

# Trophic interactions in a seasonally-open estuary in south-western Australia

by

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# Outline

- Seasonally-open estuaries: Wilson Inlet
  - Complementary methods to dietary analyses: guts, stable isotopes, fatty acids
  - Implications of findings & management recommendations



# Introduction

## Background

- Bar-built estuaries
- Commercial fishery
- Recreational fishers
- Catchment modifications
- Eutrophication
- Management implications



# Aims

- To characterise the food web in Wilson Inlet using three complementary techniques

Resolution of  
prey species



**Stomach contents**  
**Fatty acid markers**  
**Stable isotopes**

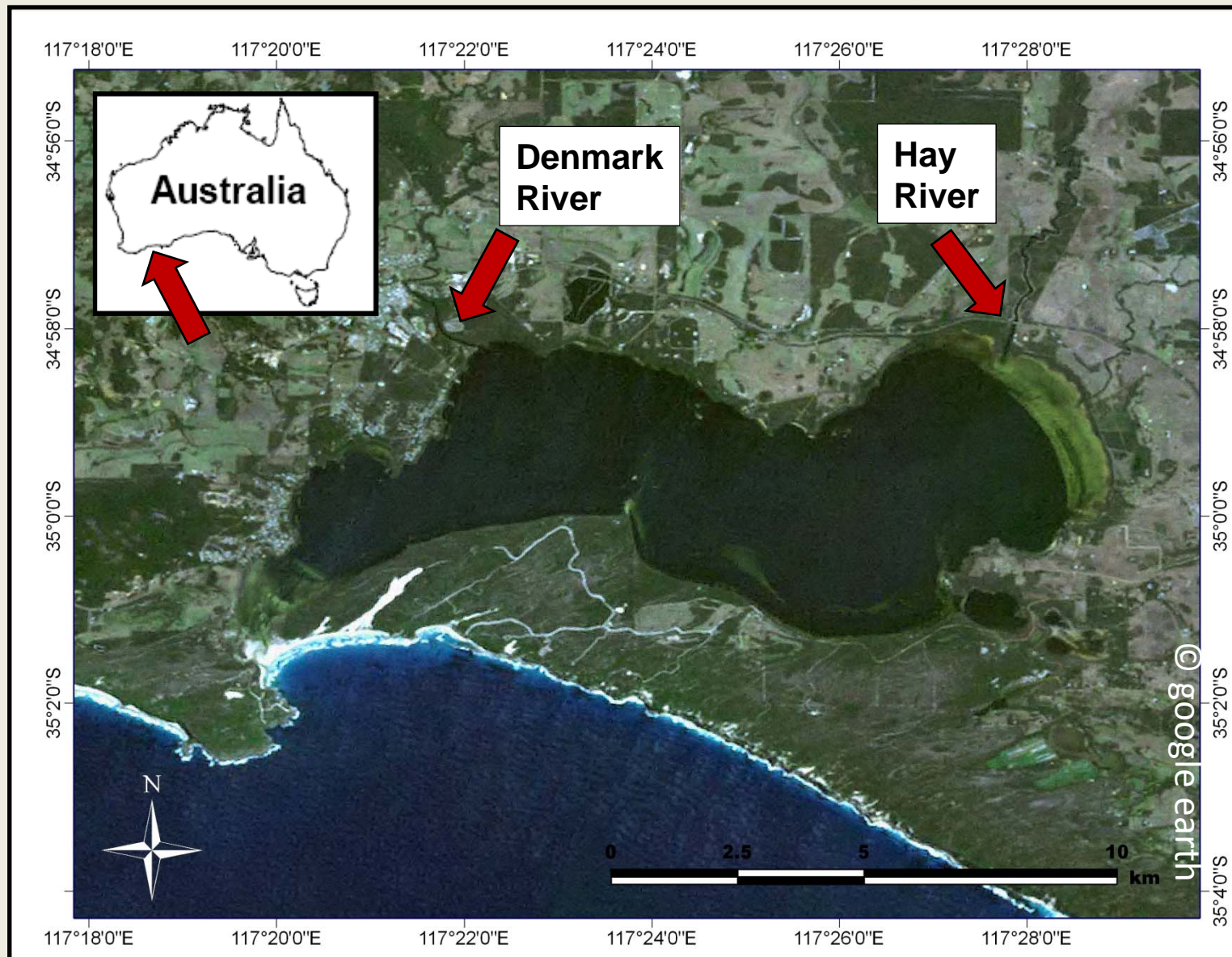


Reflection of  
feeding history

- To identify markers of feeding mode
- To understand feeding niche separation between three abundant species of teleost



