

# Diet of Olympic Mudminnow

## Spatial and Temporal Variation

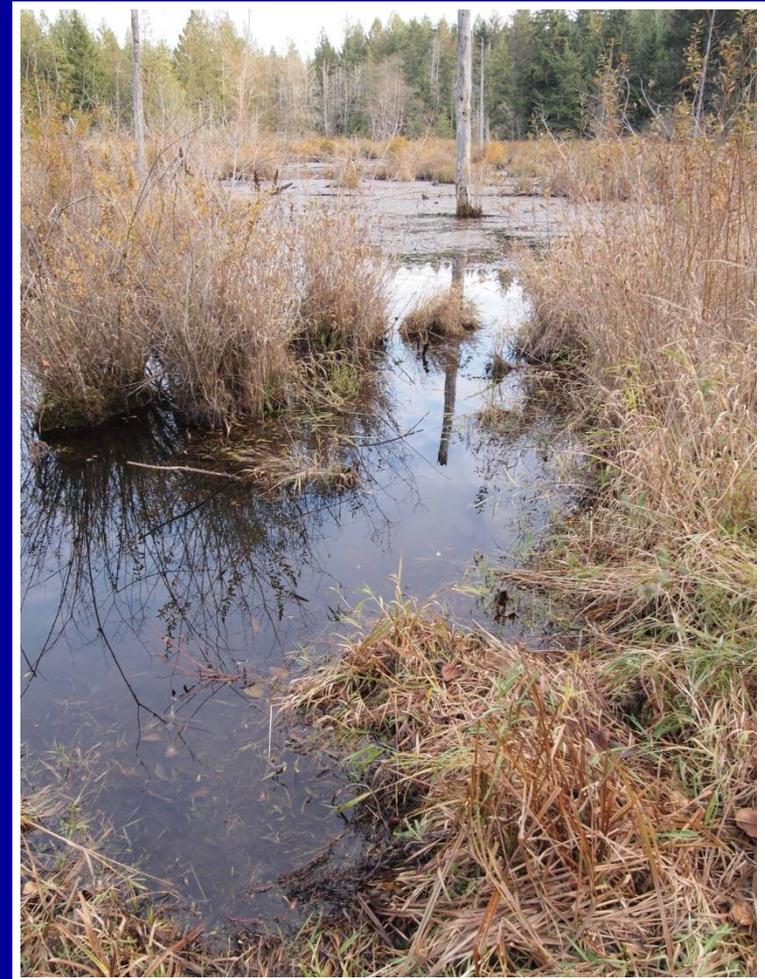


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The Evergreen State College



# Acknowledgments

- ◆ Webster Tree Farm (WDNR) – John Trobaugh
- ◆ Capital Land Trust
- ◆ USFWS employees
  - ◆ Brad Thompson
  - ◆ Teal Waterstrat
  - ◆ Kira Mazzi
  - ◆ Zachary Moore
  - ◆ Michael Elam



# Background

- ◆ John W. Meldrim conducted the first study that looked at mudminnow diet
- ◆ Meldrim, J.W. 1968. The ecological zoogeography of the Olympic mudminnow. University of Washington, Seattle.

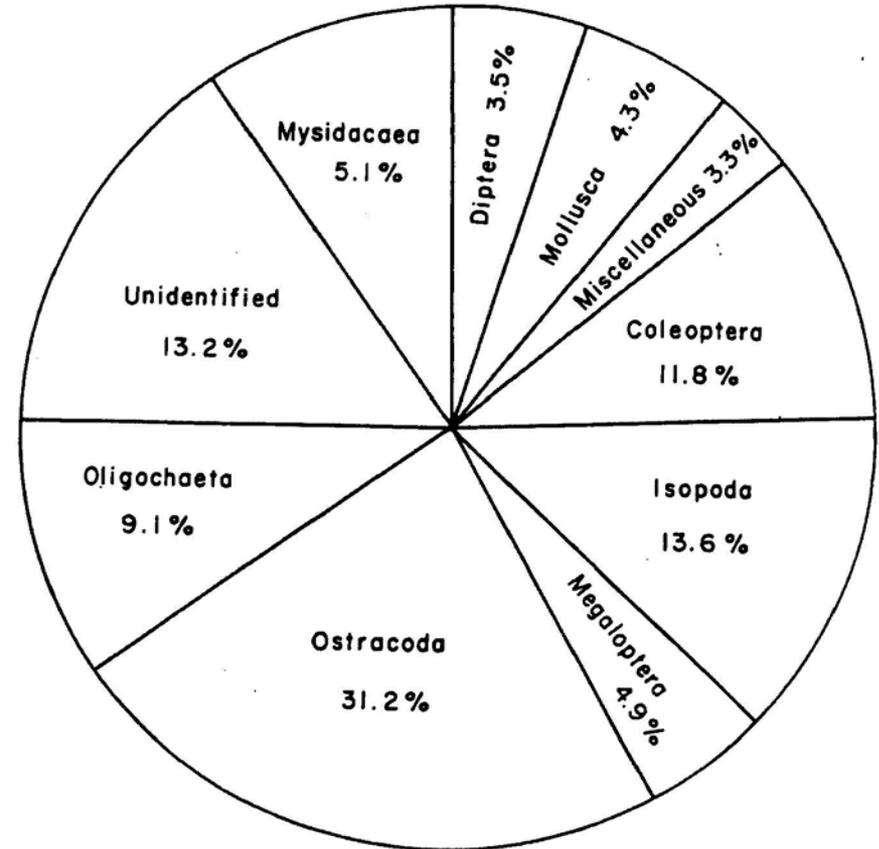


Figure 28. Food items in the diet of *Novumbra*, expressed in per cent by volume, based upon stomach analysis of 150 adults throughout the range (1964-1968).

