# Community Structure and Trophic Function of Deep-Reef Fish and Invertebrate Communities in the Gulf of Mexico

**Amanda W. J. Demopoulos, USGS**

**Steve Ross, UNCW**

**Ken Sulak, USGS**

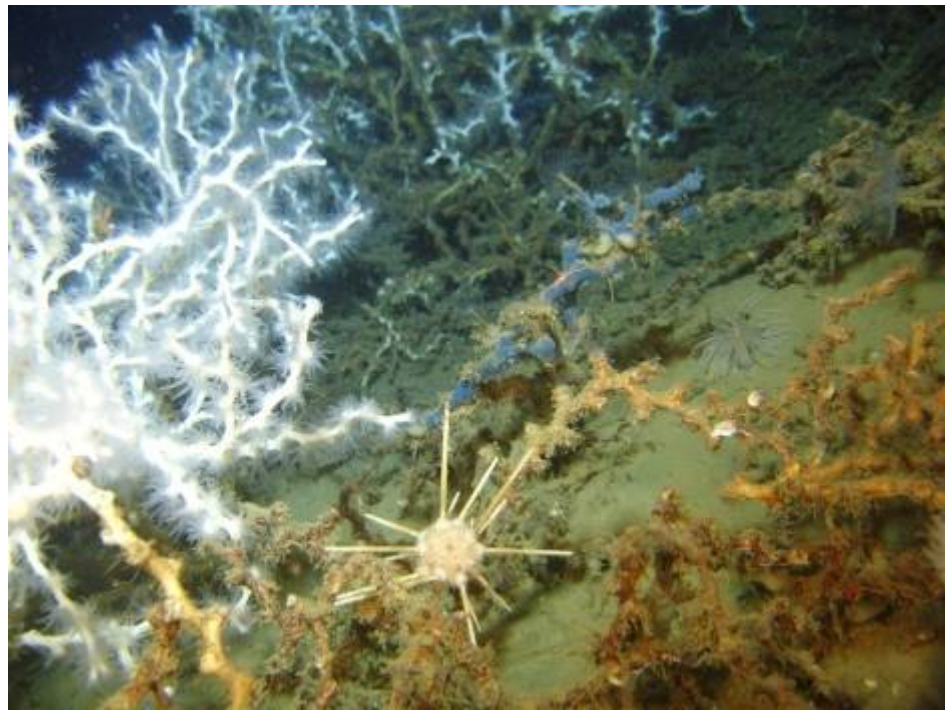
U.S. Department of the Interior
U.S. Geological Survey

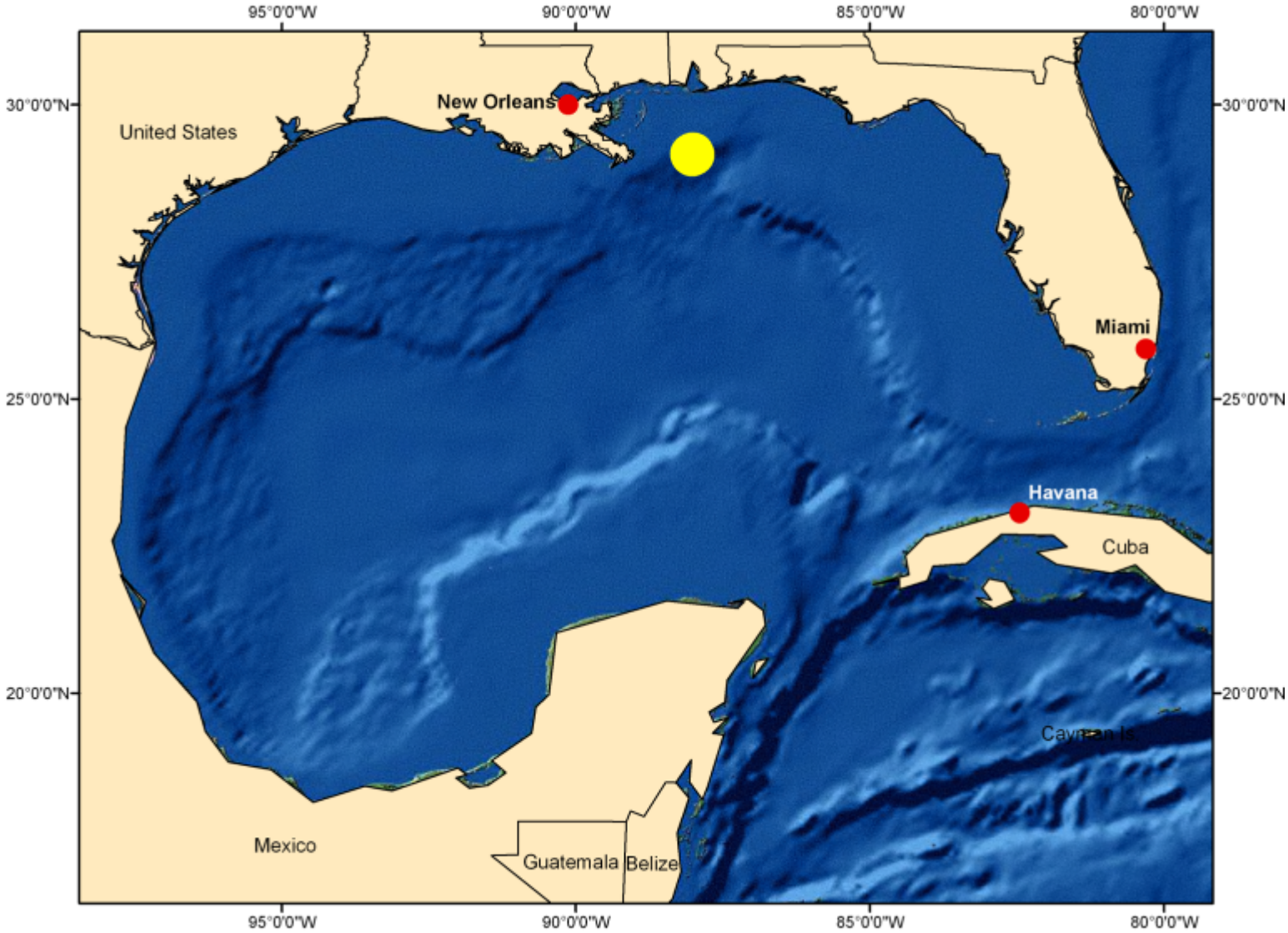
# Talk Overview

- Brief summary of results presented in Sulak et al. 2007 and Sulak et al. 2008
  - Fish communities in the Northern Gulf of Mexico (Viosca Knoll 826, 862)
- Current trophodynamics work involving stable isotope analysis and diet studies
  - Focus on “reef associates” and potential food resources