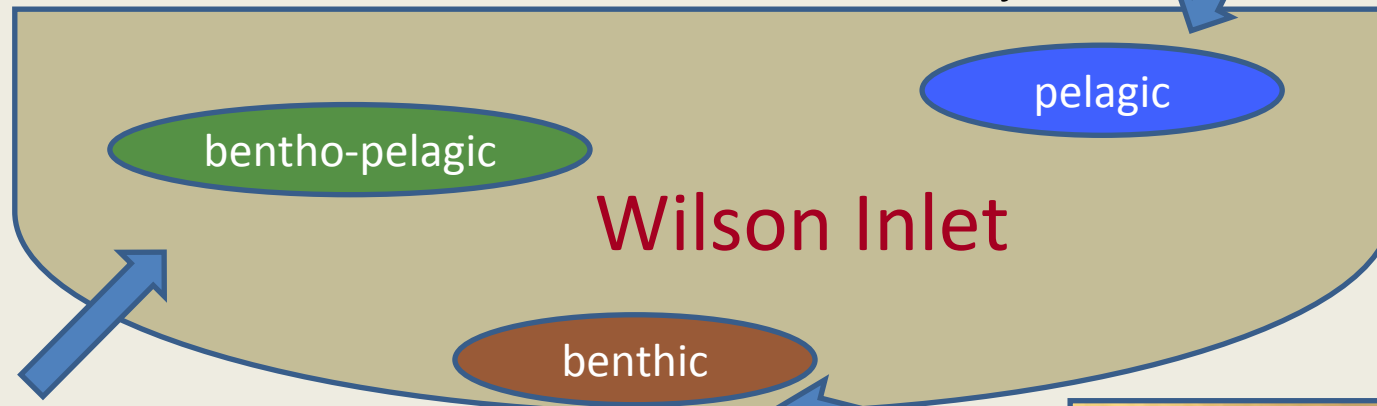
# Study area and sampling regime



# The predators



*Leptatherina wallacei*  
(Atherinidae)  
Wallace's Hardyhead

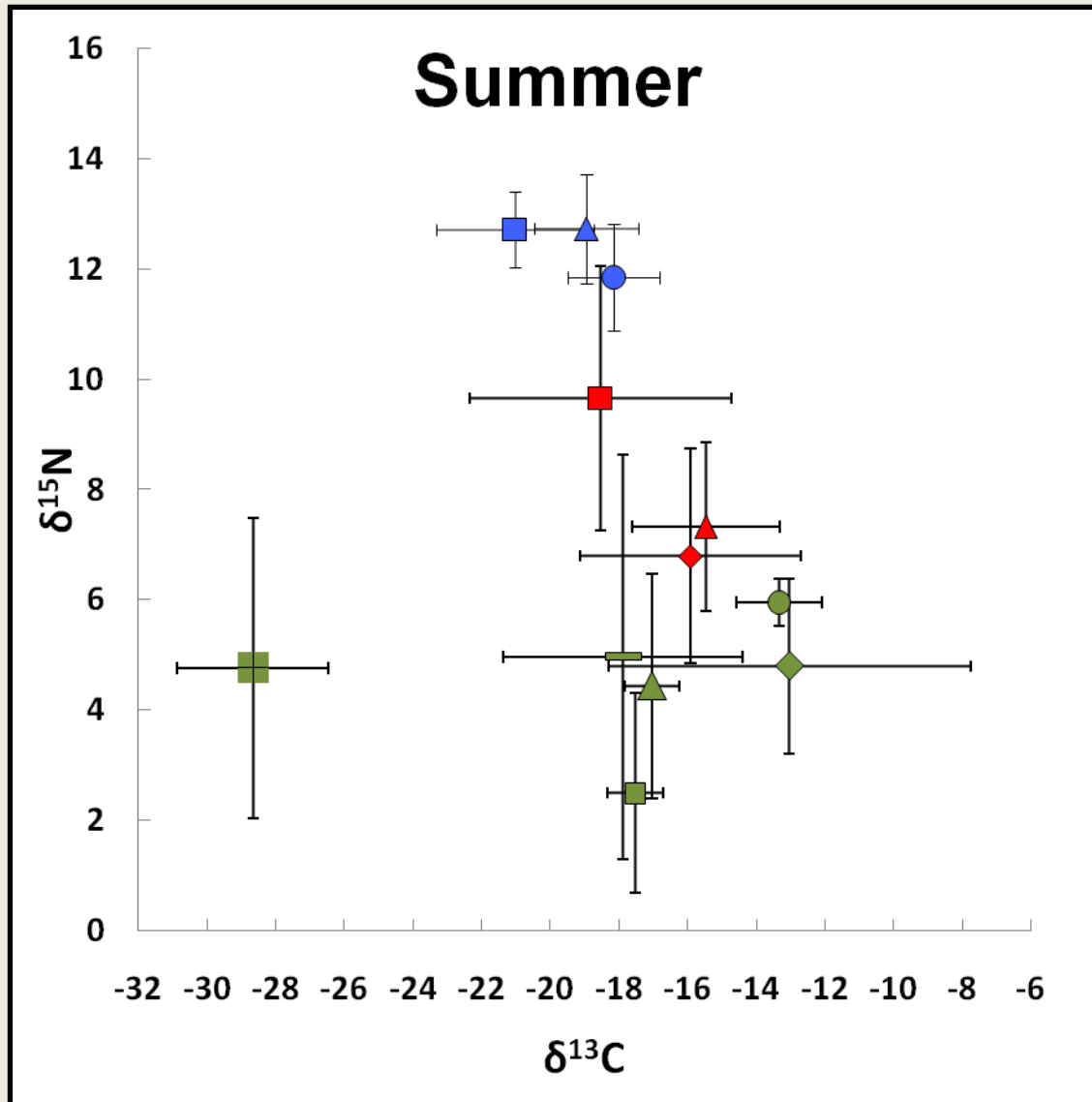


*Acanthopagrus butcheri* (Sparidae)  
Black Bream



*Pseudogobius olorum* (Gobiidae)  
Bluespot Goby

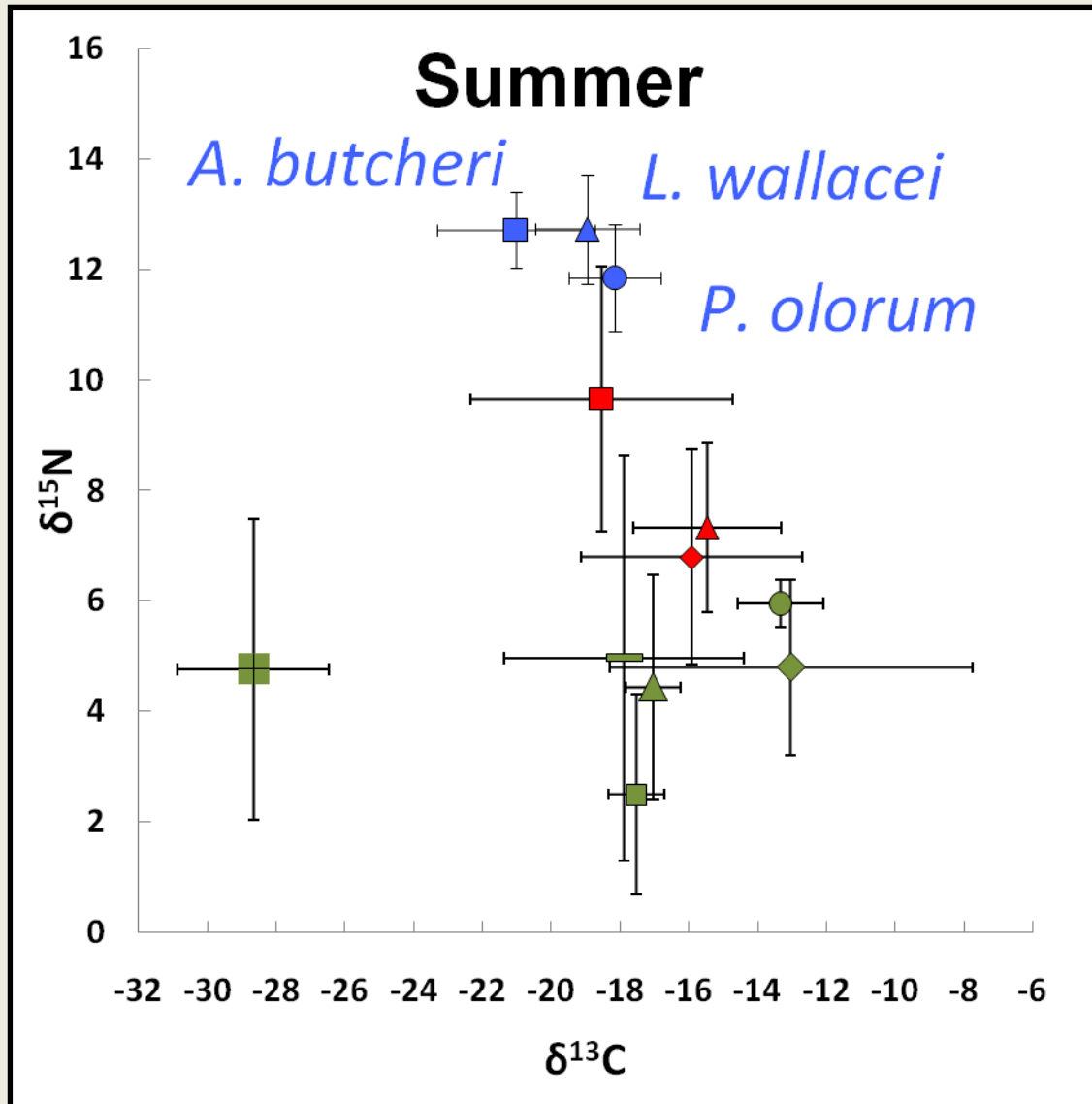
# Stable Isotopes – trophic level



- Similar  $\delta^{15}\text{N}$   
→ similar trophic level

How do they partition their resources?