# Objectives

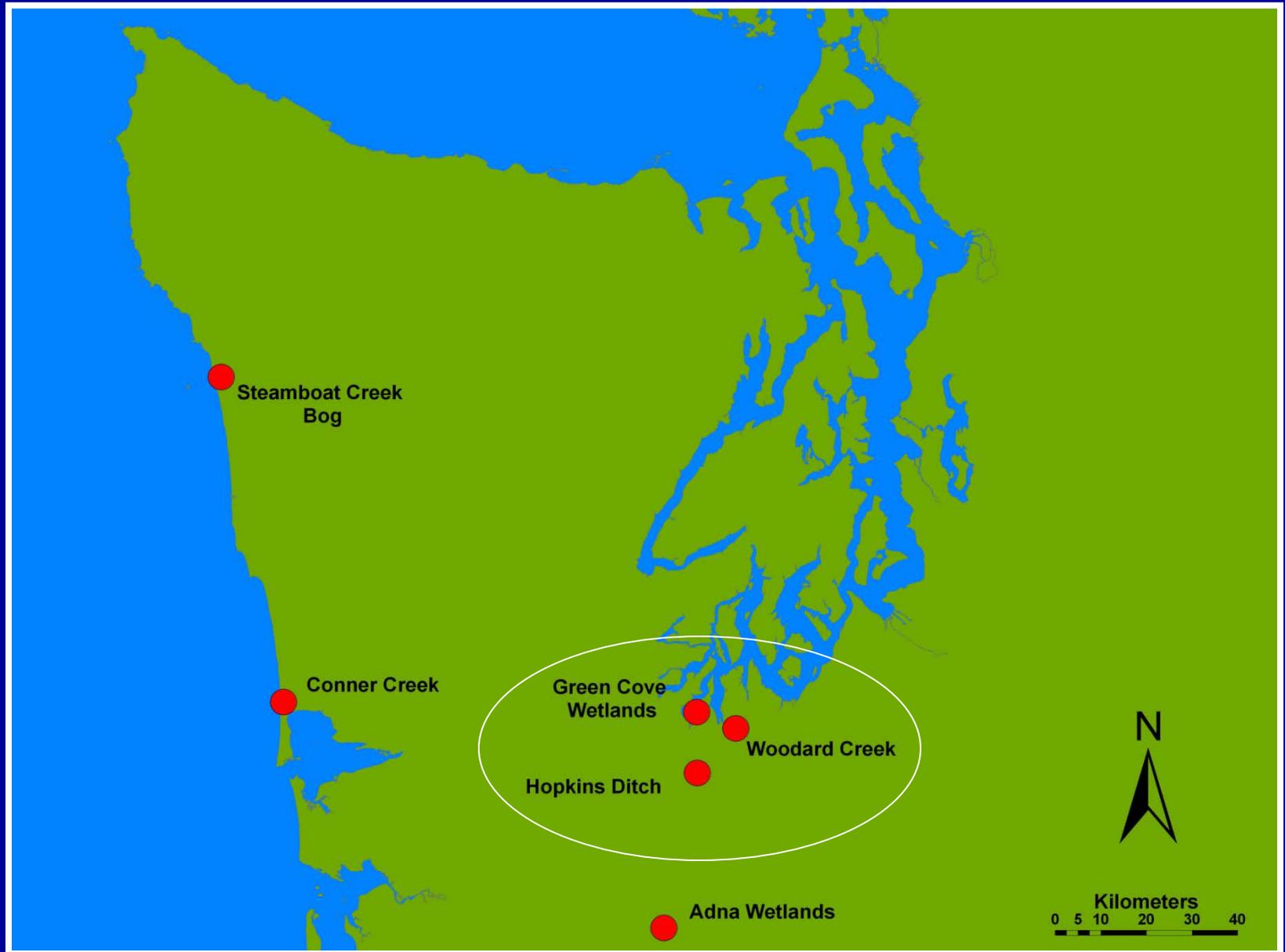
1. Basic understanding of the Olympic Mudminnow diet
2. Observe how their diets vary from site to site and between seasons
3. Do they consume pests to any extent?



# Sample Design

- ◆ Samples collected from three collection sites once a month
- ◆ Collected samples from February to August 2012
- ◆ Samples collected once in June at three other sites
- ◆ ~ 20 samples at each site on each date

# Collection Sites



# Green Cove

Large wetland

Fish species present: only Mudminnow



# Hopkins Ditch

Low gradient stream

Fish species present: Mudminnow, Stickleback, Sculpin, Cutthroat, and Coho



# Woodard Creek

Storm water retention pond

Fish species present: only Mudminnow



# June Collection Sites

Steamboat Bog  
Sphagnum moss bog  
only mudminnow present



Connor Creek  
Low gradient coastal stream



Adna Wetland  
Large wetland



Other fish species present



# Field collections

- ◆ Fish collected by dipnetting
- ◆ Gastric lavage (1.5-mm-diameter copper tube)
- ◆ Sampled fish > 40 mm
- ◆ MS-222 as anesthetic
- ◆ Weight, length, and sex recorded
- ◆ Stomach sample collected in a sieve



# Lab Analysis

- ◆ Macroinvertebrates identified, sorted, counted, and weighed
- ◆ Aquatic insects and large crustaceans identified to family
- ◆ Other prey identified to order or other convenient taxon



# Data Analysis

- ◆ Percent by Weight (%W)
- ◆ Percent by Number (%N)
- ◆ Frequency of Occurrence (FO)
- ◆ Index of Relative Importance (IRI)
  - $(\%N + \%W) * FO$
- ◆ Diet Overlap – Schoener's Index
  - Range of values: 0 - 1
  - Values  $> 0.6$  – significant overlap
- ◆ Diet Breadth – Levin's Index
  - Range of values: 1 – infinity
  - Values  $< 2$  indicate little diet breadth