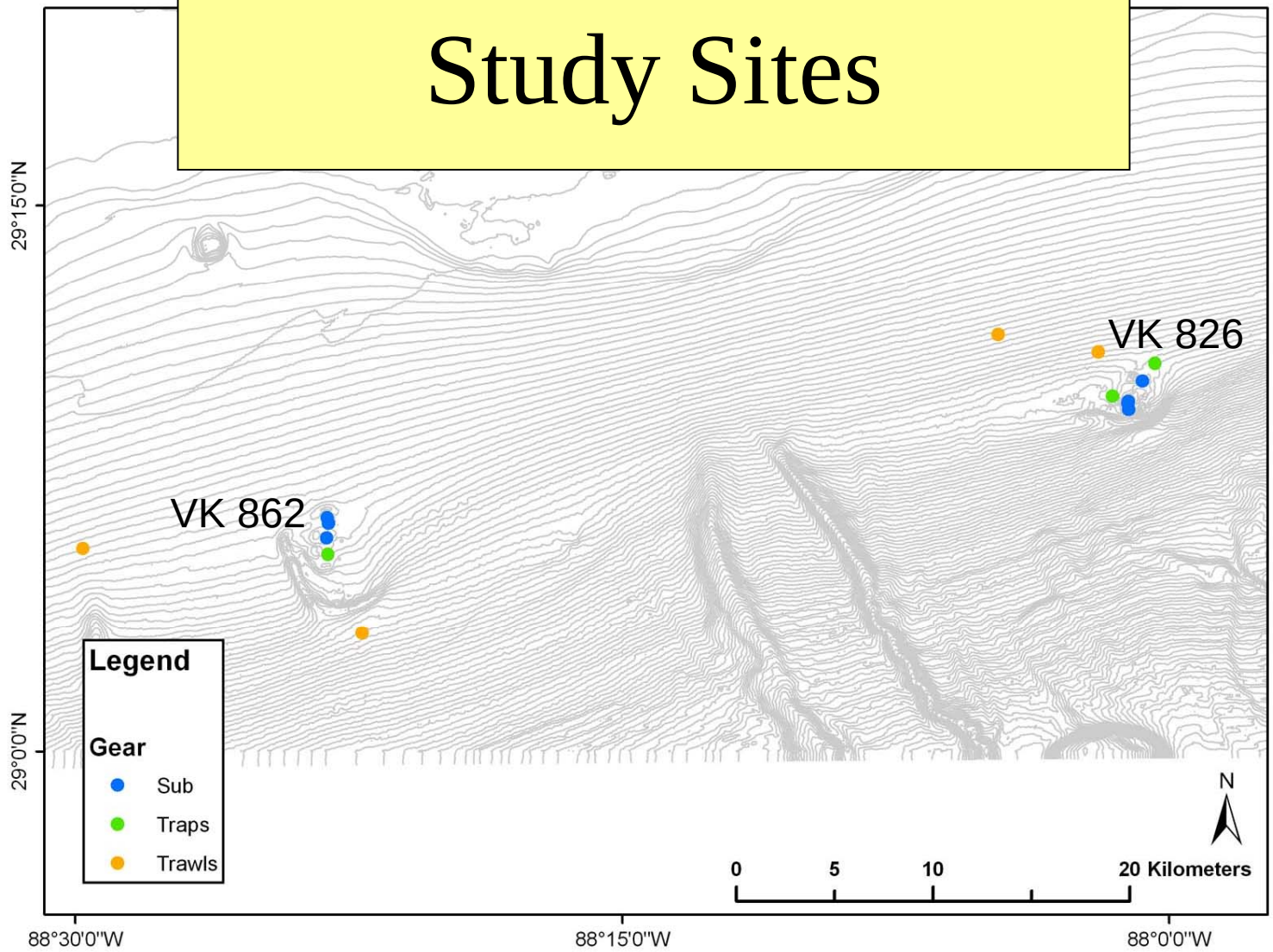
# Introduction

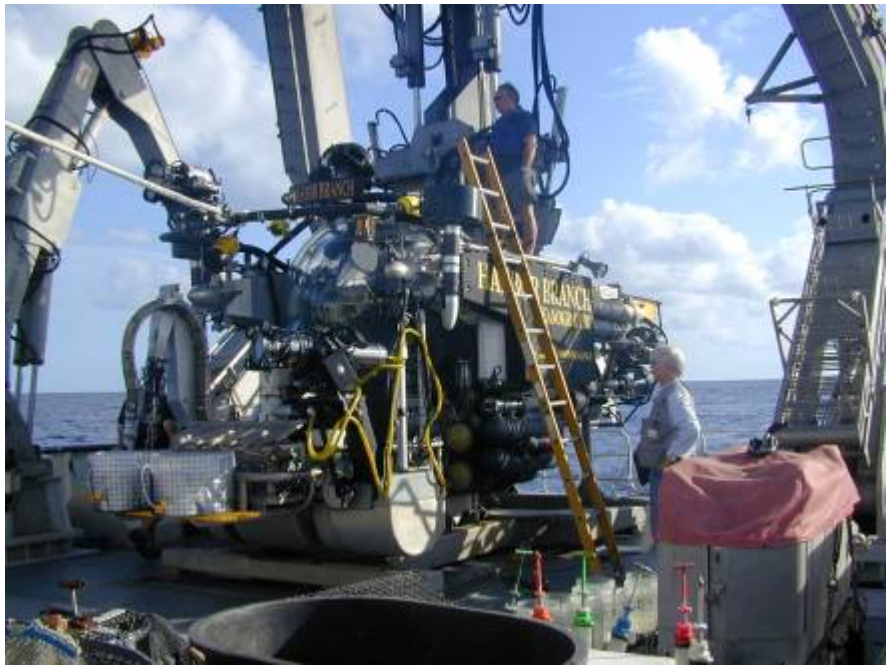
- *Lophelia pertusa* ecosystems
  - Complex matrix habitat
  - Potential oases of macro- and megafaunal biodiversity
  - Fish and invertebrate communities of western N. Atlantic relatively unknown



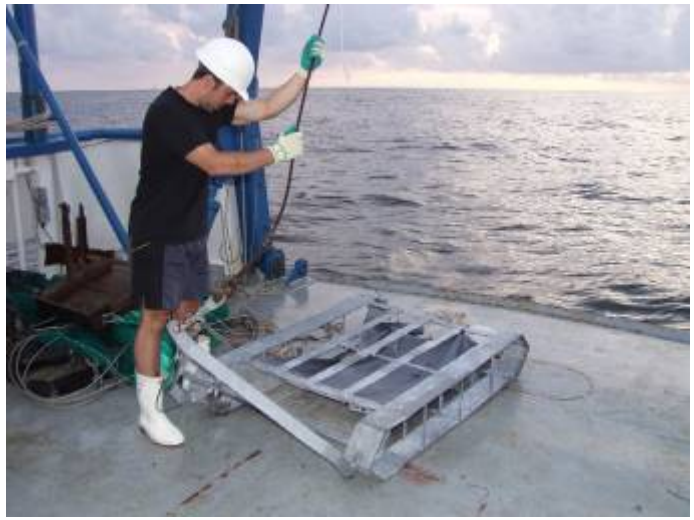

95°0'0"W
90°0'0"W
85°0'0"W
80°0'0"W
30°0'0"N
25°0'0"N
20°0'0"N
United States
New Orleans
Miami
Havana
Cuba
Cayman Is.
Mexico
Guatemala
Belize