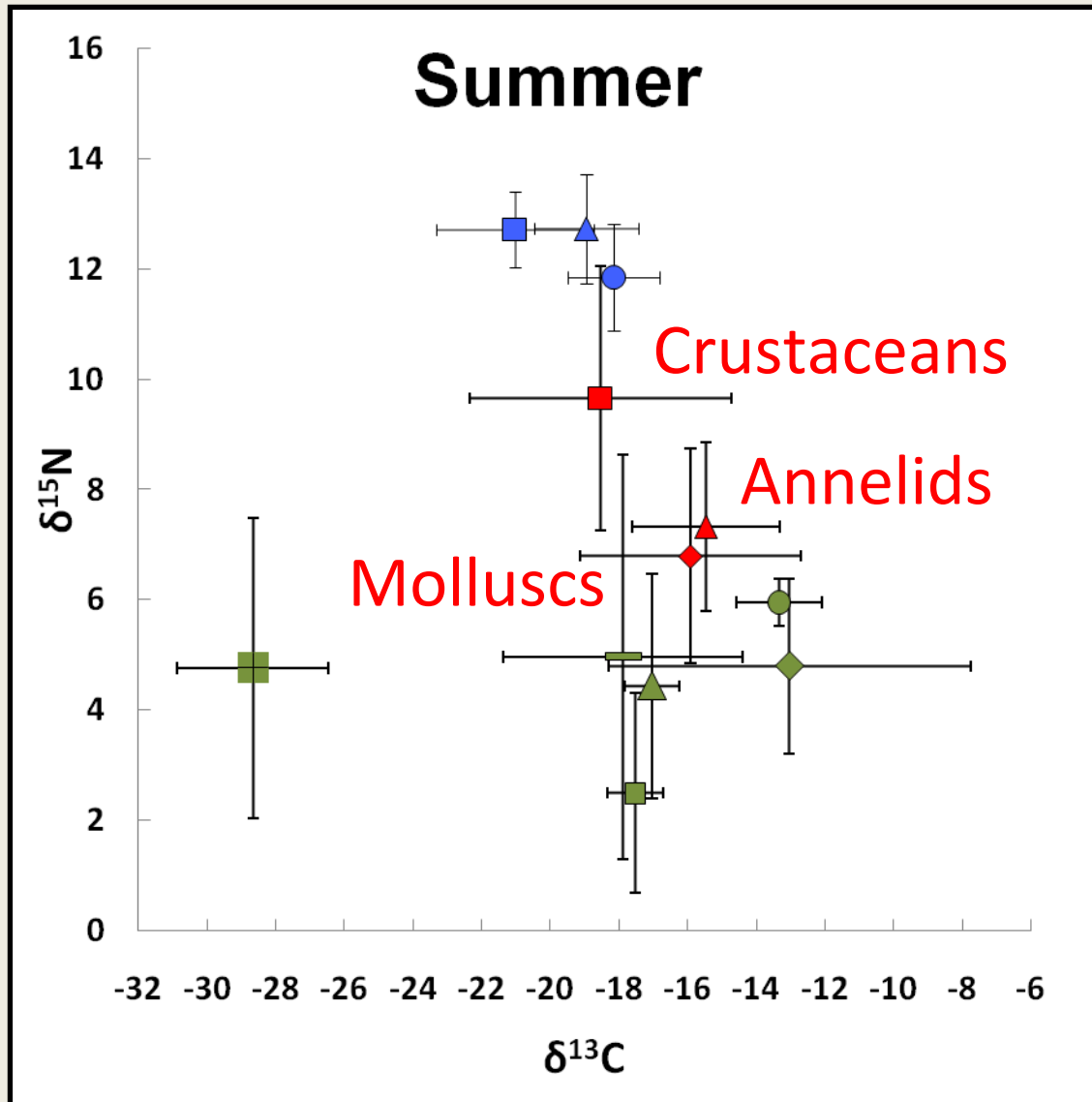
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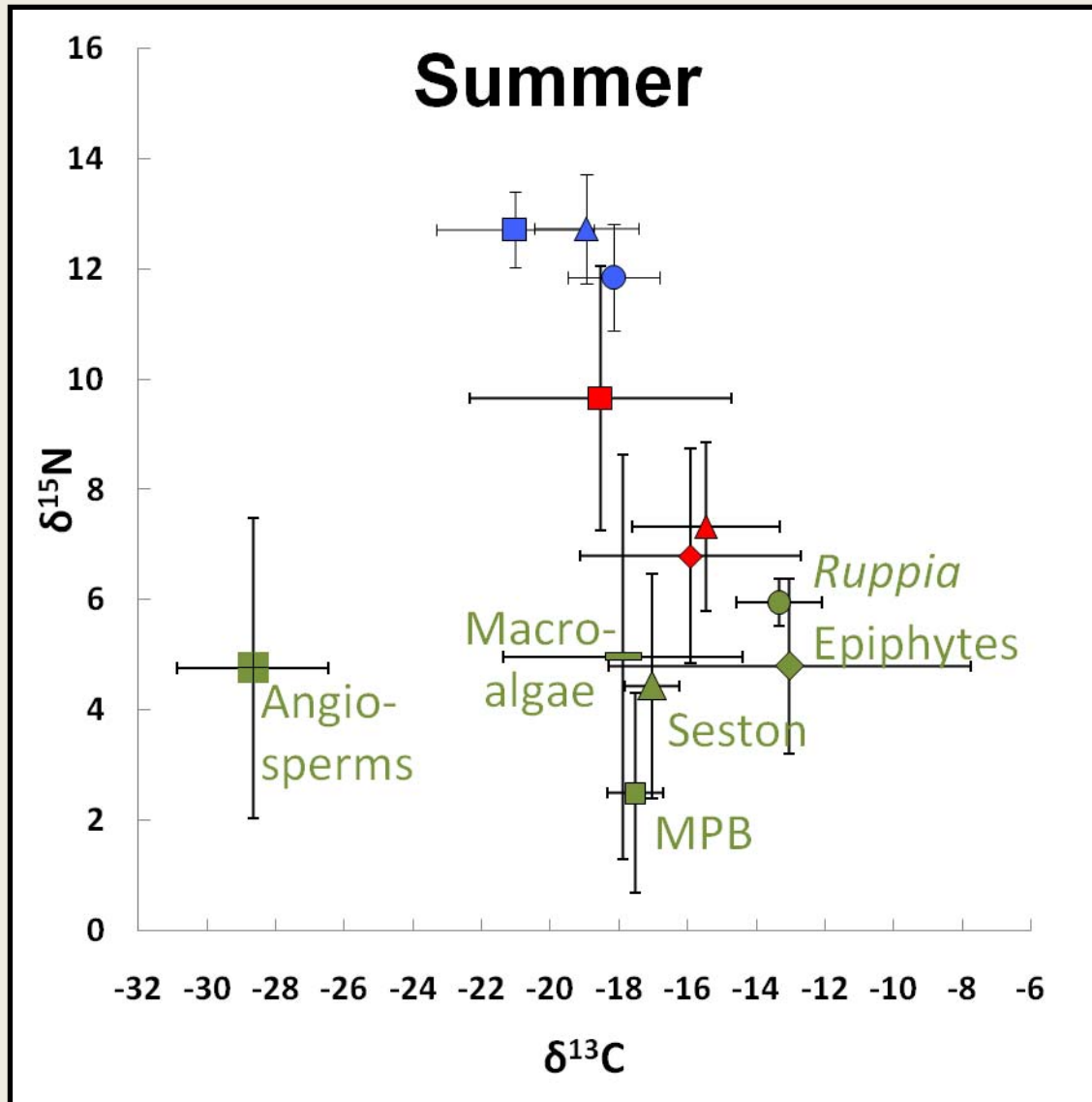
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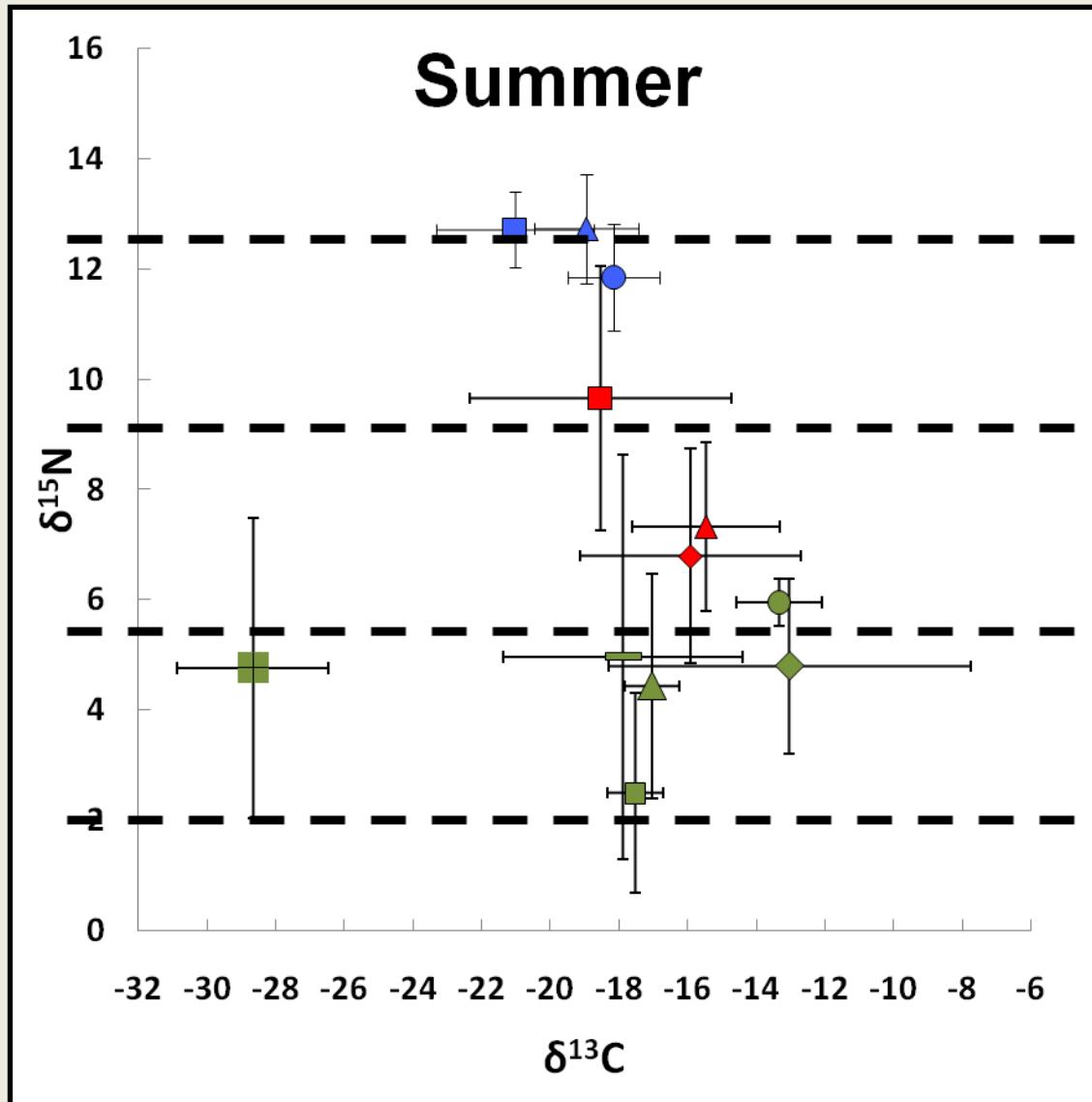
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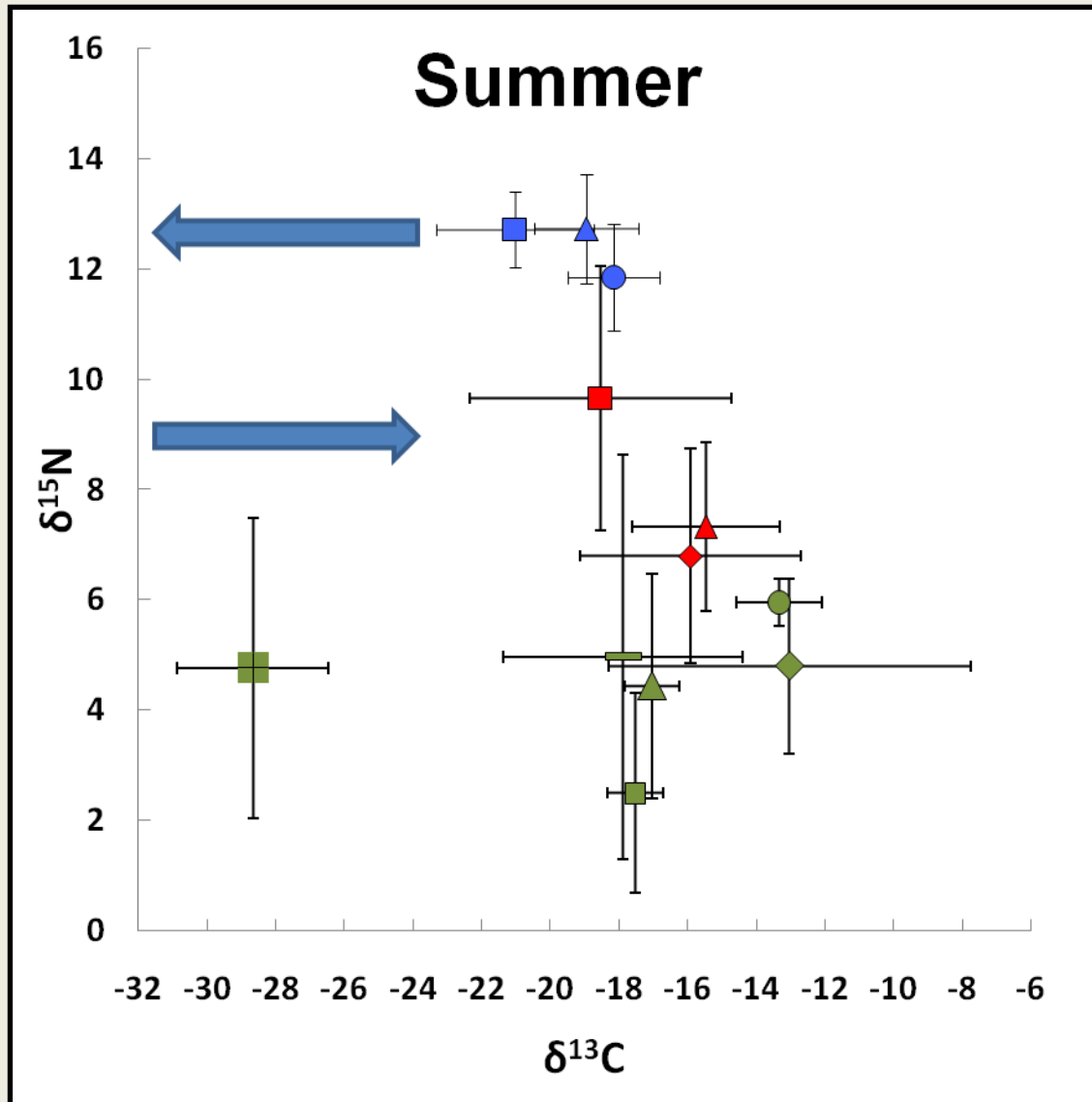
# Stable Isotopes – trophic level