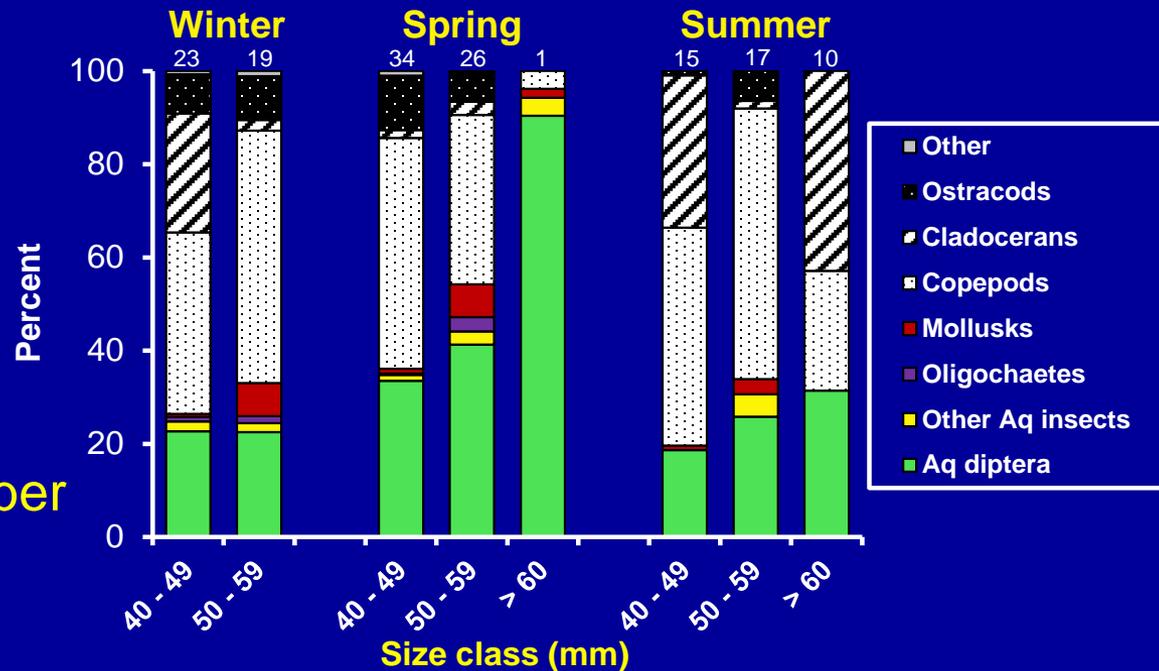


# Results

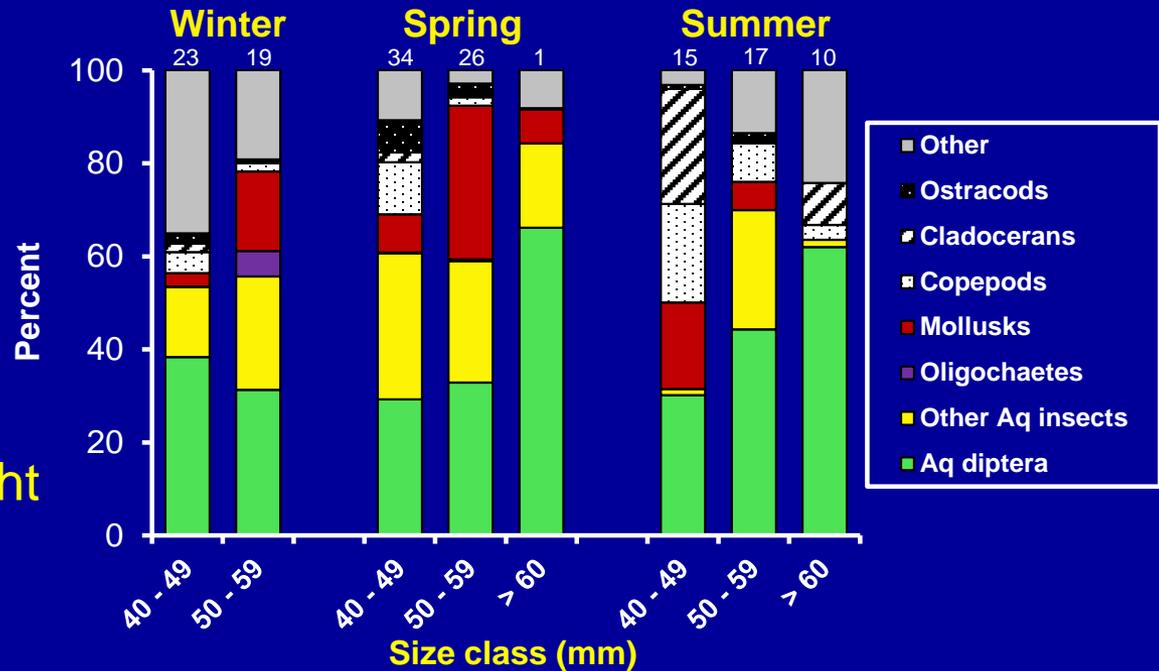


# Green Cove wetland

A) Percent by number



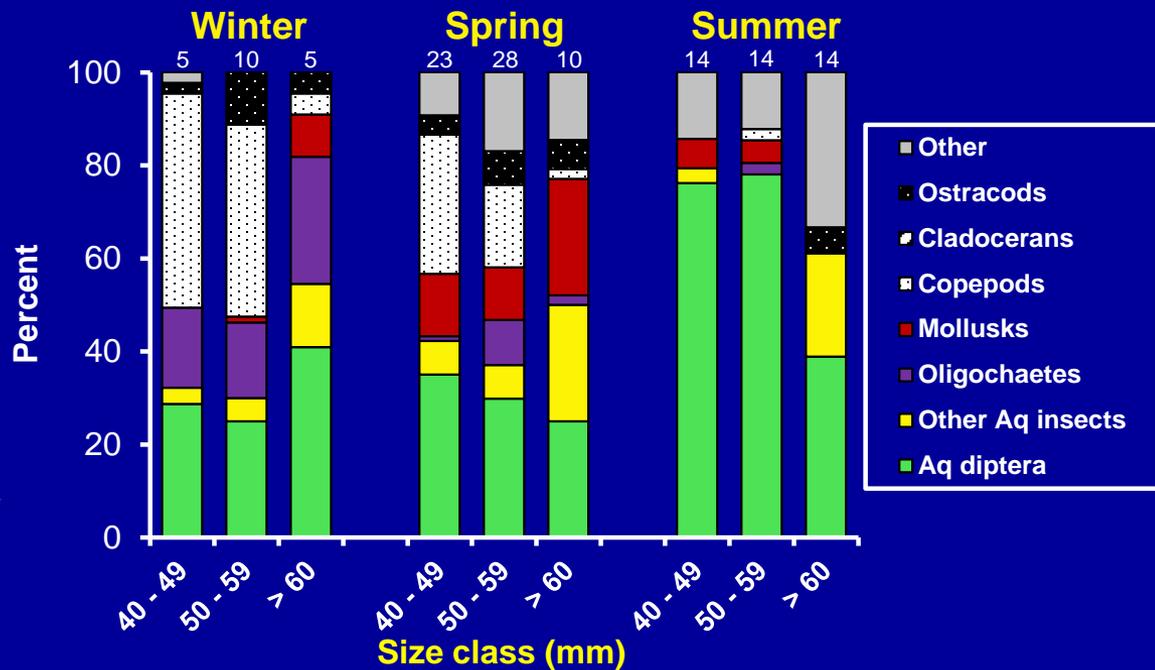
B) Percent by weight



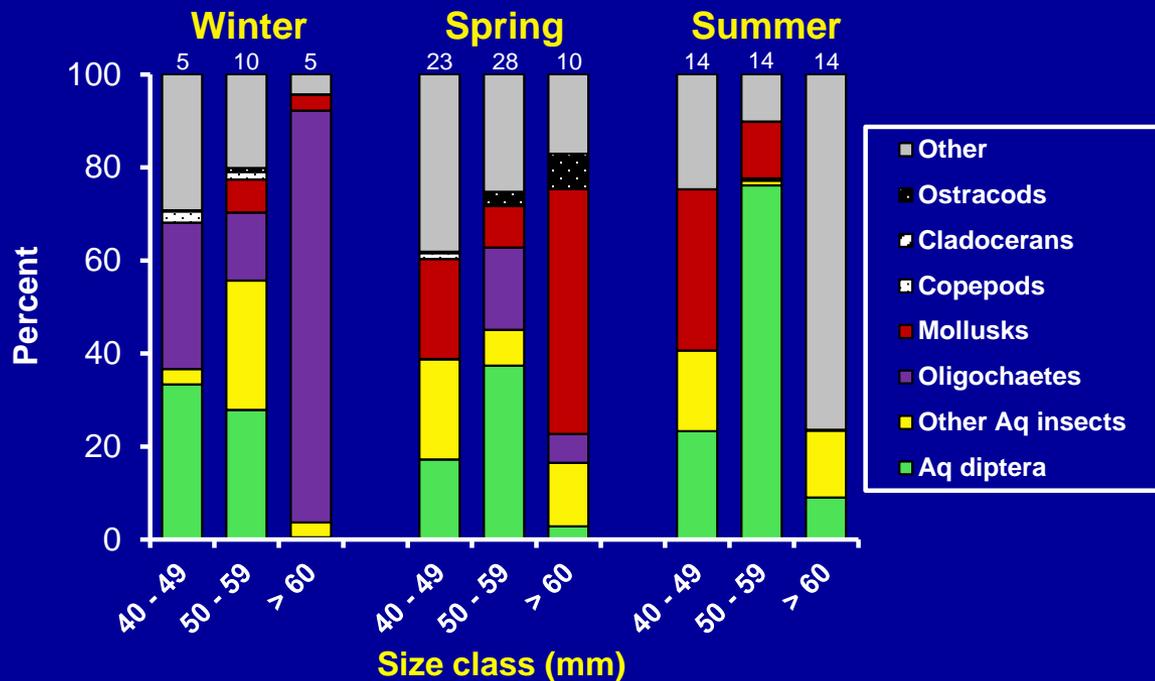
# Hopkins Ditch

Low gradient stream

A) Percent by number



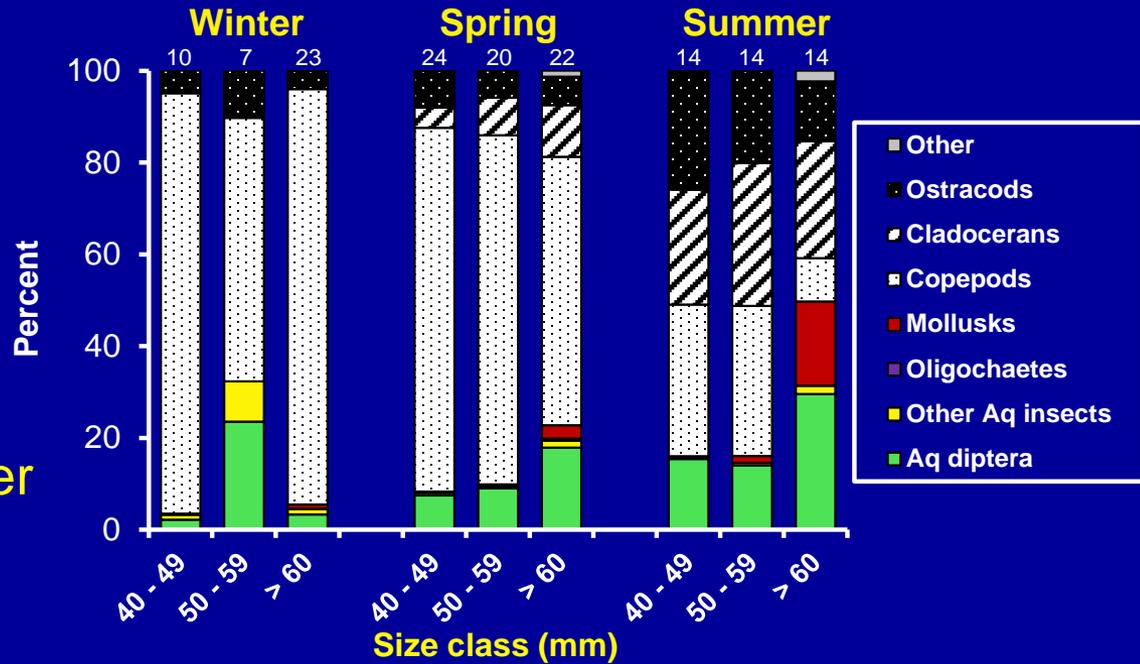
B) Percent by weight



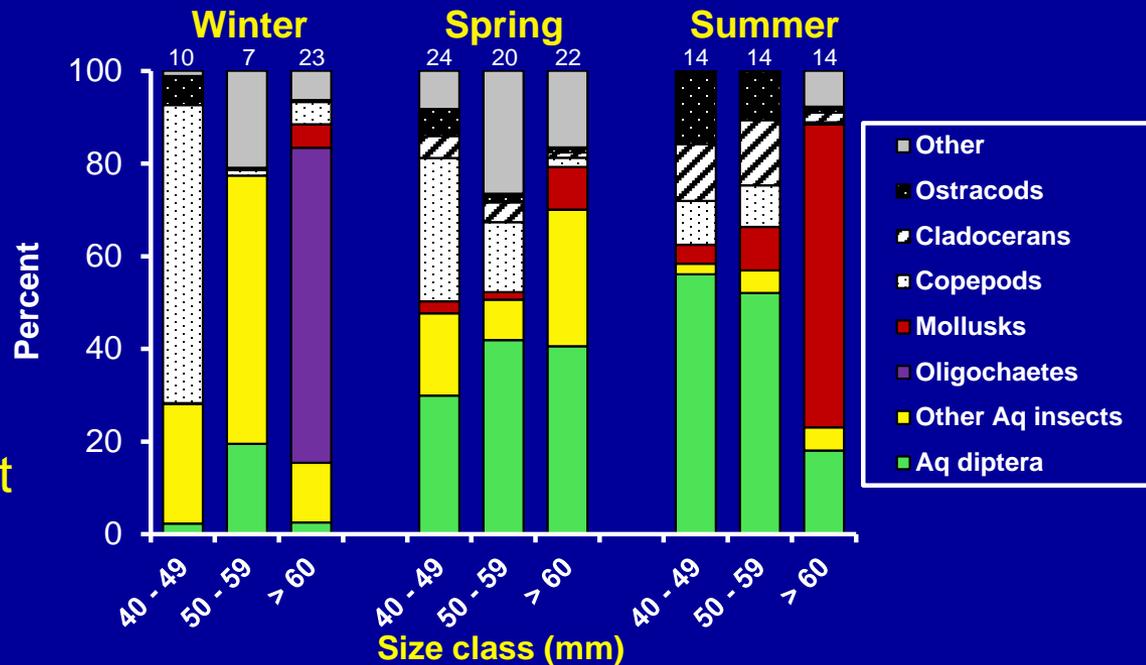