# Study Sites

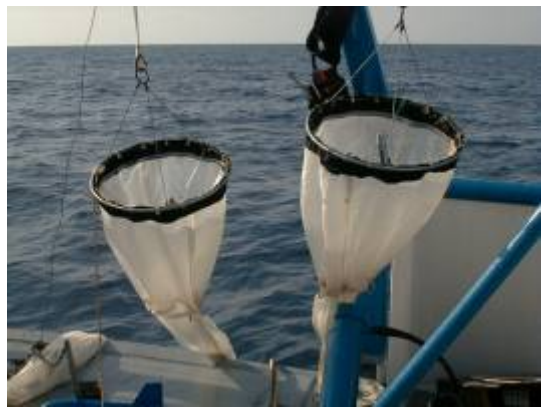

VK 826
VK 862
Legend
Gear
Sub
Traps
Trawls
N
0
5
10
20 Kilometers
29°15'0"N
29°0'0"N
88°30'0"W
88°15'0"W
88°0'0"W



Johnson Sea Link Submersible



Benthic sled



Plankton net

Otter Trawl

Z Trap

# Fish community

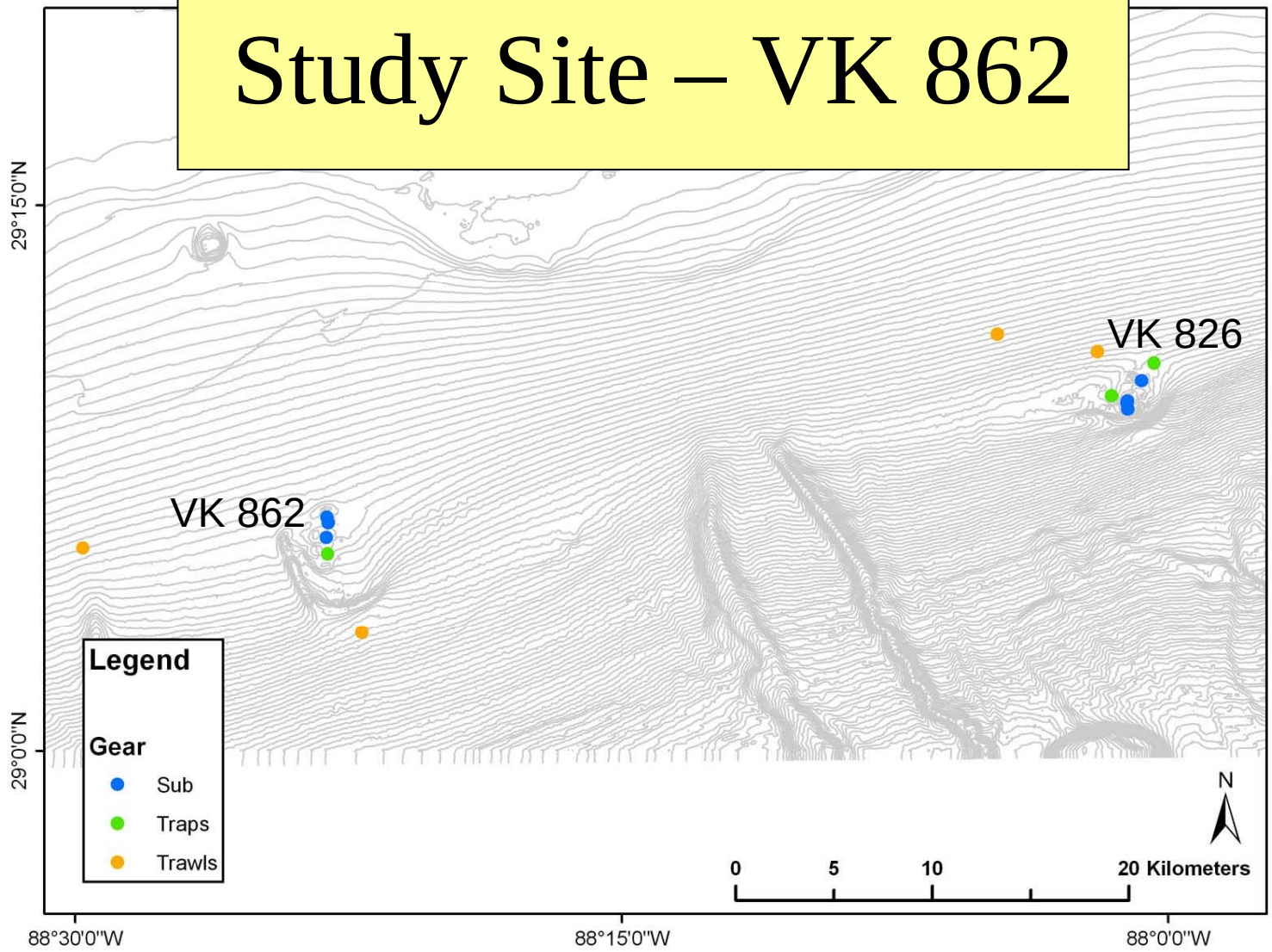
- Dominant fish families
  - Congridae, Trachichthyidae, Scorpaenidae, Gadidae, Moridae
- Fish potentially highly associated with live reef:
  - *Conger oceanicus*
  - *Helicolenus dactylopterus*
  - *Grammicolepis brachiusculus*
  - *Hoplostethus spp.*
- Diets?