- Similar  $\delta^{15}\text{N}$   
→ similar trophic level  
→ Primarily carnivorous

How do they partition their resources?

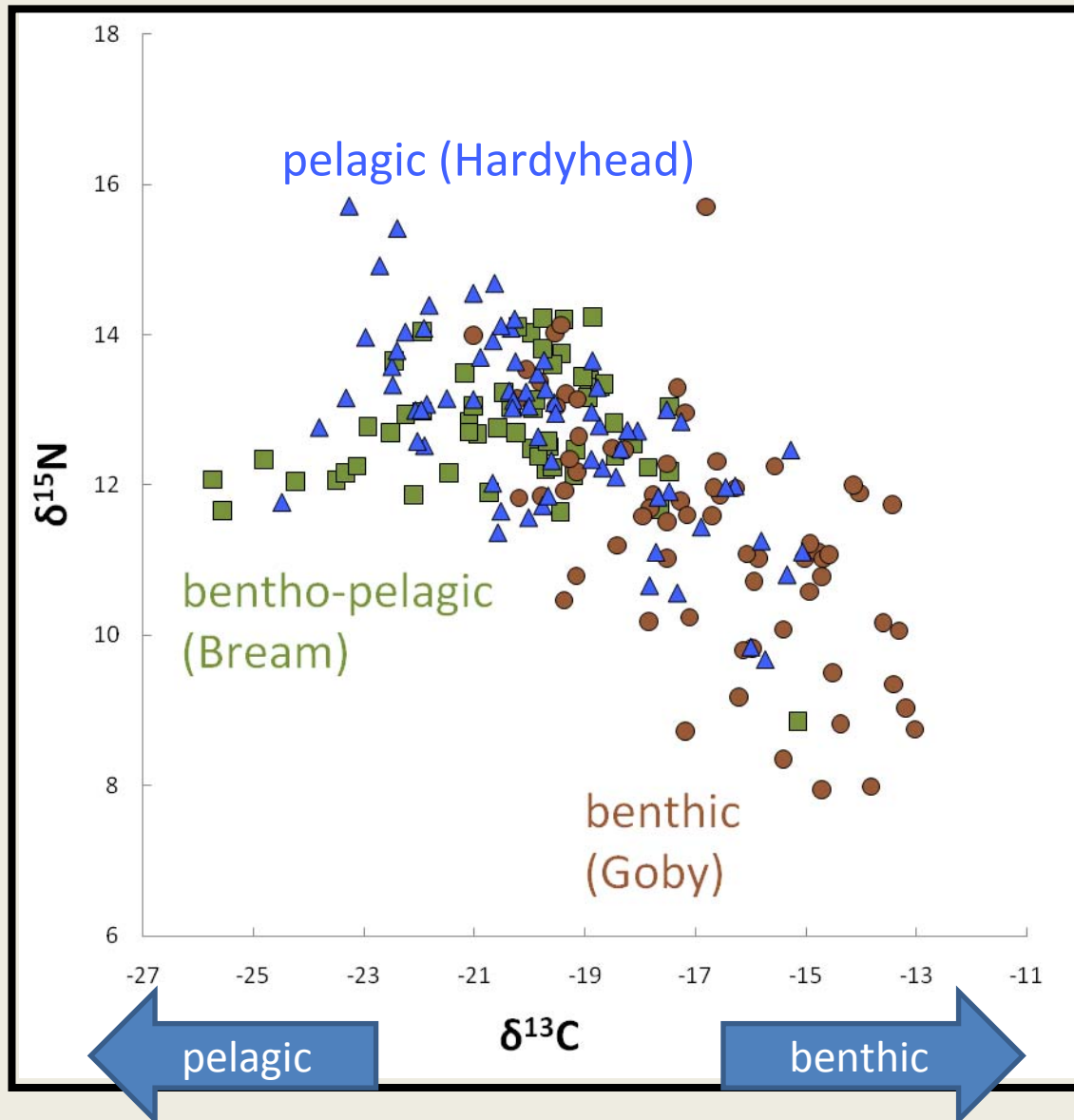
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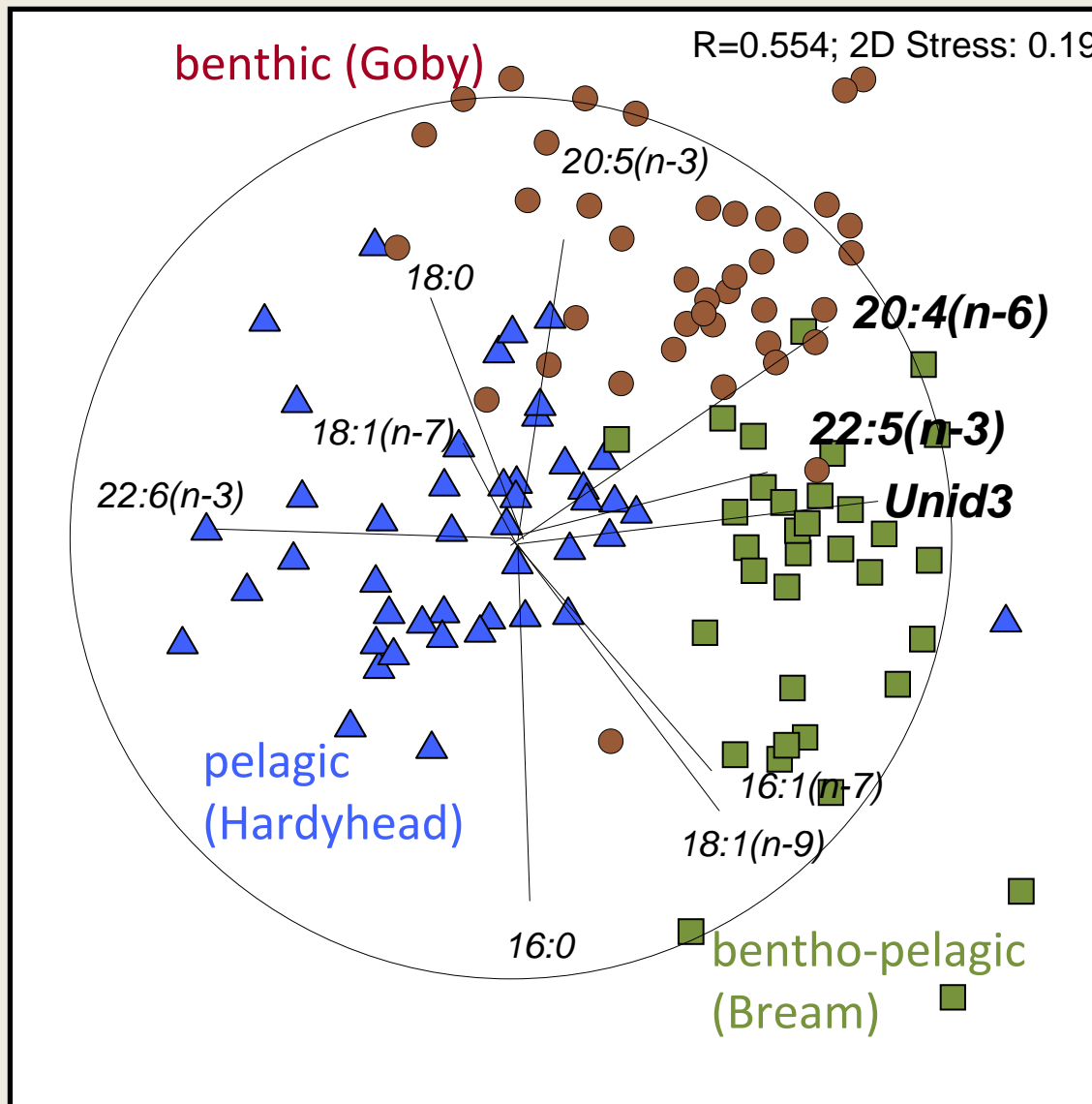
How do they  
partition  
their resources?