# Woodard Creek

Stormwater retention pond

A) Percent by number

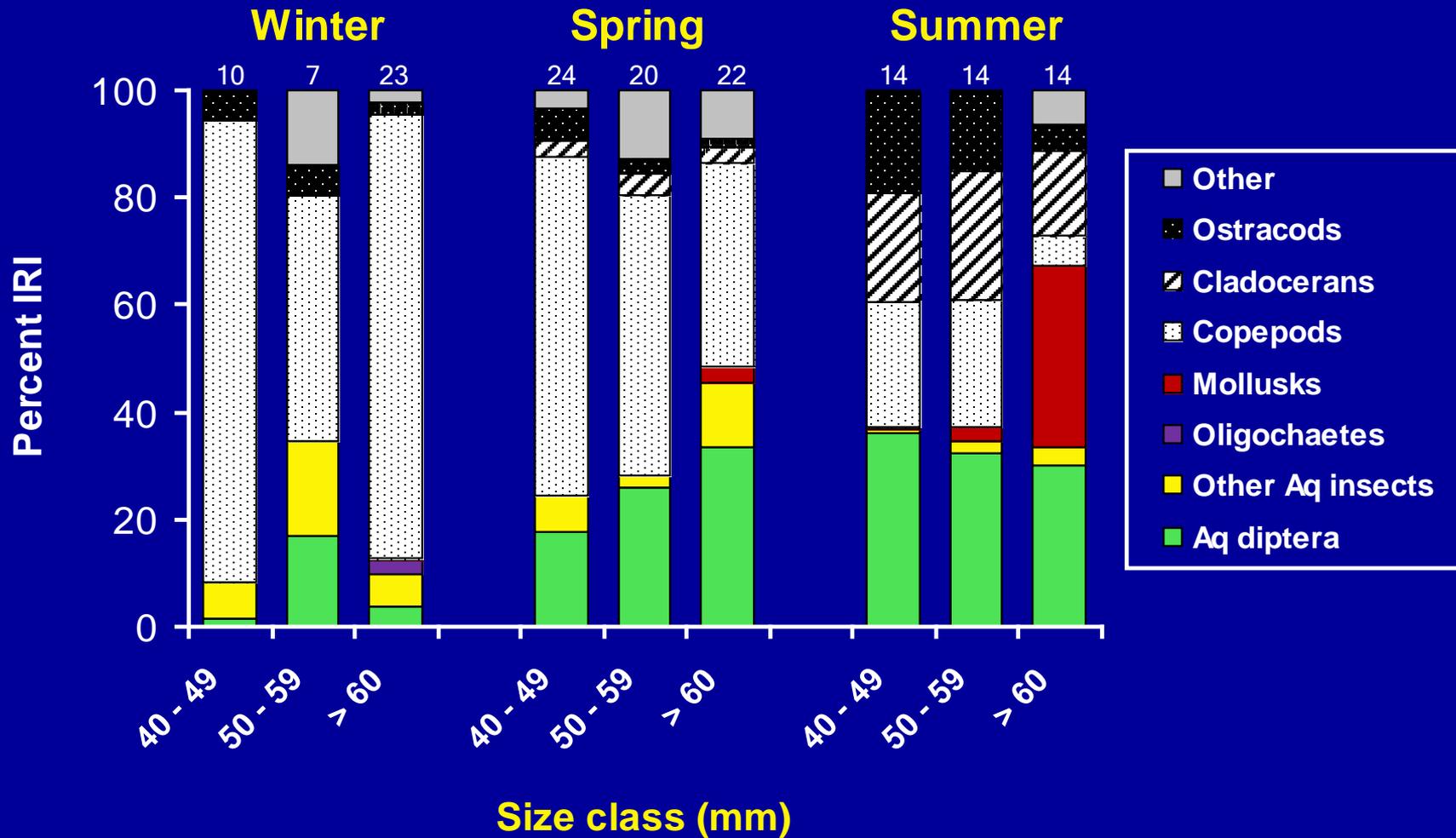


B) Percent by weight



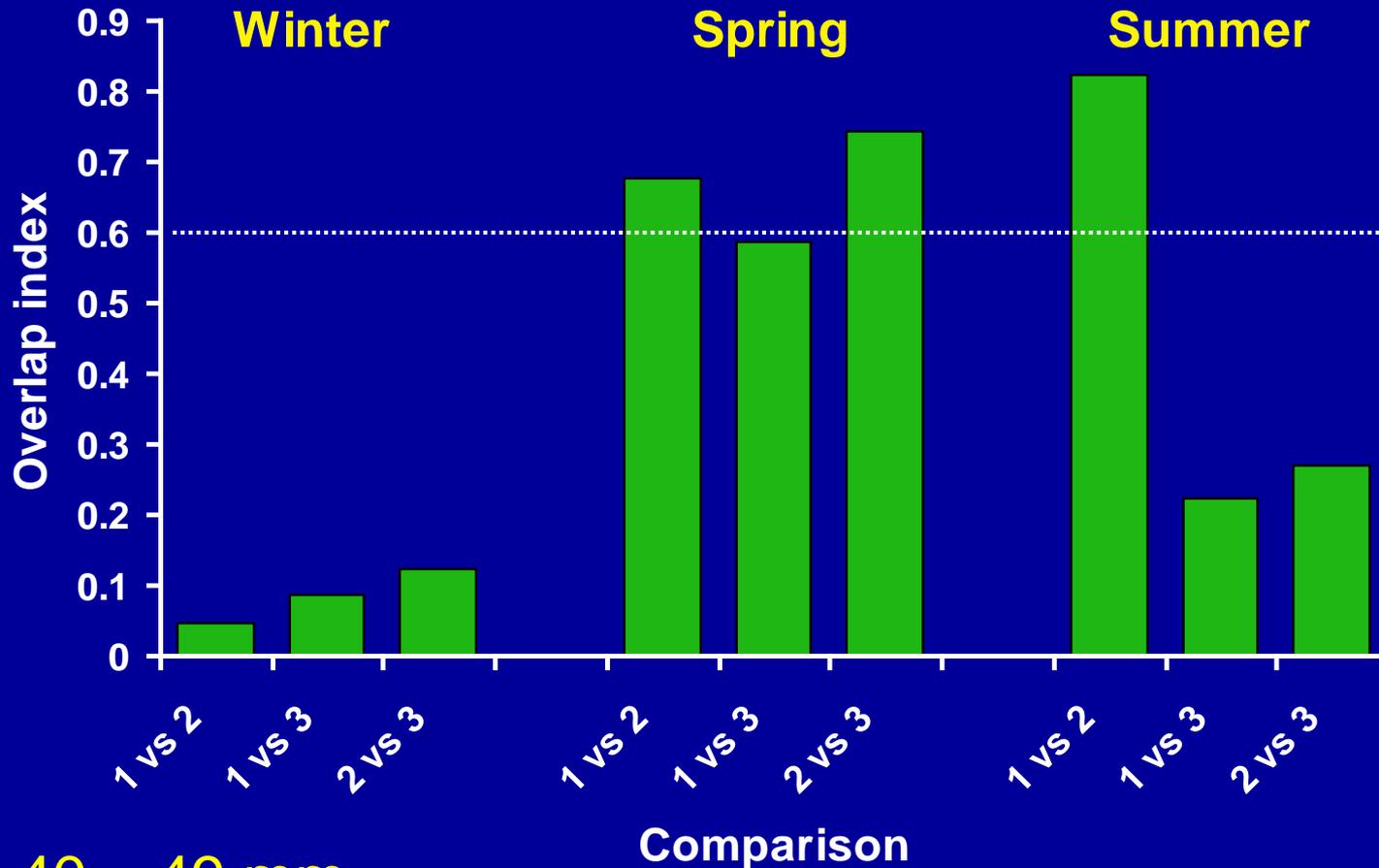
# Woodard Creek

## Index of Relative Importance



# Woodard Creek

## Size Class Comparisons - Diet Overlap Index



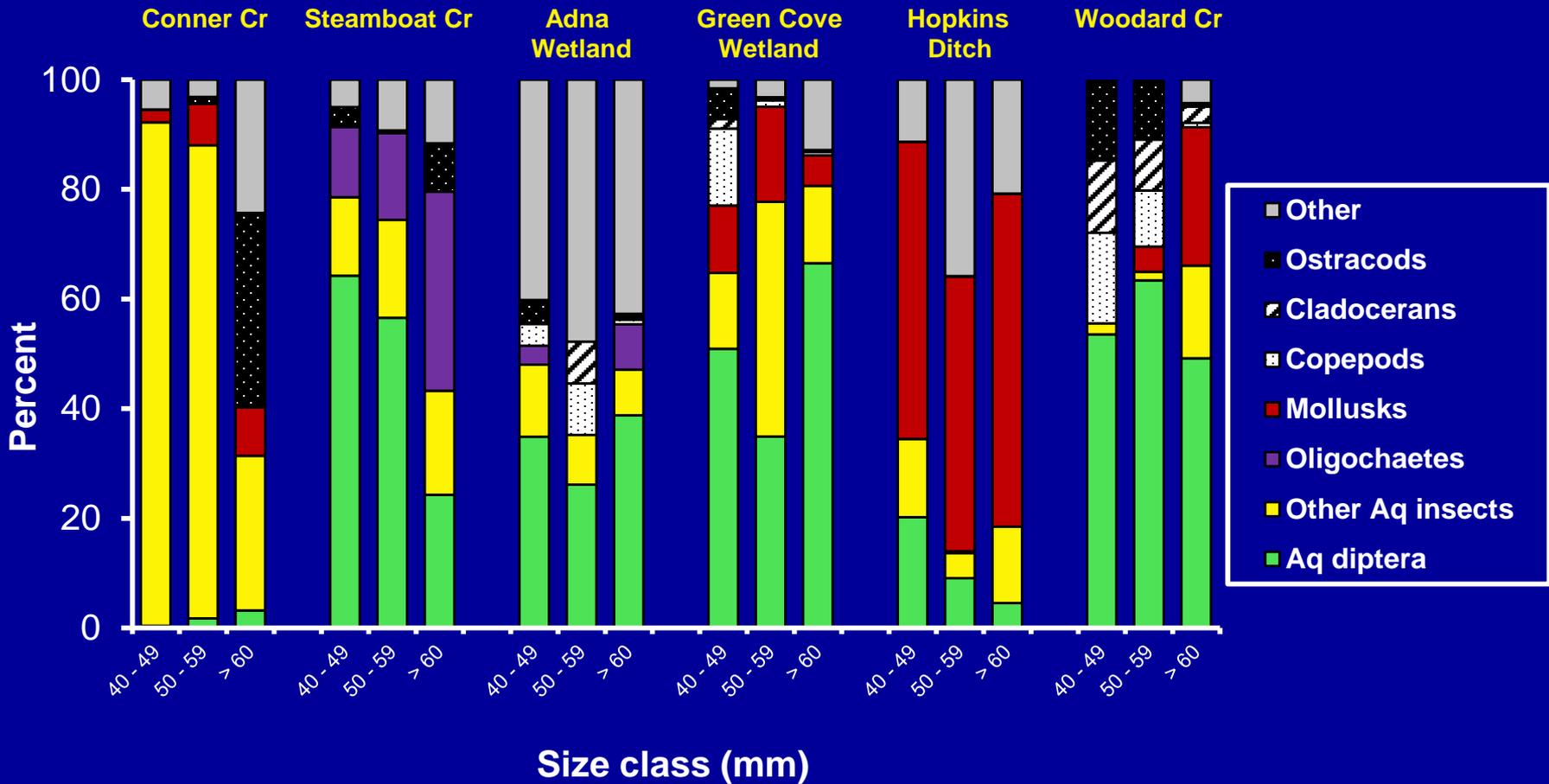
1 = 40 – 49 mm

2 = 50 – 59 mm

3 = > 60 mm