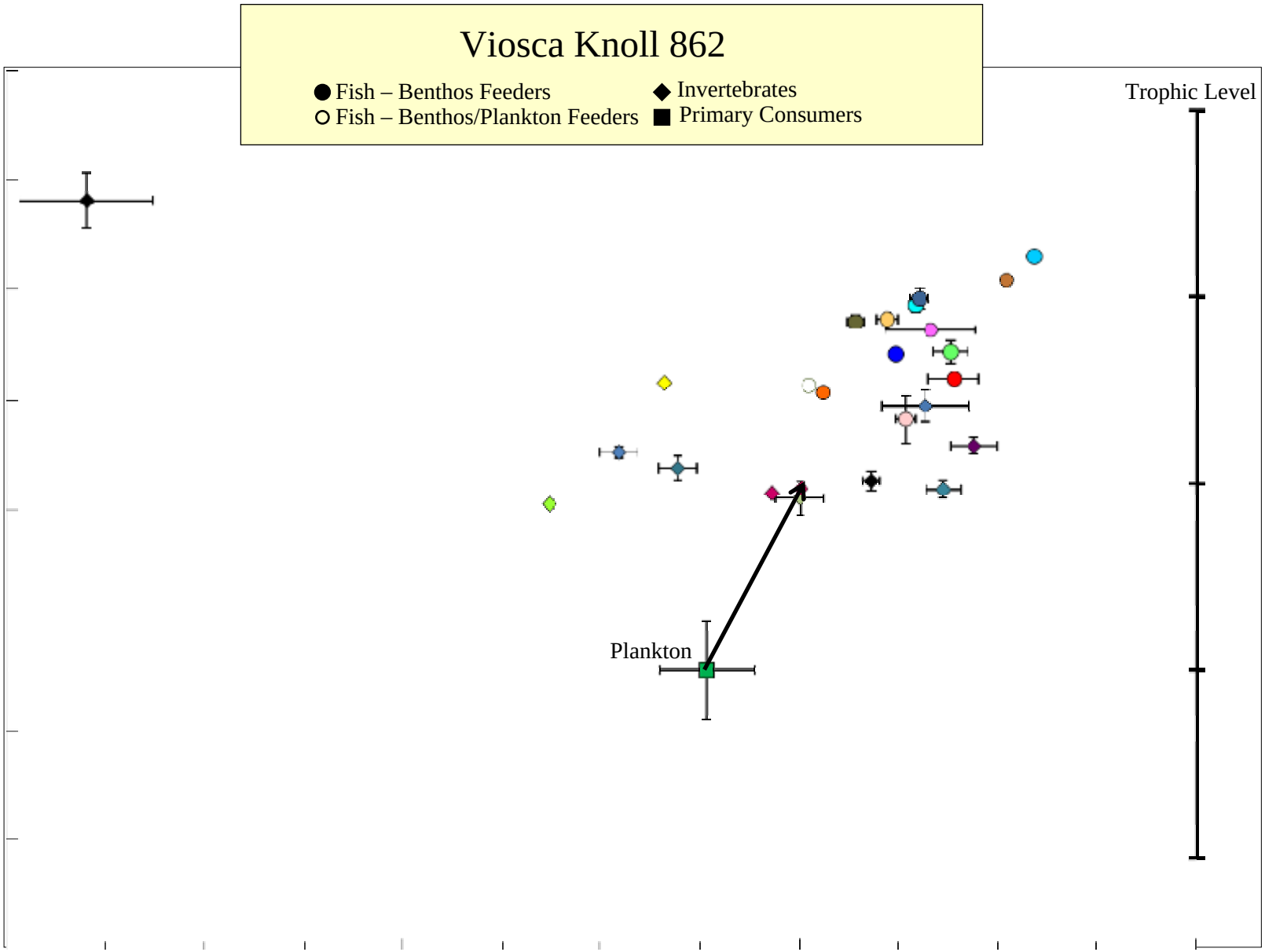
Sulak et al. 2007

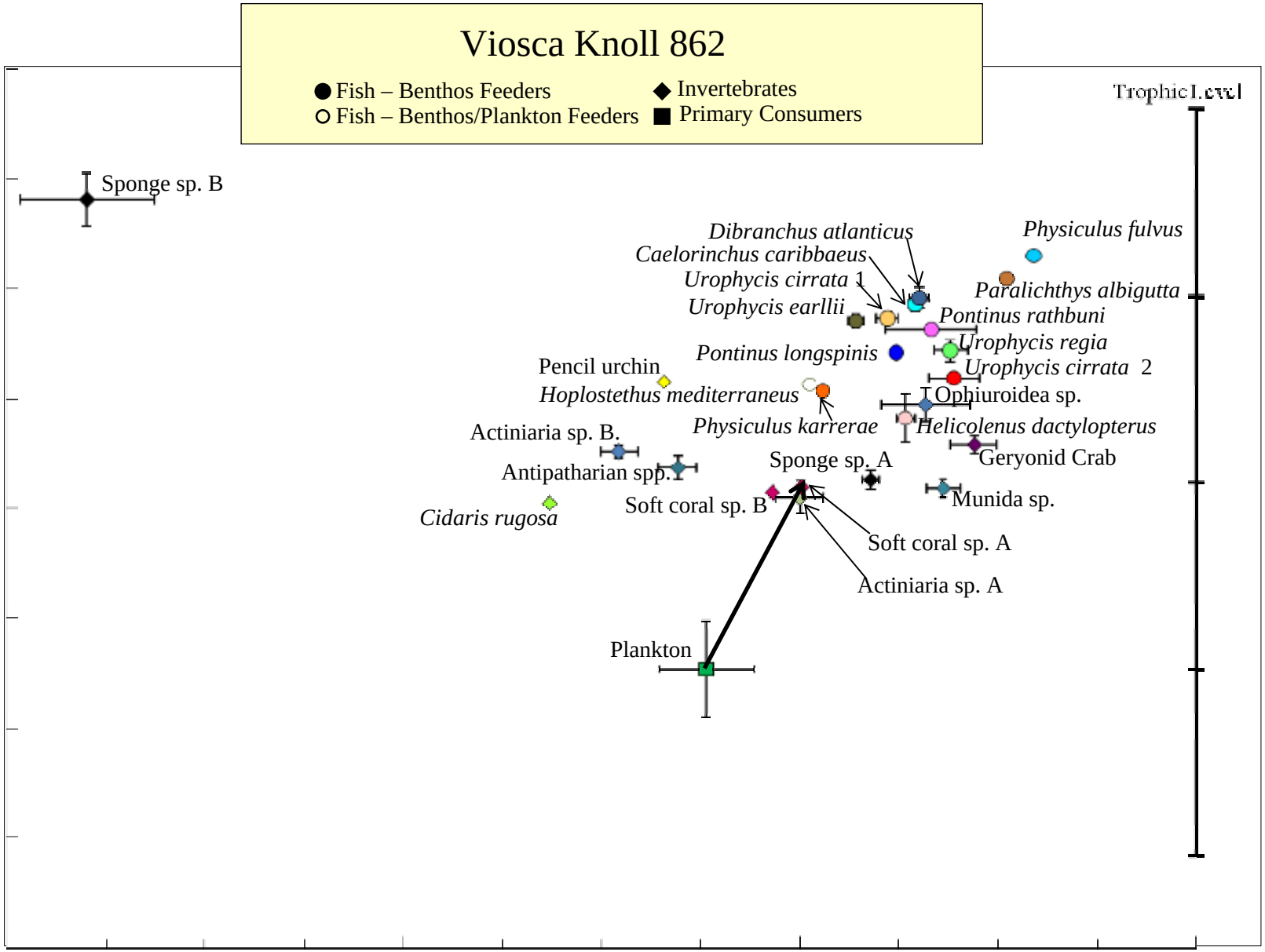
# Objectives

- Build on fish community work, understand food webs and trophic linkages using stable isotopes and traditional diet analysis
  - Traditional stomach content analyses limited to recent diet
  - Stable carbon isotopes reflect time integrated diet, consumer's food source
  - Stable nitrogen isotopes indicative of food chain position

