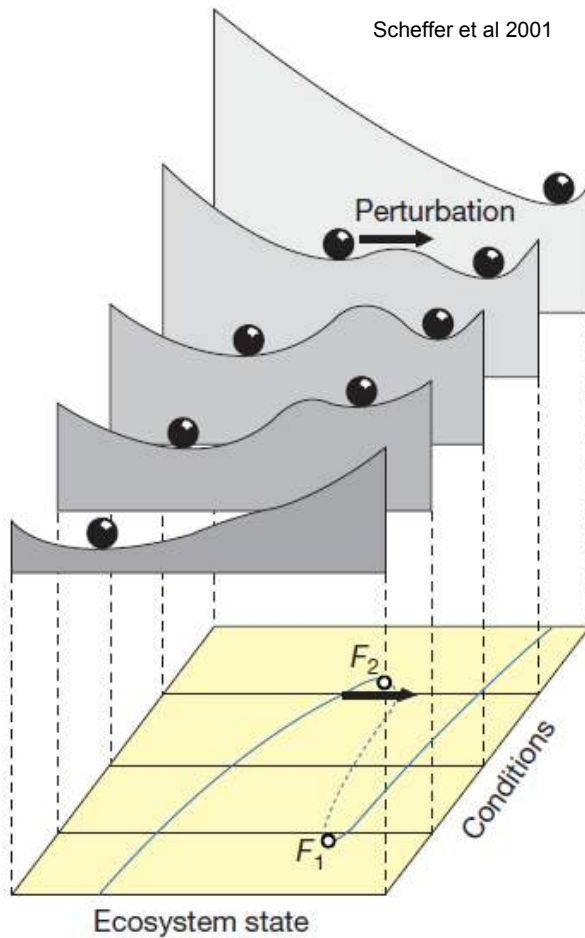
- Highlight the cross-species issues and suggests potential for EBFM metrics