# Diet Composition – June-July 2012

## Percent by weight

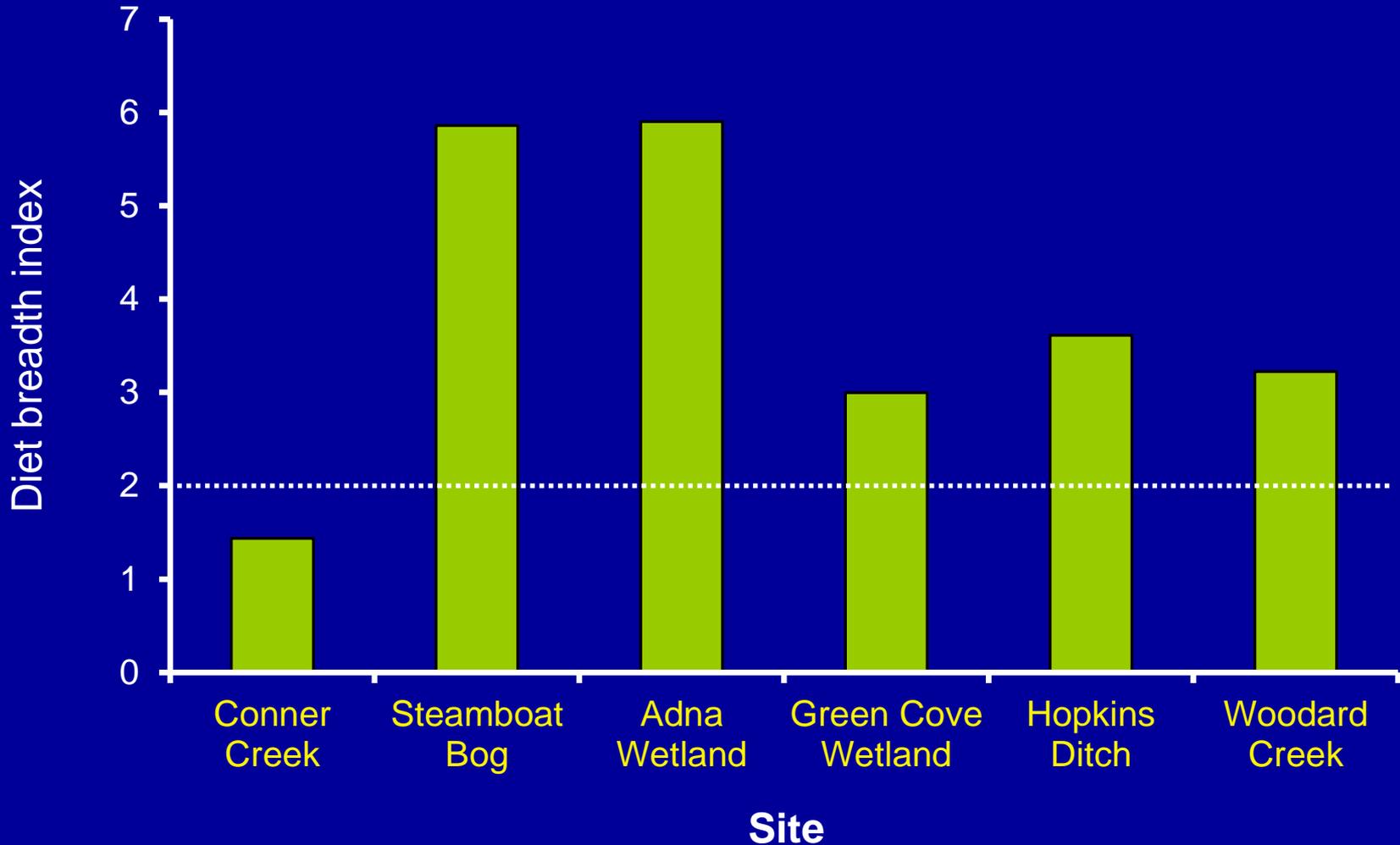


# Diet Overlap Index Values June-July 2012

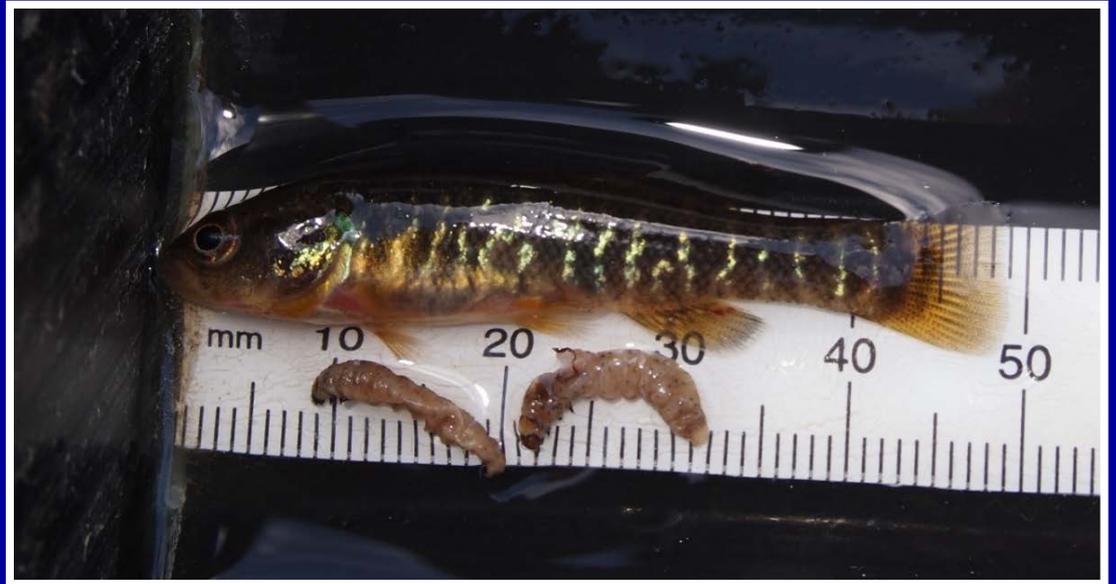
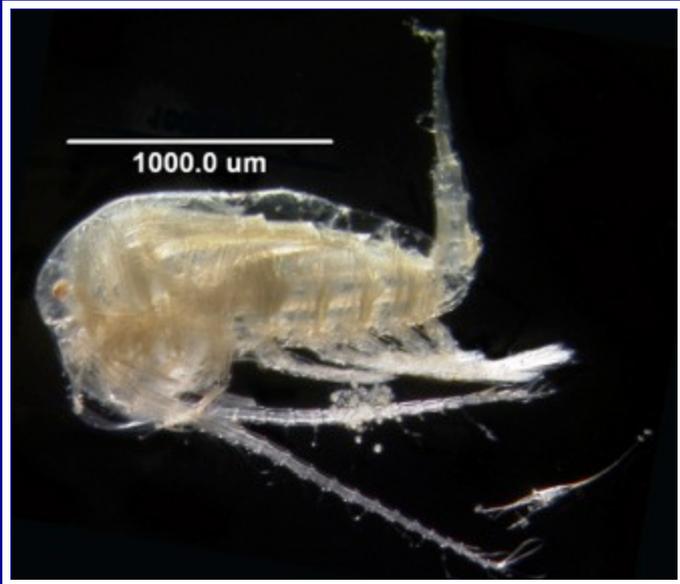
Site	Conner Cr	Steamboat Cr	Adna Wetland	Green Cove Wetland	Hopkins Ditch	Woodard Cr
Conner Cr						
Steamboat Cr	0.064					
Adna Wetland	0.035	0.354				
Green Cove Wetland	0.071	0.221	0.368			