# Study Site – VK 862

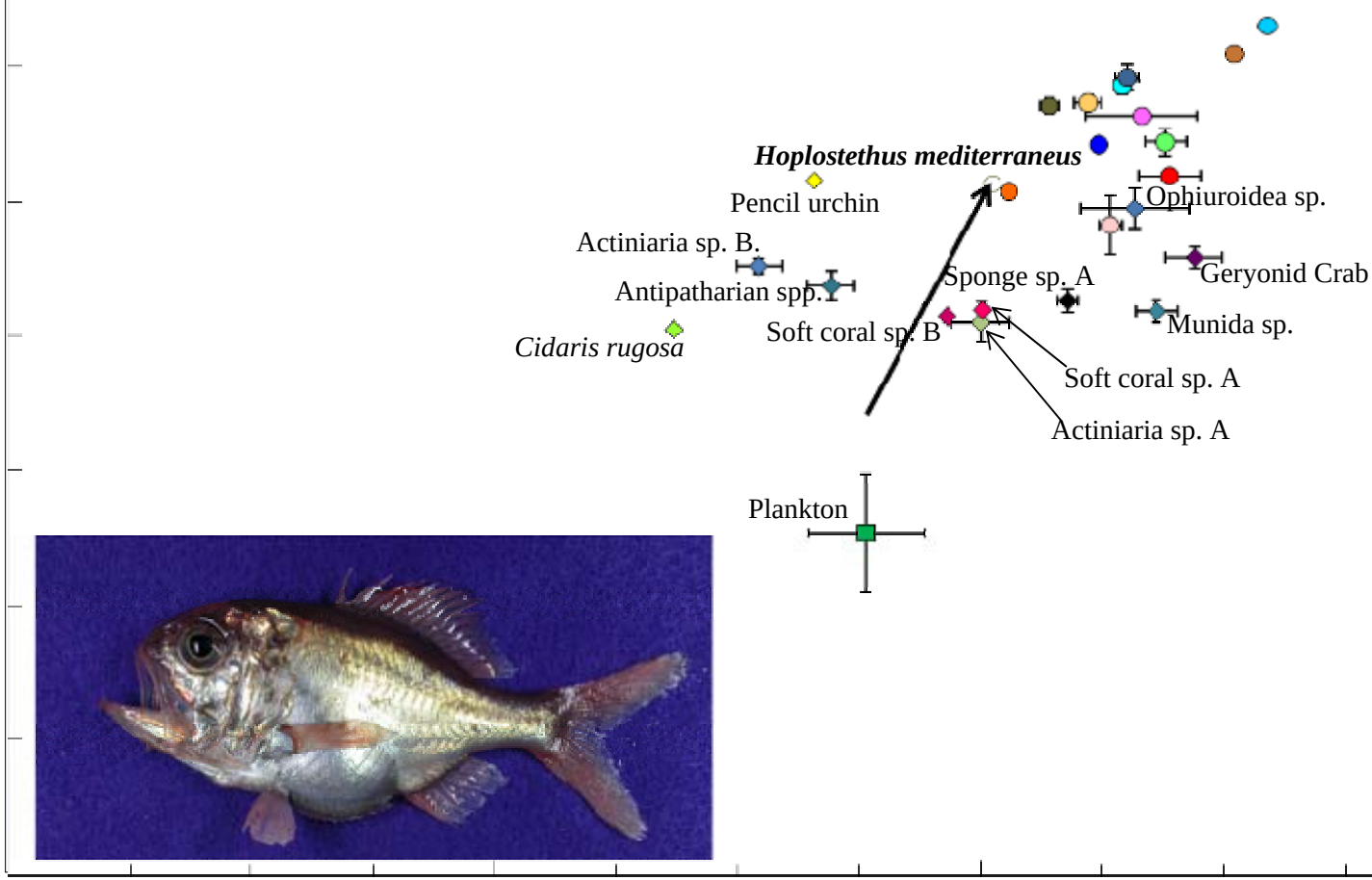



Viosca Knoll 862
Fish – Benthos Feeders
Fish – Benthos/Plankton Feeders
Invertebrates
Primary Consumers
Trophic Level
Plankton


Viosca Knoll 862
Fish – Benthos Feeders
Fish – Benthos/Plankton Feeders
Invertebrates
Primary Consumers
TrophicLevel
Sponge sp. B
Dibranchus atlanticus
Caelorinchus caribbaeus
Urophycis cirrata 1
Urophycis earllii
Physiculus fulvus
Paralichthys albigutta
Pontinus rathbuni
Urophycis regia
Pontinus longspinis
Urophycis cirrata 2
Pencil urchin
Hoplostethus mediterraneus
Ophiuroidea sp.
Physiculus karrerae
Helicolenus dactylopterus
Actiniaria sp. B.
Geryonid Crab
Sponge sp. A
Antipatharian spp.
Munida sp.
Soft coral sp. B
Cidaris rugosa
Soft coral sp. A
Actiniaria sp. A
Plankton

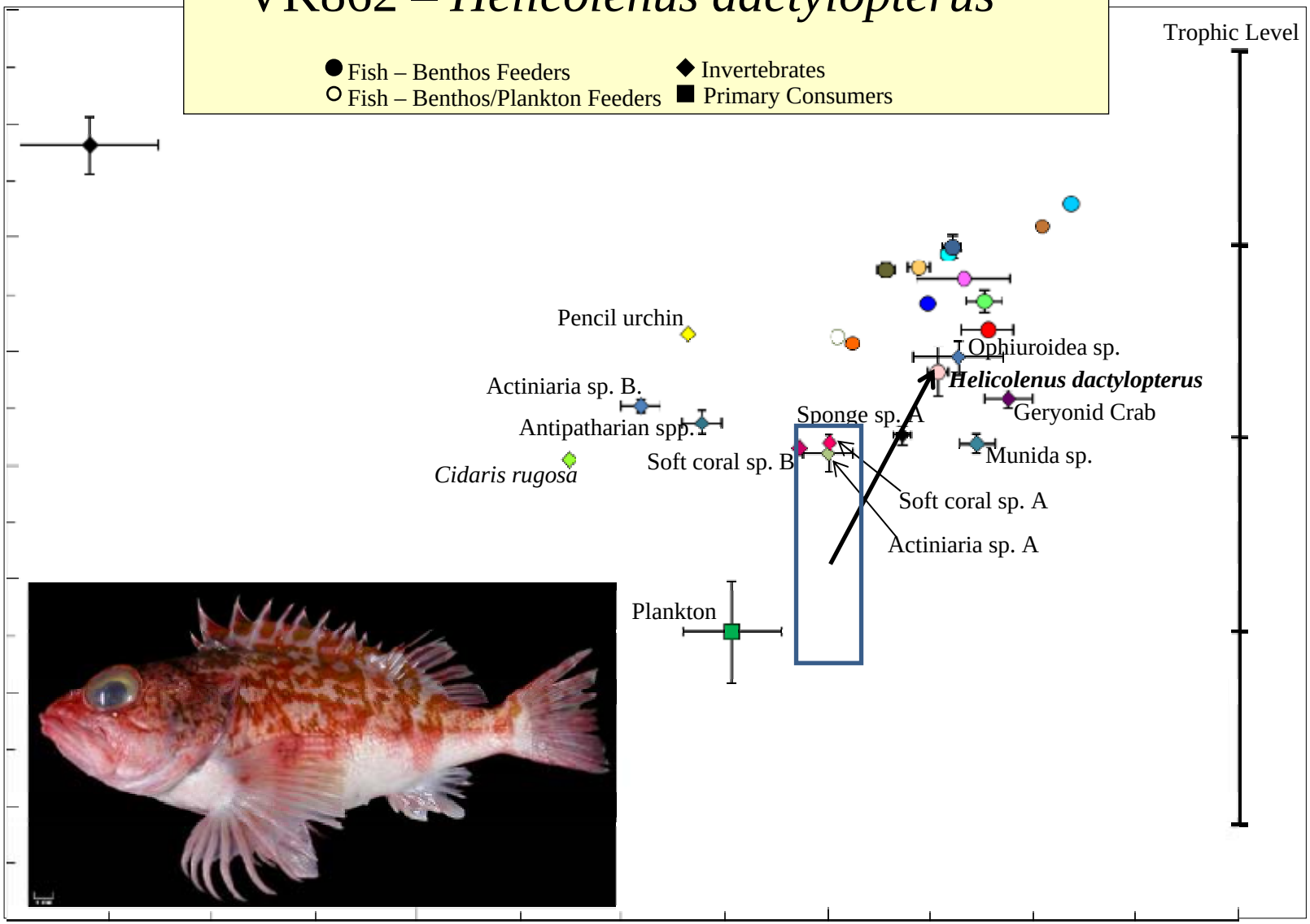
# VK862 – *Hoplostethus mediterraneus*

● Fish – Benthos Feeders
○ Fish – Benthos/Plankton Feeders
◆ Invertebrates
■ Primary Consumers