# Trophic Structure - Intro

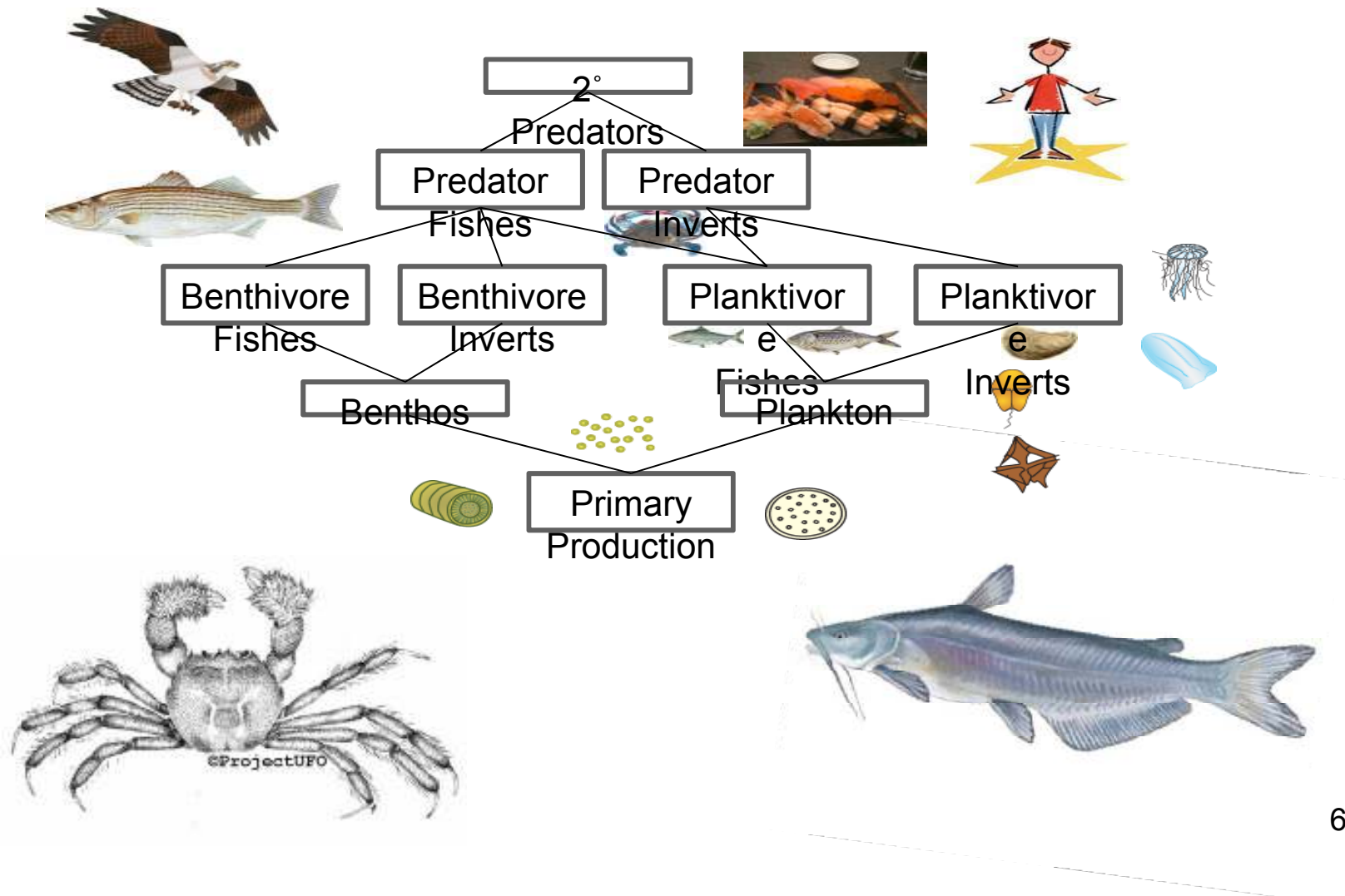


# Trophic Structure Issues



# Trophic Structure

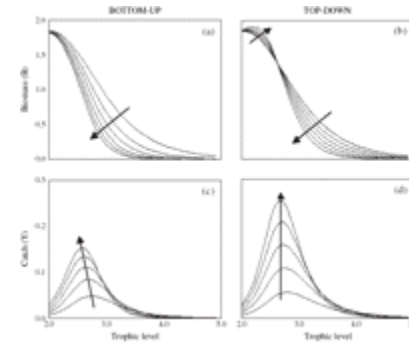
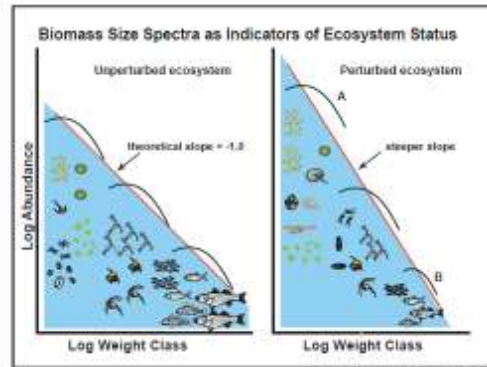
## Issues: Invasive Species



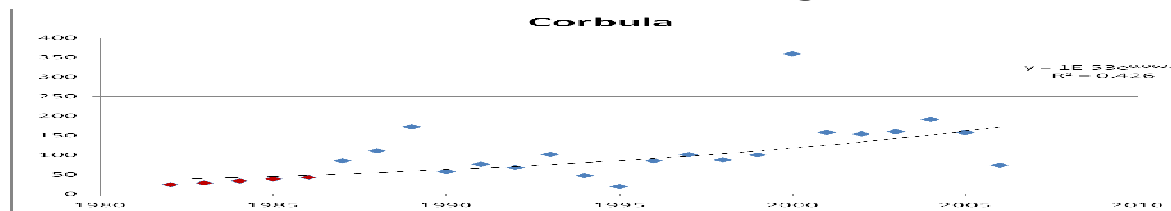


# Trophic Structure – Metrics

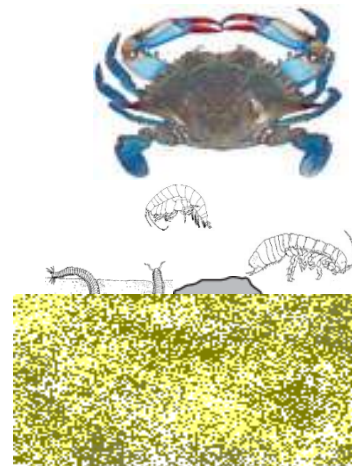
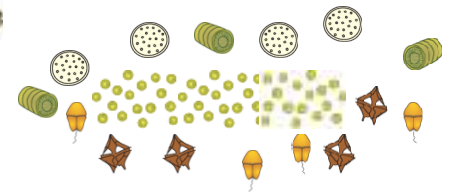
- Structure



- Invasive species –
  - Time series of relative abundance
  - Research and Monitoring