Hopkins Ditch	0.102	0.141	0.158	0.290		
Woodard Cr	0.069	0.192	0.362	0.802	0.248	

Values > 0.6 indicate significant overlap

# Diet Breadth Index Values June-July 2012



# Variation in Prey Size



Observed prey size range: < 1 mm to 15 mm

# Consumption of Pests

- ◆ Mosquitoes (*Culicidae*)
- ◆ Biting Midges or No-see-ums (*Ceratopogonidae*)



# Consumption of Pests

## A) Culicidae – mosquitoes

- documented only at Woodard Creek in July and August

Month	Sample Size	Number observed	Percent of diet by weight
July	21	3	1.4
August	21	6	5.4

## B) Ceratopogonidae – biting midges (no-see-ums)

- documented at each site

Site - Month	Sample Size	Number observed	Percent of diet by weight
Green Cove wetland - May	20	47	2.8
Steamboat Creek bog - June	18	247	23.4

# Summary

- ◆ Mudminnow diet varied seasonally
- ◆ Mudminnow diet usually varied from site to site
- ◆ Diet often varied with fish size
- ◆ Prey size varied widely
- ◆ Overall, mudminnow appear to an opportunistic feeder

# Summary

- ◆ Consumption of mosquitoes was observed at one site during the summer
- ◆ Because mudminnow can be locally abundant, they may be beneficial in reducing the abundance of some pests