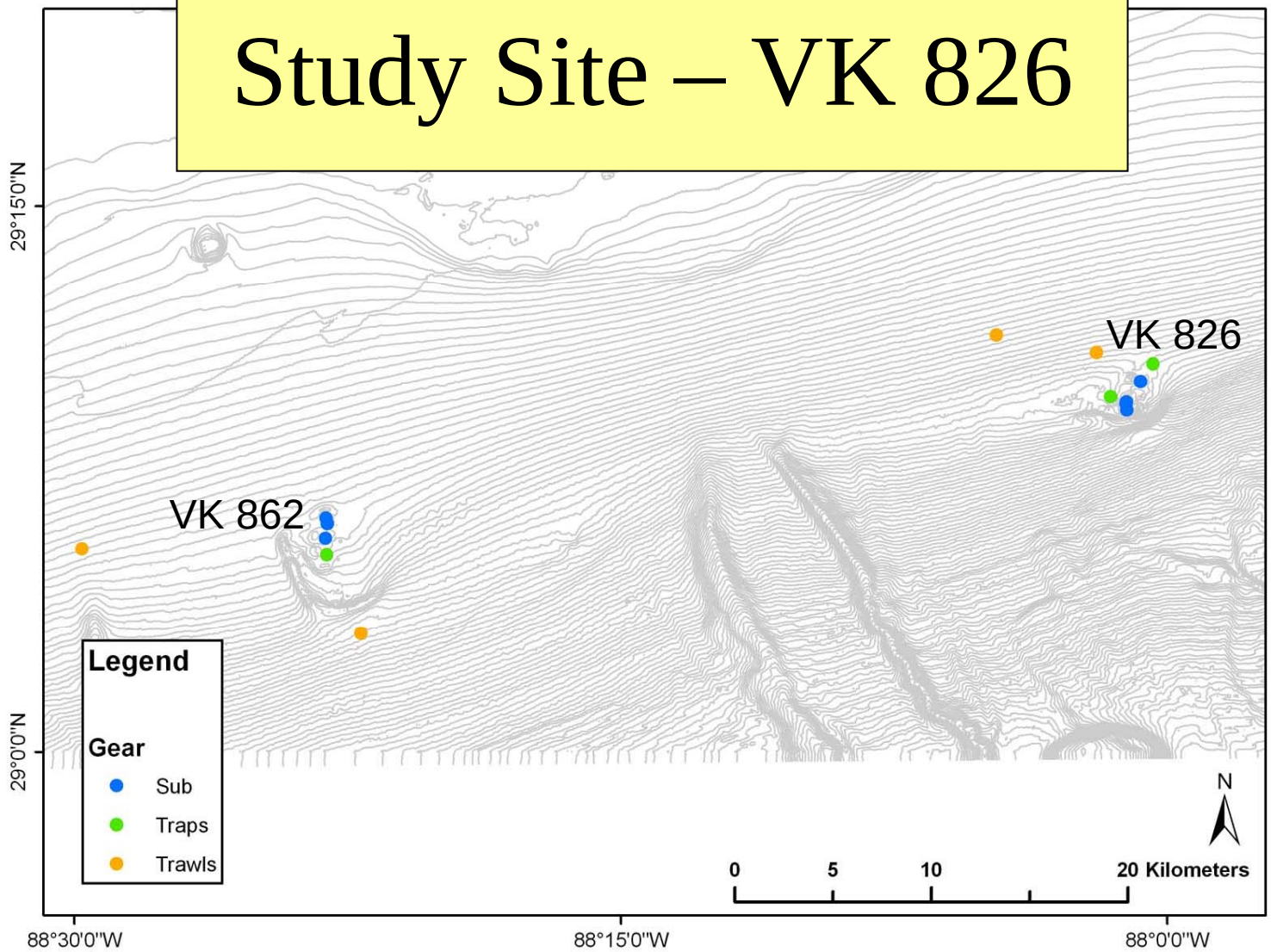


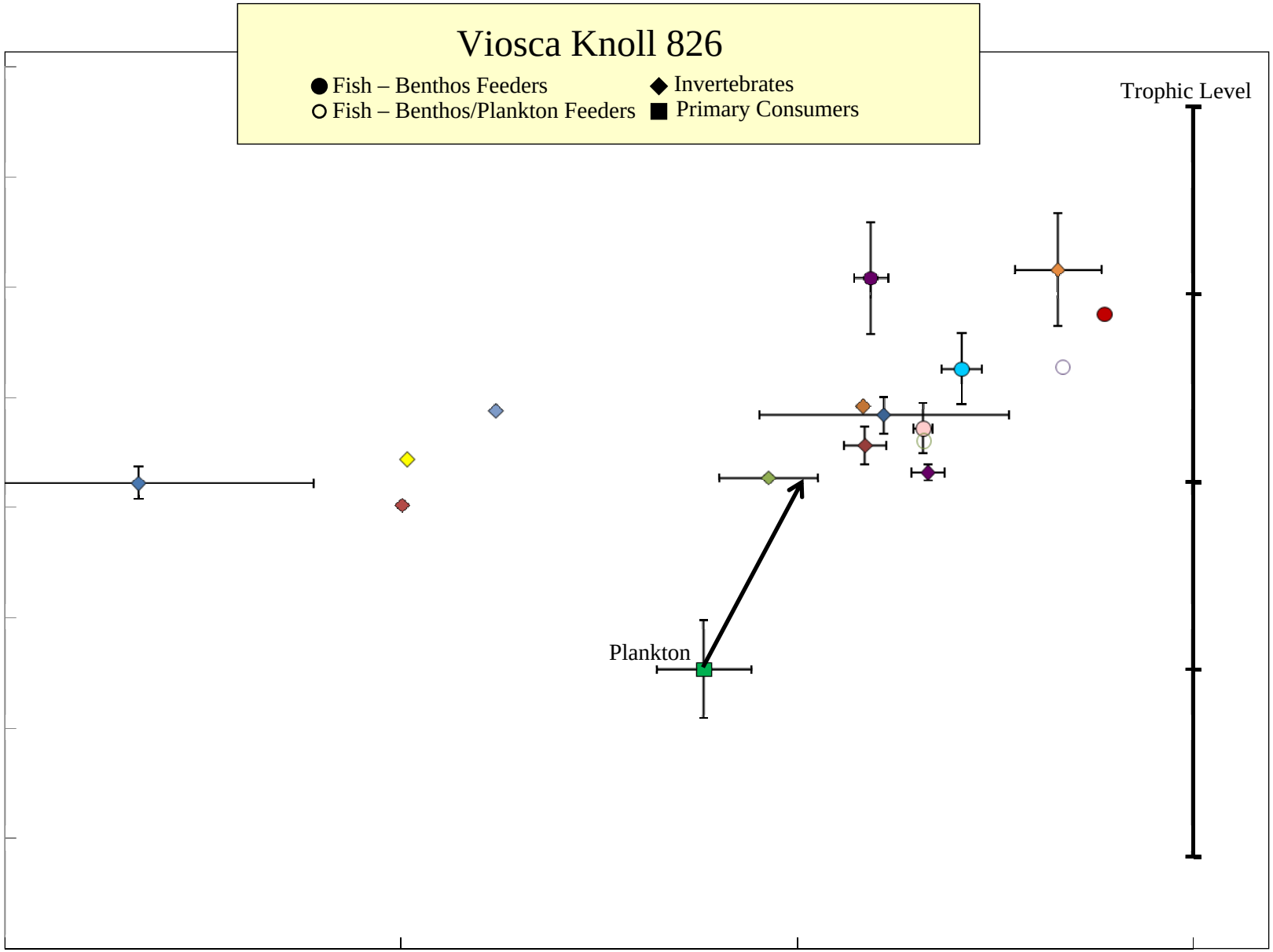
# VK862 – *Helicolenus dactylopterus*

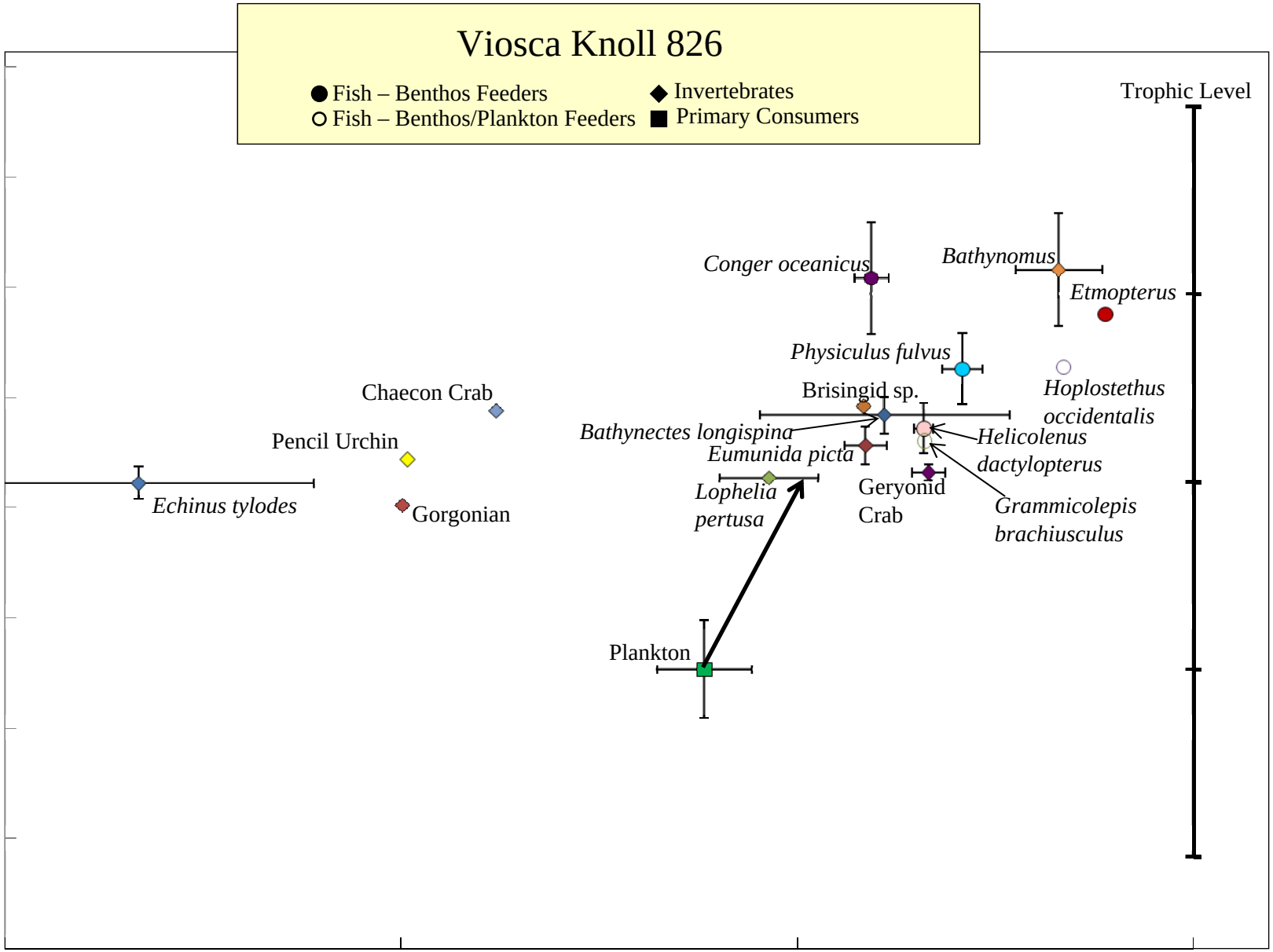
● Fish – Benthos Feeders
○ Fish – Benthos/Plankton Feeders
◆ Invertebrates
■ Primary Consumers



# Study Site – VK 826




Viosca Knoll 826
Fish – Benthos Feeders
Fish – Benthos/Plankton Feeders
Invertebrates
Primary Consumers
Trophic Level
Plankton


Viosca Knoll 826
Fish – Benthos Feeders
Fish – Benthos/Plankton Feeders
Invertebrates
Primary Consumers
Trophic Level
Conger oceanicus
Bathynomus
Etmopterus
Physiculus fulvus
Hoplostethus occidentalis
Brisingid sp.
Bathynectes longispina
Eumunida picta
Helicolenus dactylopterus
Lophelia pertusa
Geryonid Crab
Grammicolepis brachiusculus
Chaecon Crab
Pencil Urchin
Echinus tylodes
Gorgonian
Plankton

# VK826 – *Hoplostethus occidentalis*

● Fish – Benthos Feeders
○ Fish – Benthos/Plankton Feeders
◆ Invertebrates
■ Primary Consumers

Trophic Level

*Bathynomus*

Brisingid sp.

***Hoplostethus occidentalis***

*Bathynectes longispina*