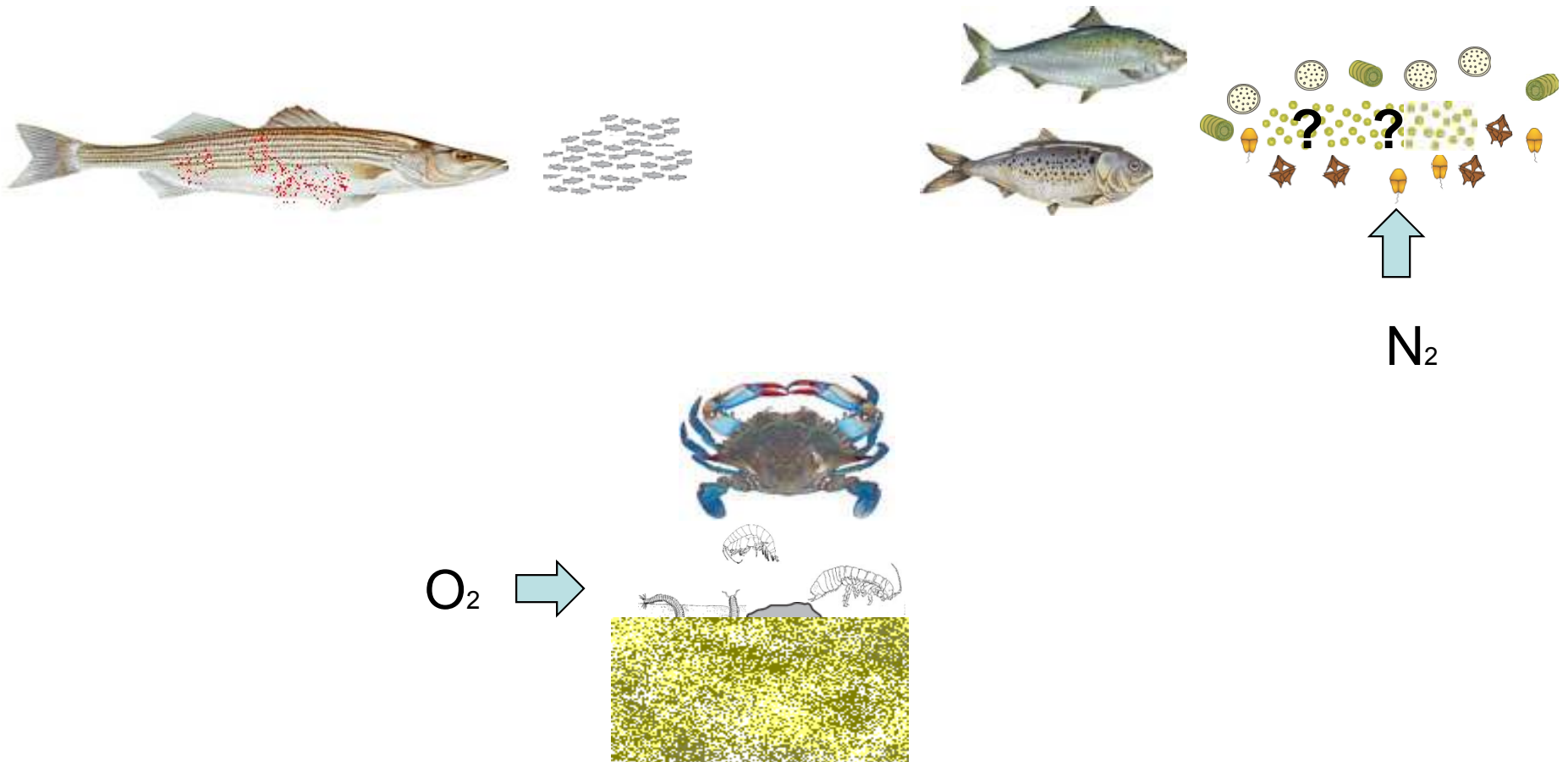


# Forage/Prey - Introduction



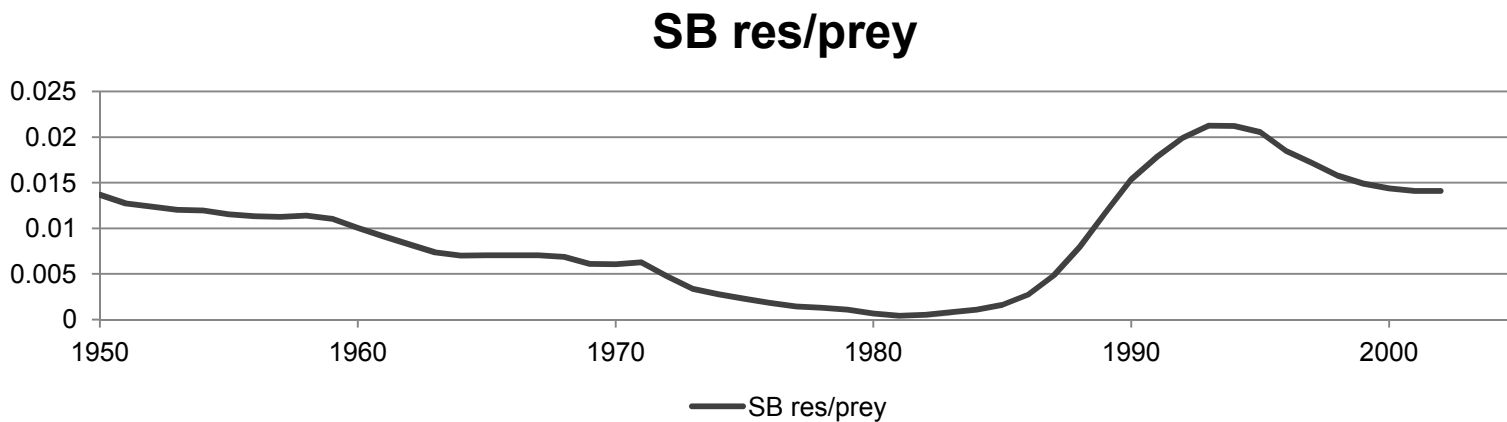


# Forage/Prey - Issues



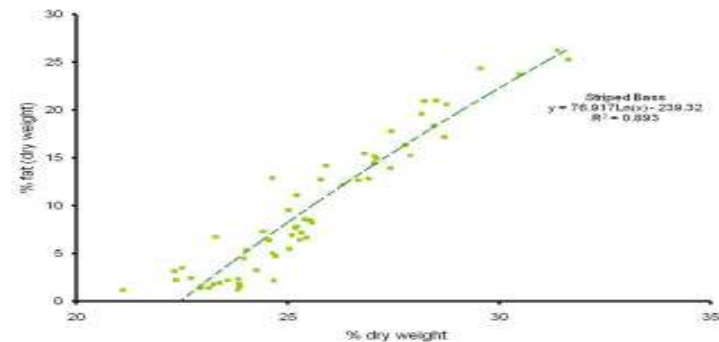