# Stable Isotopes – food source



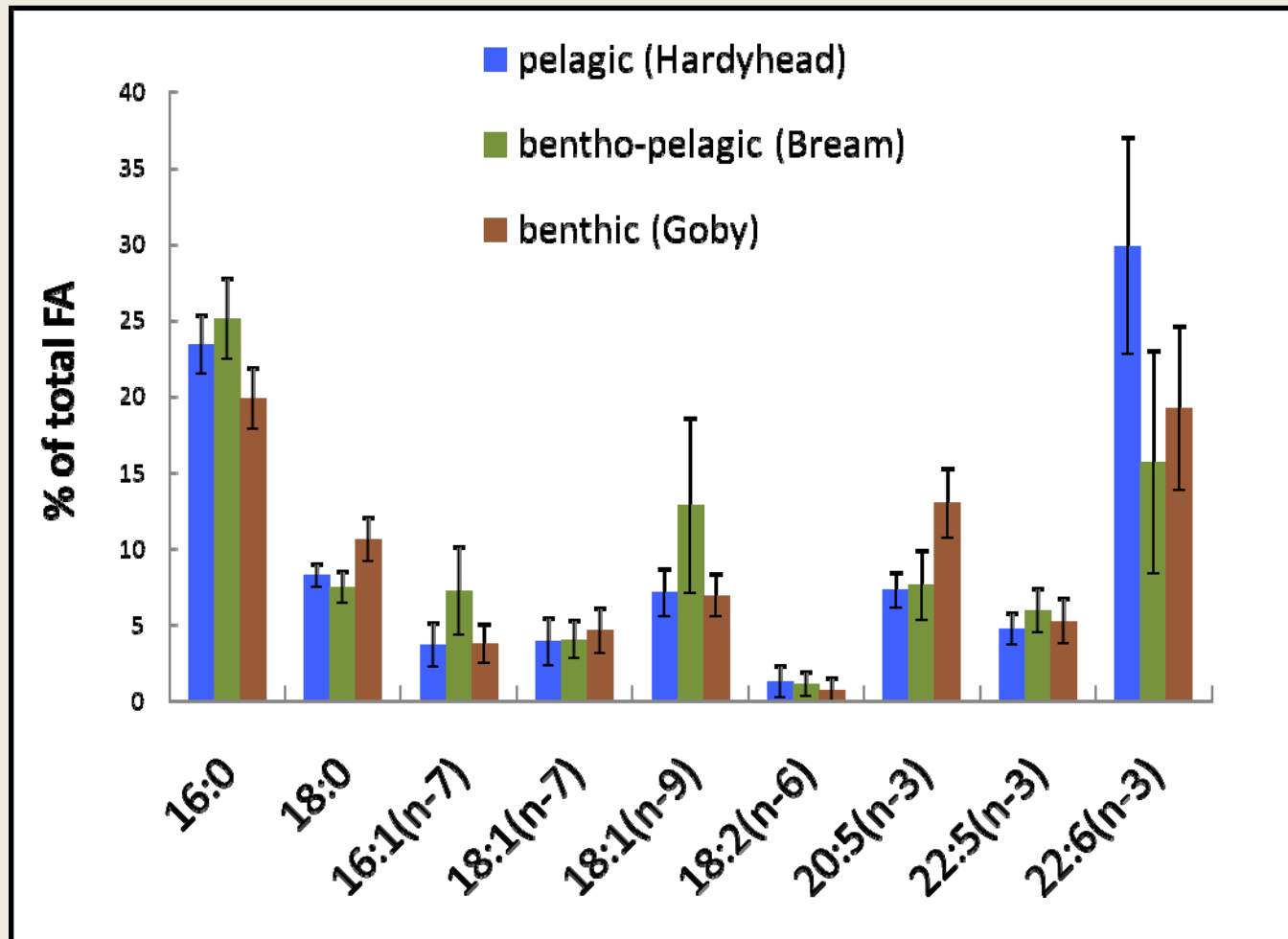
- Greater influence of pelagically-derived carbon in the benthic-pelagic and pelagic feeders
- Differences in the FA pattern?

# Fatty acid markers – trophic niches



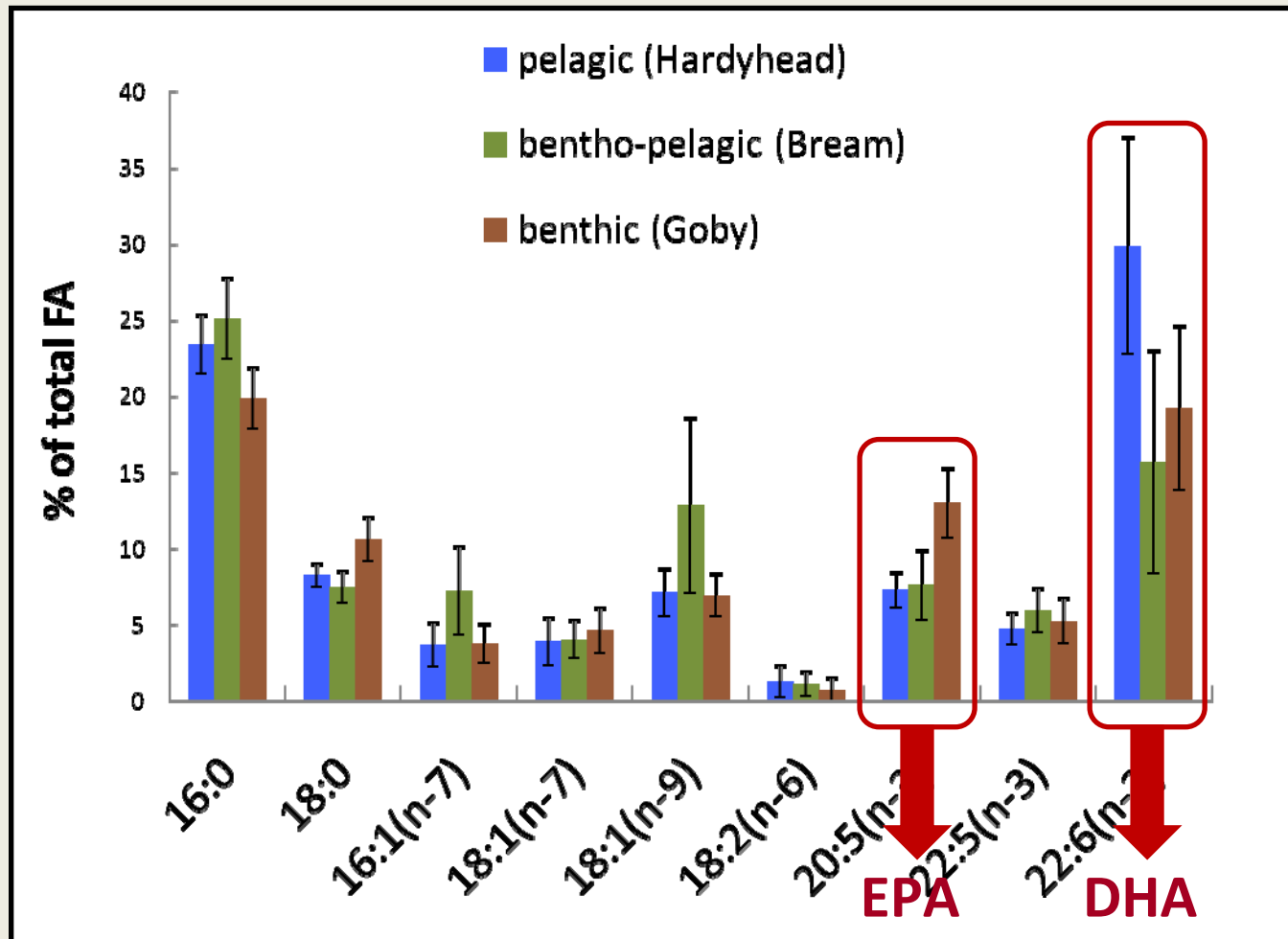
- Clearer separation than isotopes
- 3 feeding modes quite distinct
- Highest correlation is  $20:4(n-6)$  – produced by microalgae