*Eumunida picta*

*Lophelia pertusa*

Geryonid Crab

Chaecon Crab

Pencil Urchin

*Echinus tylodes*

Gorgonian

Plankton

# VK826 – *Grammicolepis brachiusculus*

● Fish – Benthos Feeders
○ Fish – Benthos/Plankton Feeders
◆ Invertebrates
■ Primary Consumers

Trophic Level

*Bathynomus*

Chaecon Crab

Brisingid sp.

Pencil Urchin

*Bathynectes longispina*

*Eumunida picta*

***Grammicolepis brachiusculus***

*Echinus tylodes*

Gorgonian

*Lophelia pertusa*

Geryonid Crab

Plankton

# VK826 – *Helicolenus dactylopterus*

● Fish – Benthos Feeders
○ Fish – Benthos/Plankton Feeders
◆ Invertebrates
■ Primary Consumers

Trophic Level

*Bathynomus*

Chaecon Crab

Brisingid sp.

Pencil Urchin

*Bathynectes longispina*

*Eumunida picta*

***Helicolenus dactylopterus***

*Echinus tylodes*

Gorgonian

*Lophelia pertusa*

Geryonid Crab

Plankton

# VK826– *Conger oceanicus*

● Fish – Benthos Feeders
○ Fish – Benthos/Plankton Feeders
◆ Invertebrates
■ Primary Consumers

Trophic Level

***Conger oceanicus***

*Bathynomus*

Brisingid sp.