# Forage/Prey - Metrics

- Predator-prey (or fish-plankton) ratios

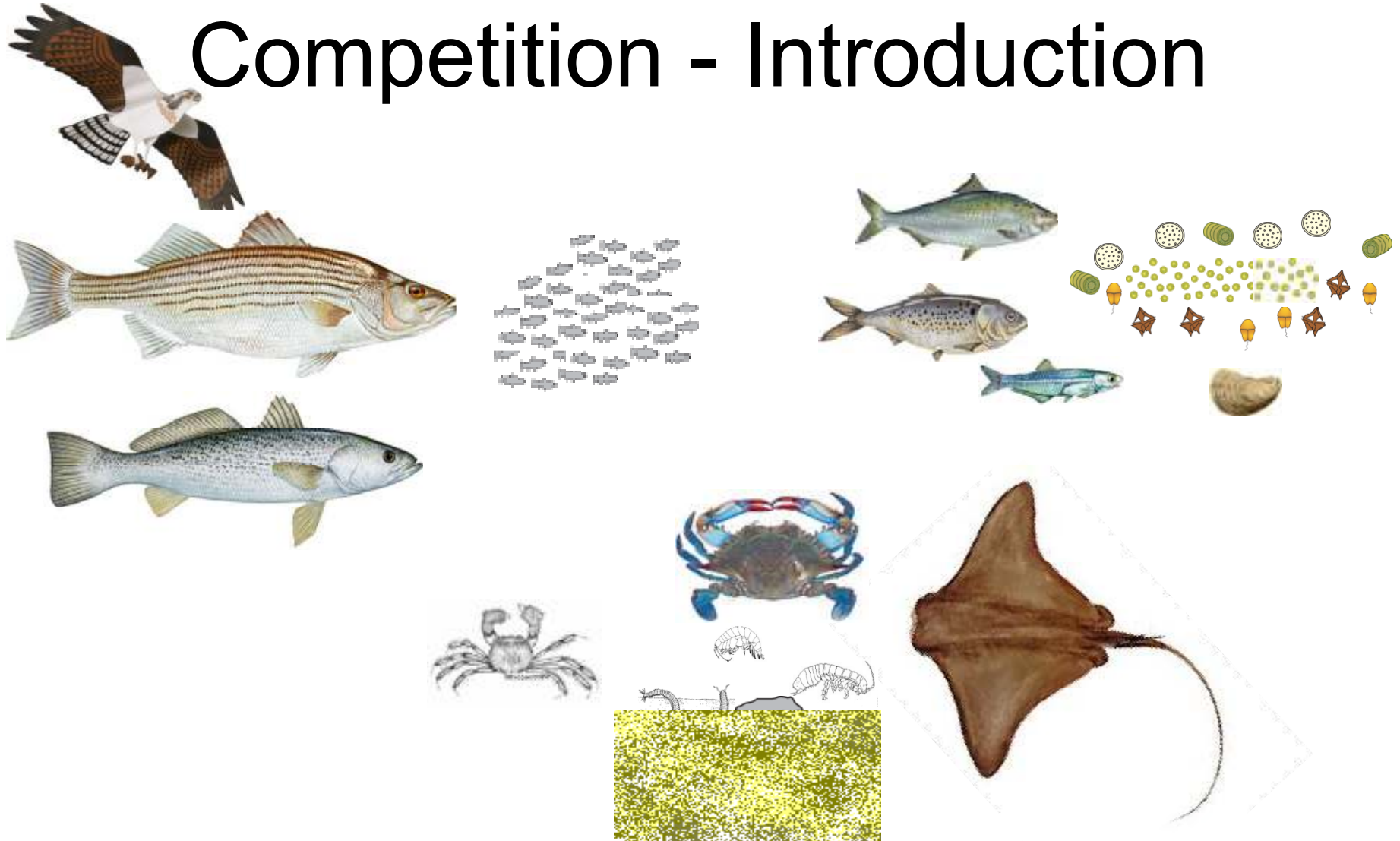


- Body condition

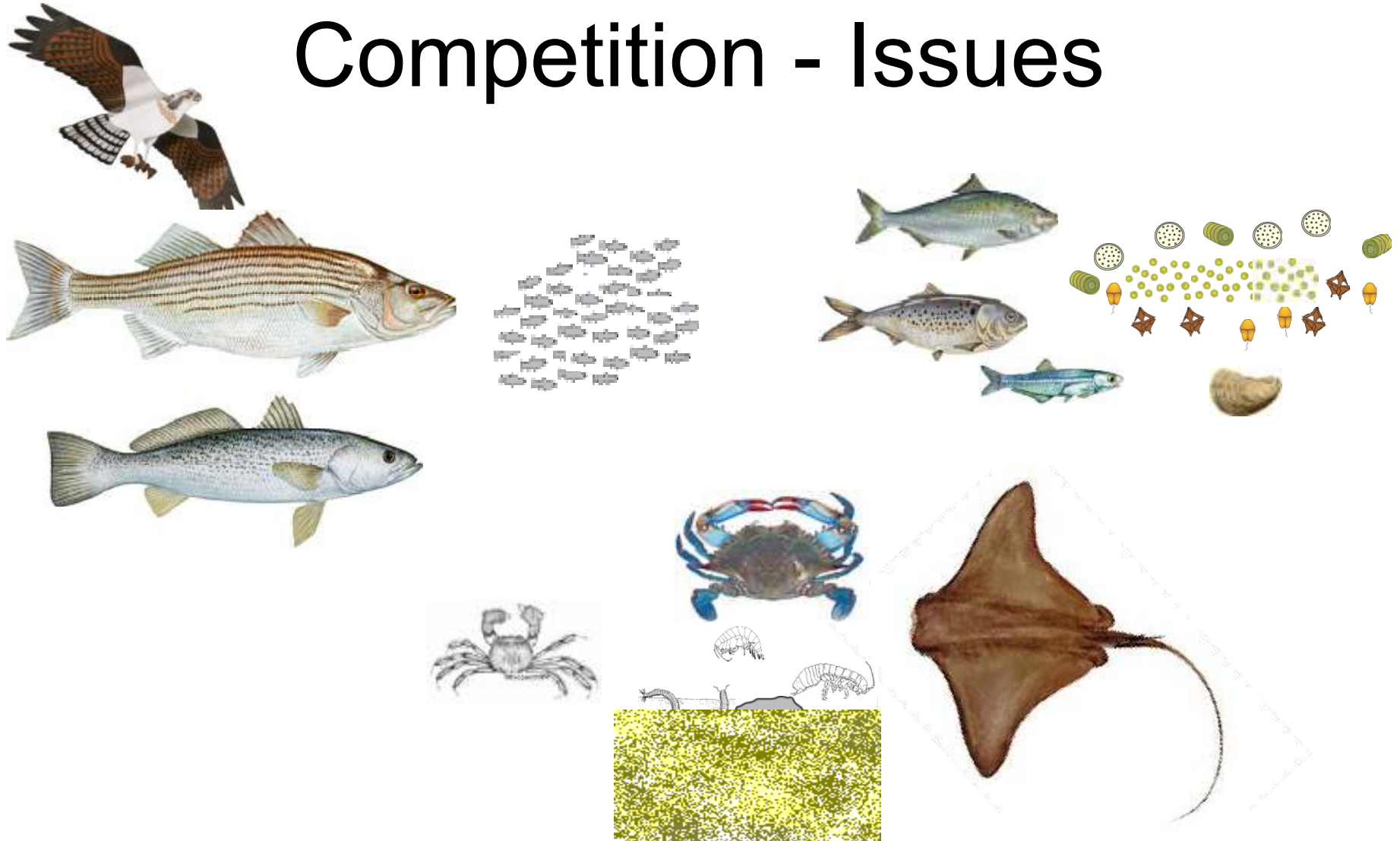
Figure 2. For striped bass, nearly 90% of the variability in fat (lipid) percentage of dry weight is explained by the PDW of the fish {from Hartman & Margraf 2008}.