# Fatty acid markers – trophic niches



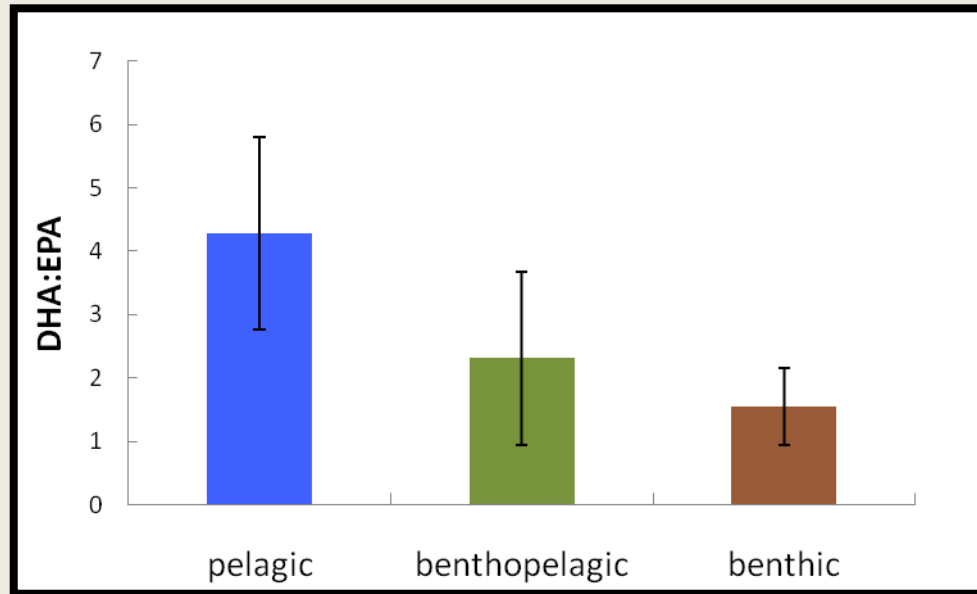
- No typical markers like 16:1(n-7) – Phytoplankton or C18 PUFA's – Dinoflagellates

# Fatty acid markers – trophic niches



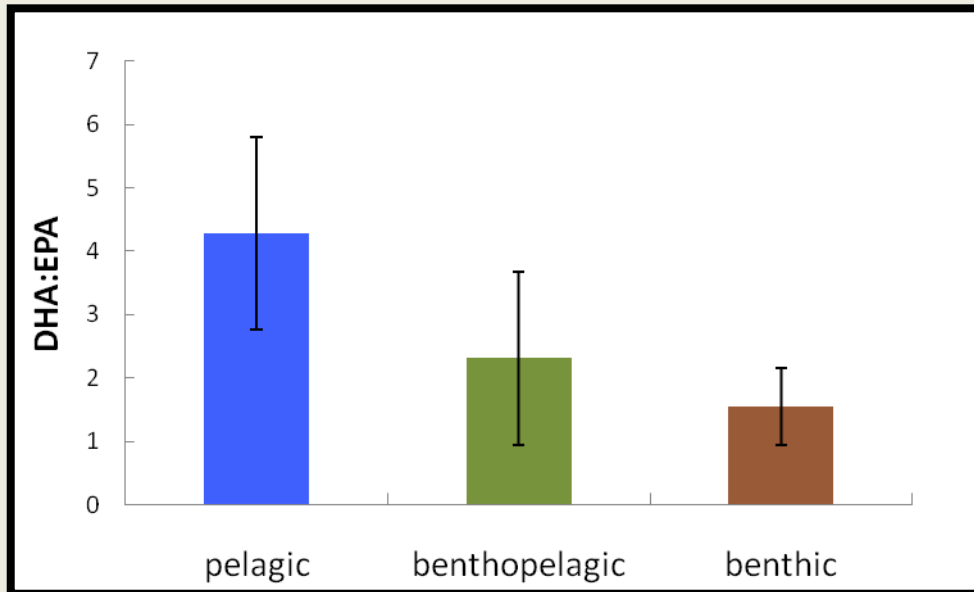
- Significant differences in 20:5(n-3) – EPA and 22:6(n-3) – DHA

# DHA:EPA ratio – useful as marker?



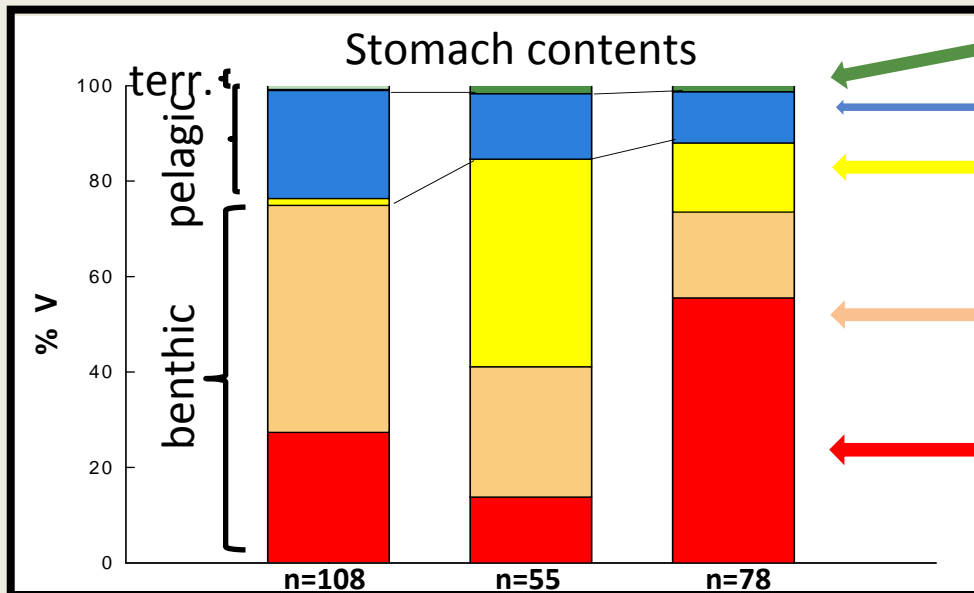
- Decrease in DHA:EPA ratio
- Both components of membrane lipids