# Competition - Introduction

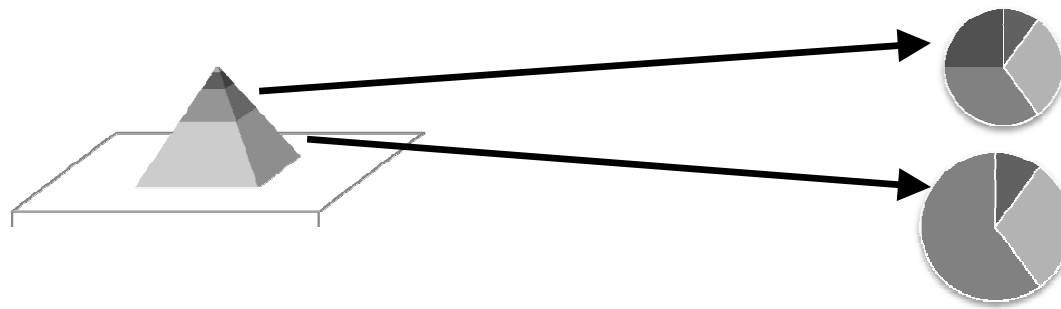


# Competition - Issues

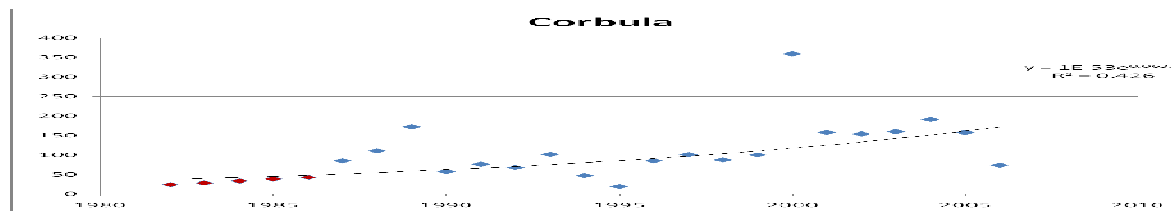


# Competition - Metrics

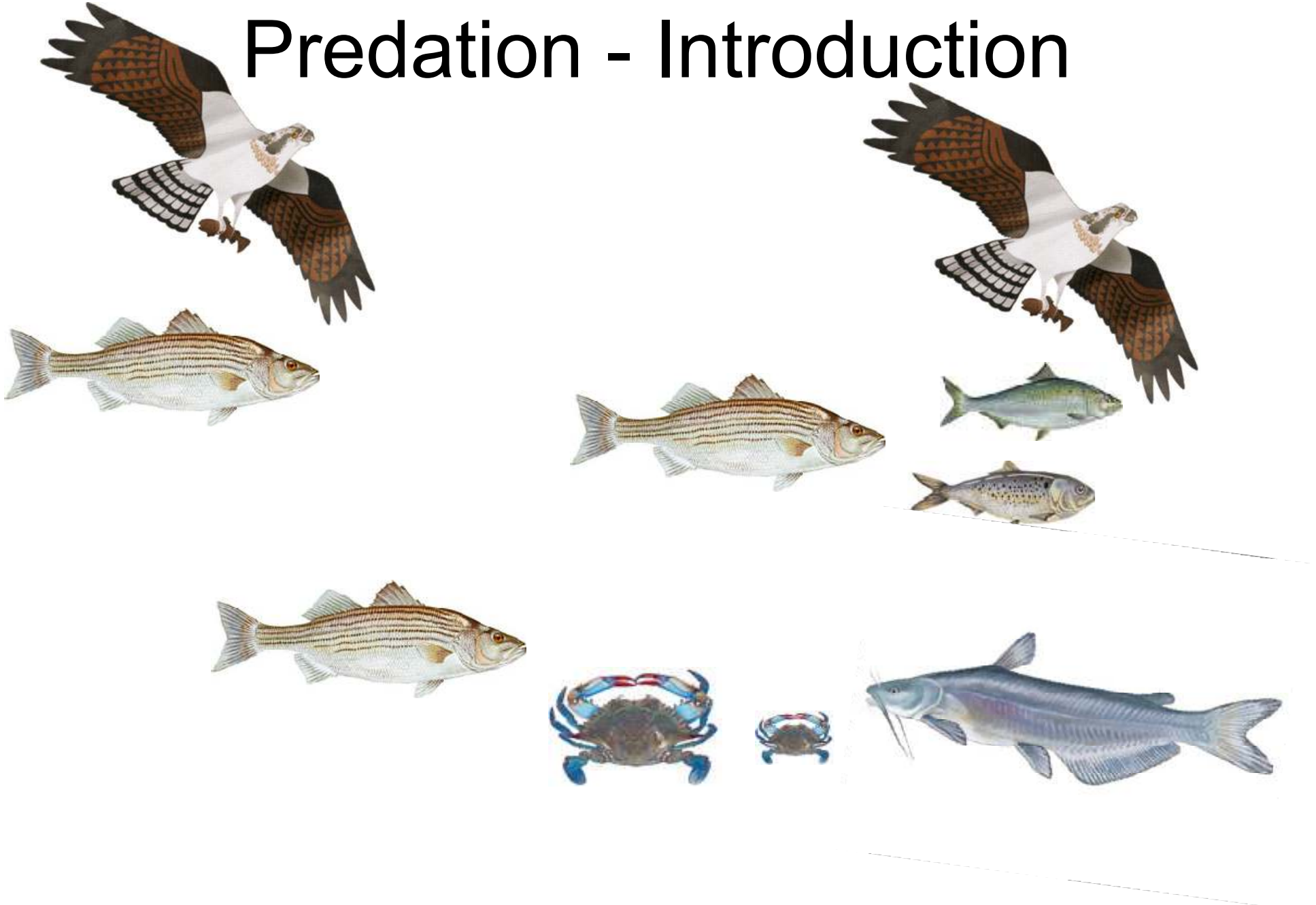
- Trophic level-species composition



- Relative abundance or biomass of invasive species

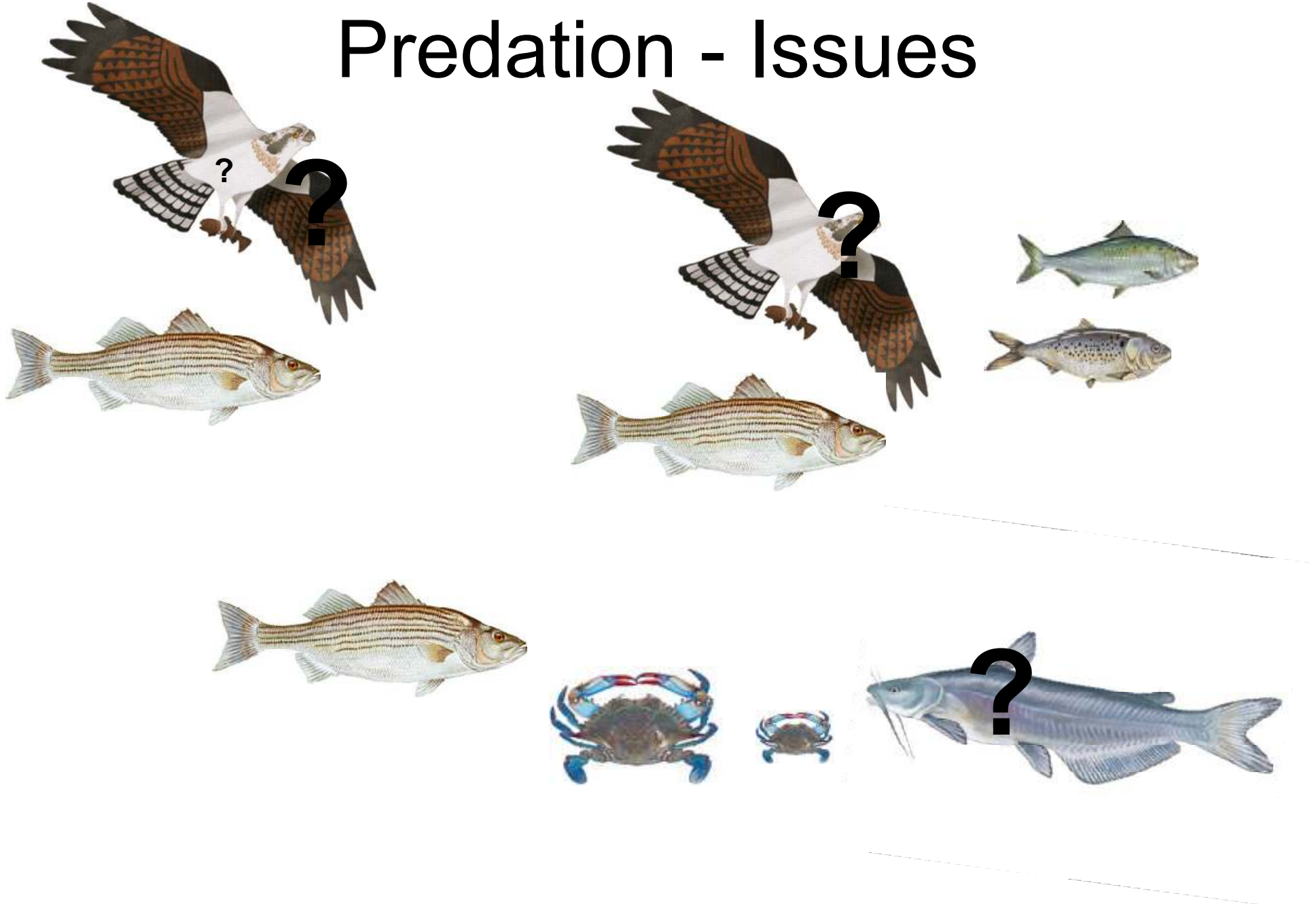


# Predation - Introduction



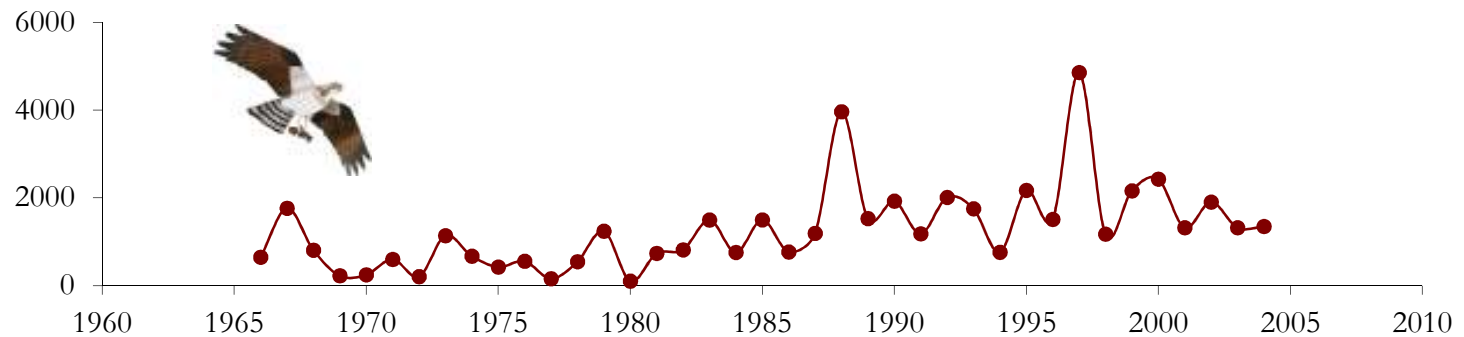


# Predation - Issues

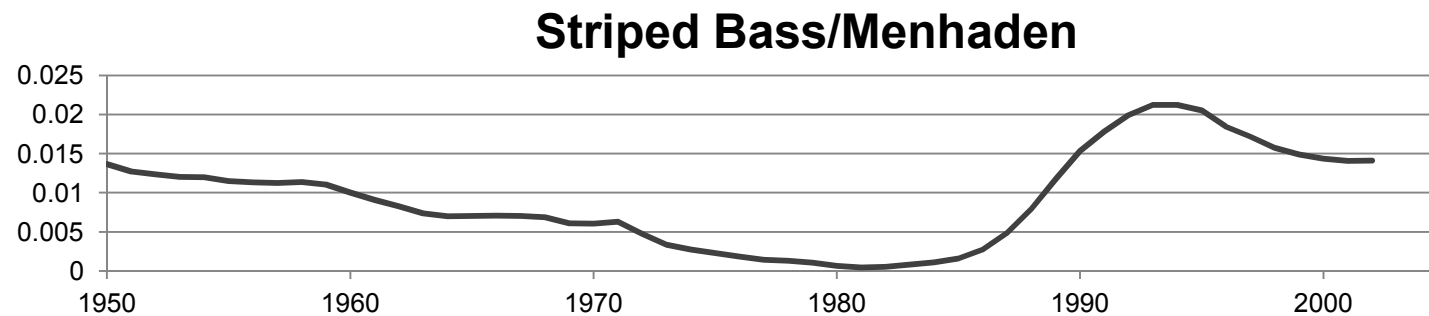


# Predation - Metrics

- Avian predator index



- Predator-prey ratios



- Estimates of predation-based mortality

$$Z = F + M + M2$$

# Conclusions – What is necessary for moving forward

- 1) Adequate fisheries dependent and independent monitoring programs,
- 2) Regular analysis of trophic interactions, and
- 3) An ecosystem/food-web modeling and analysis program

# Conclusions – What we have for moving forward

- 1) Adequate fisheries dependent and independent monitoring programs?
  - For some species and in some areas
  - Improved Integration necessary
- 2) Regular analysis of trophic interactions,
  - Chesapeake Bay Trophic Interactions Laboratory Services
- 3) An ecosystem/food-web modeling and analysis program
  - NCBO Food Web/Ecosystem Modeling Program

# Conclusions – What we need for moving forward

- Zooplankton/phytoplankton monitoring, and remotely sensed chl-a data.
- Monitoring and research of non-target species that potentially have a large impact on trophic structure (e.g., jellyfish, cownose rays, piscivorous birds).
- Detection systems for invasive species and research on the impact of invasives (e.g., blue catfish).
- Research on methods to augment or improve stomach content analysis (e.g., fatty acid signatures, stable isotopes).
- Research on methods to improve the assessment of body condition (e.g., lipid content).