# DHA:EPA ratio – useful as marker?



## Stomach contents

- Species mainly differ in contribution of pelagic prey



insects

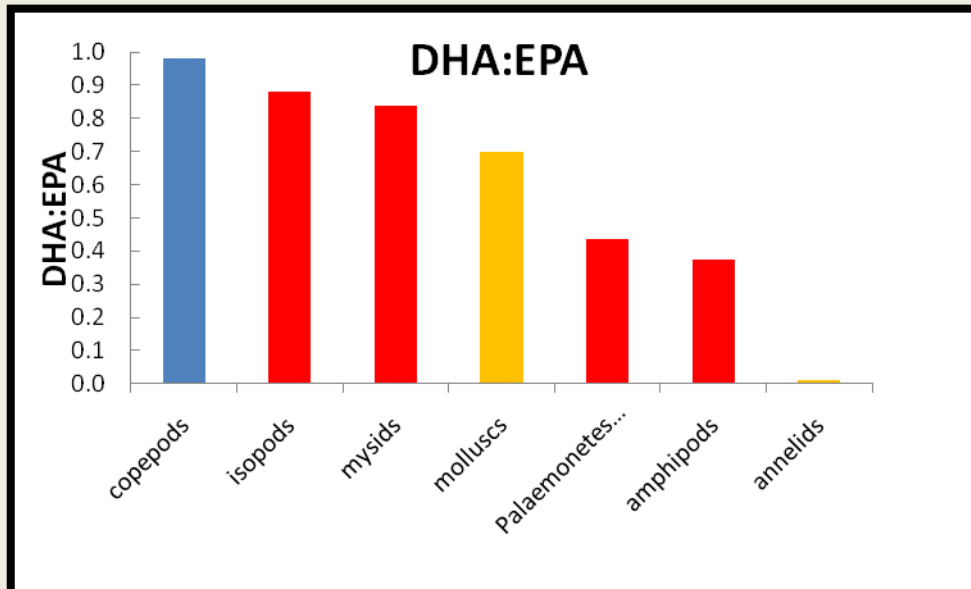
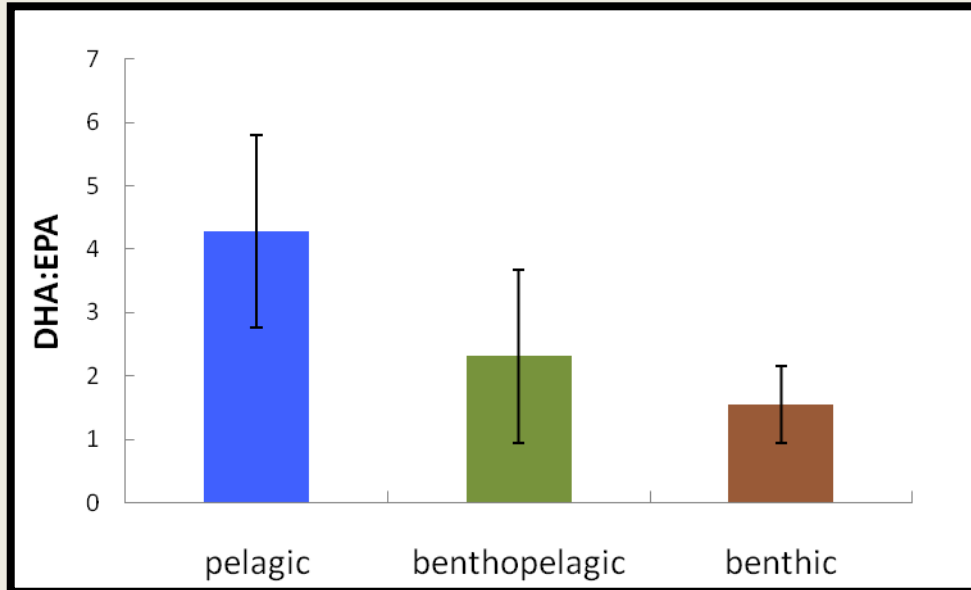
copepods & teleosts

micro & macroalgae

annelids  
molluscs

amphipods  
decapods

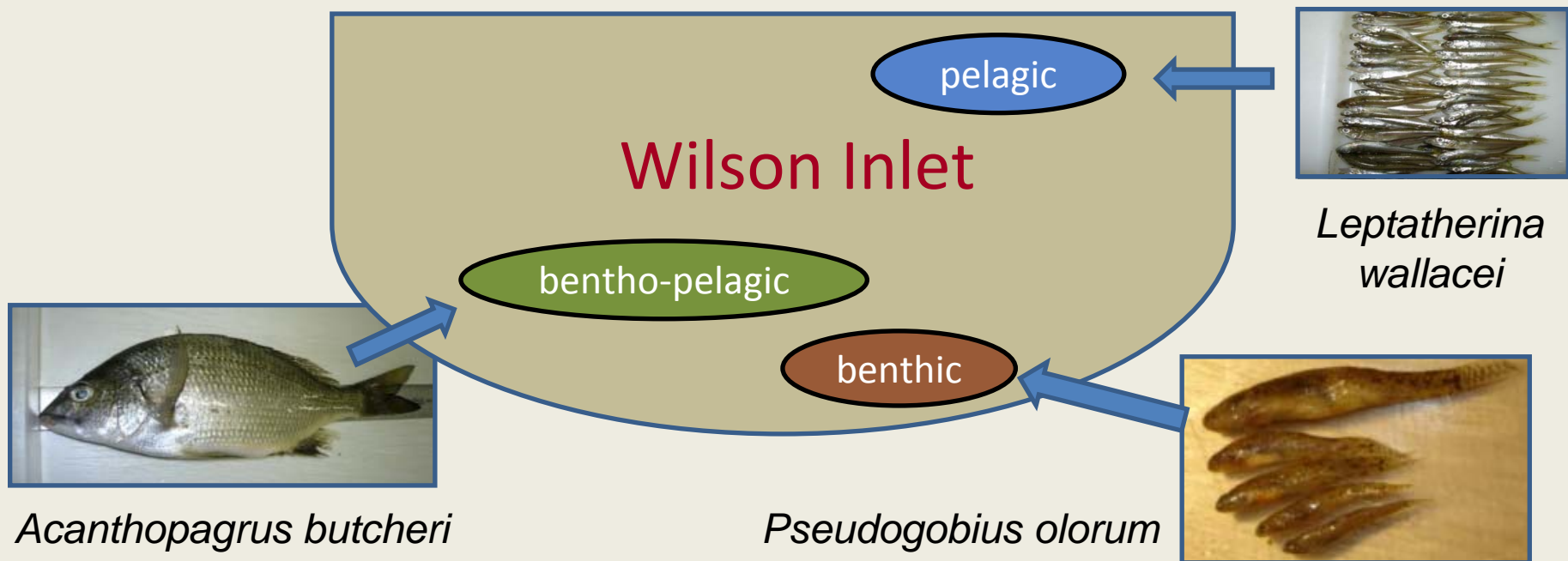
# DHA:EPA ratio – useful as marker?



- DHA accumulates with trophic level

# Conclusions I

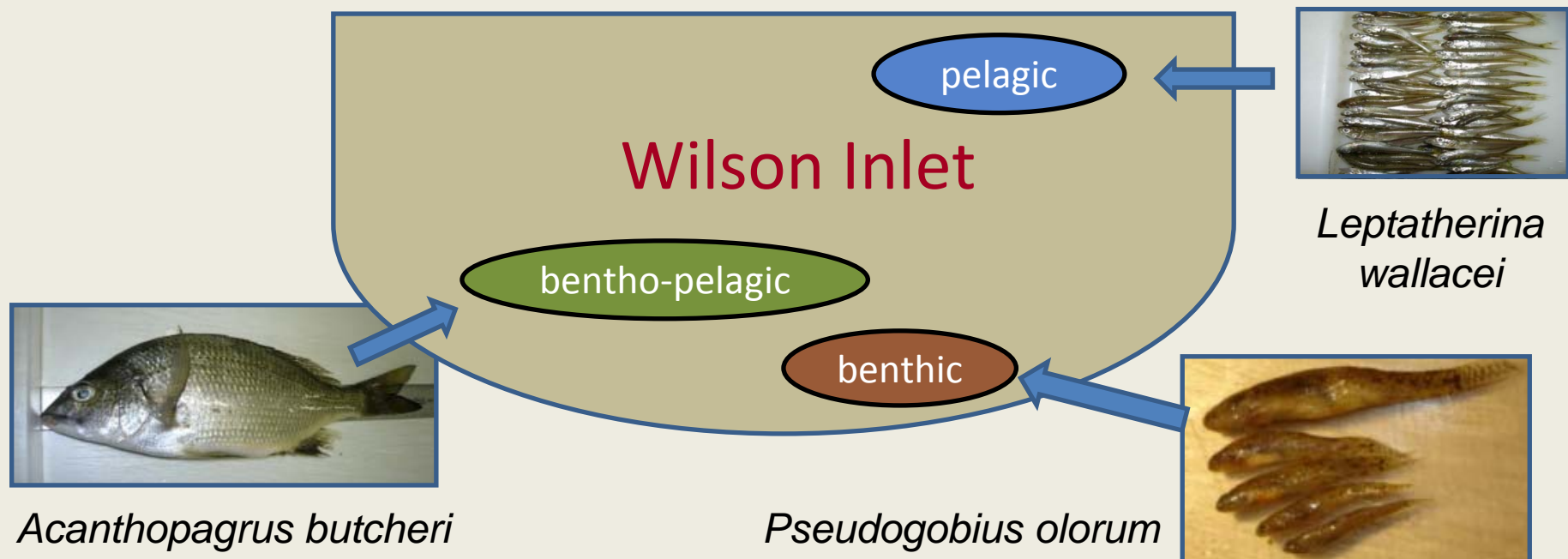
Trophic niche separation:



# Conclusions I

## Trophic niche separation:

- Stable isotopes:
  - Similar trophic level: primarily carnivorous
- Fatty acids and stomach contents:
  - Resource partitioning with overlaps reflected in both methods

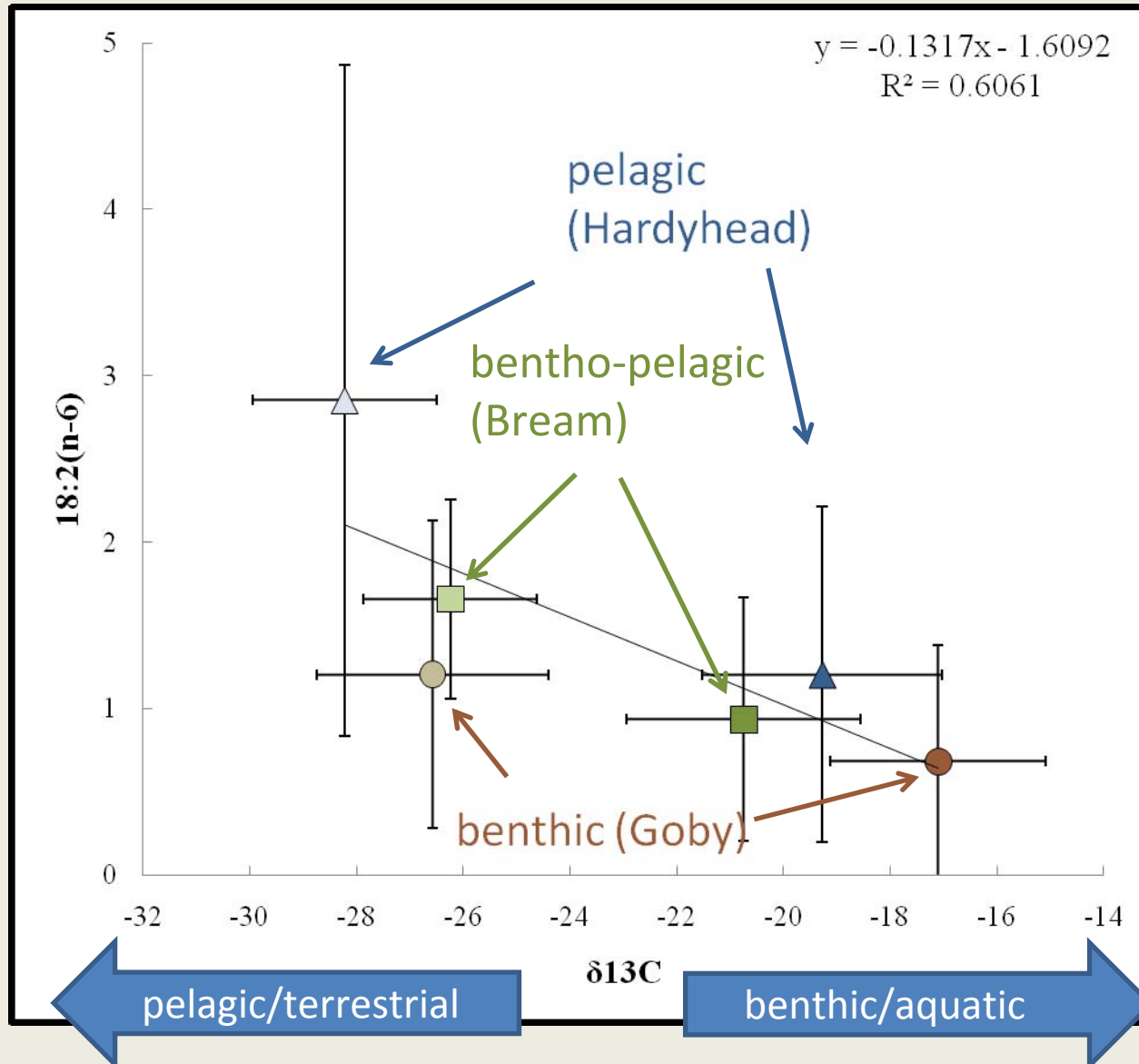


# Conclusions II

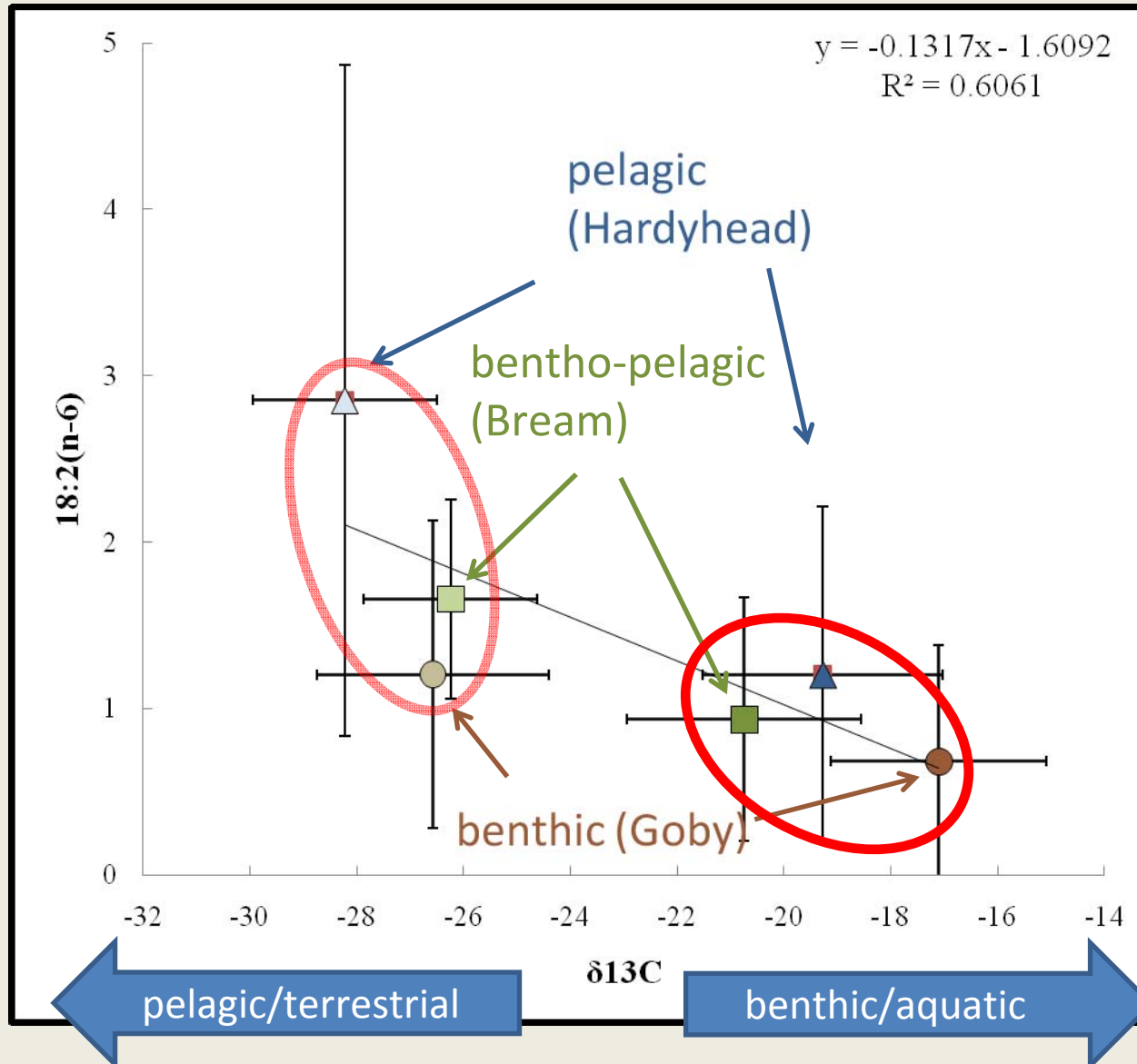
- No typical FA markers found – indicates diverse feeding modes by all species, BUT
  - **DHA:EPA ratio** decreases from pelagic to benthic predator and prey species
  - apparently related to food sources
- **Accumulation of DHA** with trophic level, BUT further research is needed to determine whether this is a good trophic marker



# Comparison between Swan and Wilson



# Comparisons between Swan and Wilson



- 18:2(n-6): terrestrial marker
- Higher influence in the Swan
- Carbon source differs
- Higher influence of aquatic sources in Wilson Inlet

# Management value

This study provides the following:

- Trophic level of Black Bream in the food chain of the Swan Estuary and Wilson Inlet
- The main sources of organic material for the three species studied
- A basis for assessing environmental changes in the future
- Crucial data for quantitative and qualitative modelling of the two estuarine systems



# Acknowledgements

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Fellow Fishgroup members



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marine science institution



Universität Hamburg



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