*Bathynectes longispina*

*Eumunida picta*

*Lophelia pertusa*

Geryonid Crab

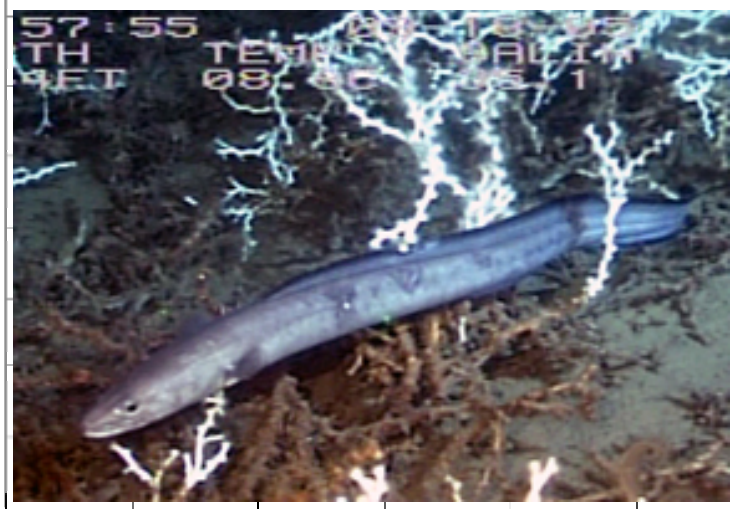
Chaecon Crab

Pencil Urchin

*Echinus tylodes*

Gorgonian

Plankton



# Conger diet items: stomach contents

- Crustaceans (crabs, amphipods, blind deep-sea lobster?)
- Annelids (leeches and polychaetes)
- Bivalves?
- Nematodes
- Fish scales

# Results Summary

- SIA reveals simple food web but primary sources ambiguous for certain fish
- $\delta^{15}N$ data indicates *Lophelia* reefs contain ~ 4 trophic levels
  - Invertebrates occupied lower trophic levels than fishes
  - *Conger* and *Bathynomus* occupied the highest trophic position consistent with descriptions of their diets (predators, scavengers)
- Consistent SI ranges across both sites; however, replication was limited

# Results Summary

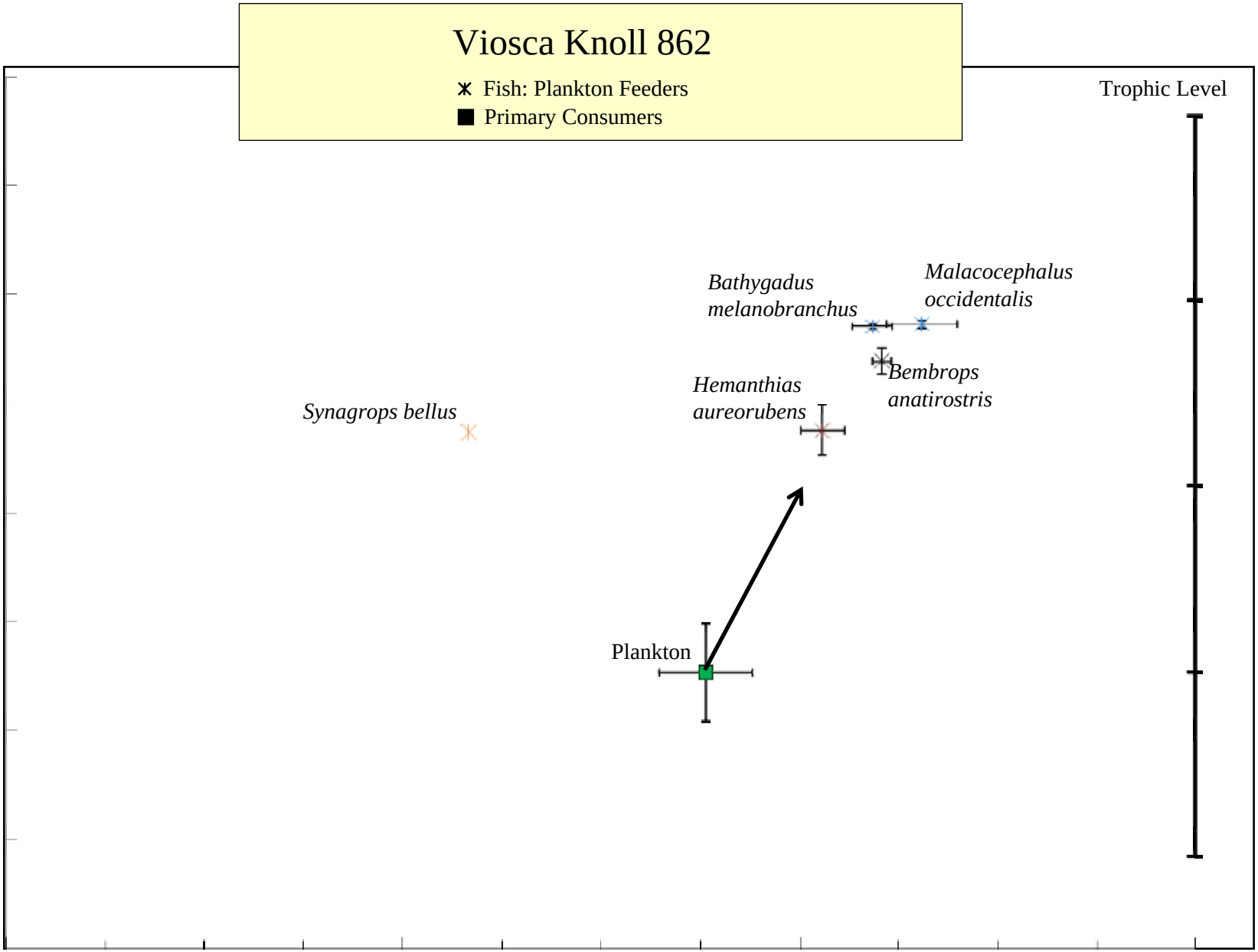
- Diet of “reef associates”
  - *Conger oceanicus*
  - *Helicolenus dactylopterus*
  - *Grammicolepis brachiusculus*
  - *Hoplostethus spp.*

# Conclusions: What next?

- Data gaps
  - Understanding of food habits for fish and mobile invertebrates largely unknown (optimize sampling, more stomach content and isotope work)
  - Exploring residency and movement patterns, life history strategies (use natural tracers)
  - Linking reef habitat associates with other ecosystems, e.g., water column community (isotopes and diet analysis)

# Acknowledgments


- USGS/MMS
- Dan Gualtieri, Ann Foster, Kaitlin Kovacs (USGS)
- Steve Ross Lab (UNCW)
- Erik Cordes, Andrea Quattrini
- R. Allen Brooks
- Sulak Lab, past and present (USGS)
- Crew R/V Seward Johnson, Johnson Sealink, Tommy Munro


Viosca Knoll 862
Fish: Plankton Feeders
Primary Consumers
Trophic Level
Bathygadus melanobranchus
Malacocephalus occidentalis
Bembrops anatirostris
Hemanthias aureorubens
Synagrops bellus
Plankton

# References

Sulak, K.J., R.A. Brooks, K.E. Luke, A.D. Norem, M.T. Randall, A.J. Quaid, G.E. Yeargin, J.M. Miller, W.M. Harden, J.H. Caruso, and S.W. Ross. 2007. Demersal fishes associated with Lophelia pertusa coral and hard substrate on the continental slope, northern Gulf of Mexico. In: George, R.Y. and S.D. Cairns, eds. Conservation and Adaptive Management of Seamount and Deep-sea Coral Ecosystems. Rosenstiel School of Marine and Atmospheric Science, University of Miami. Pp. 65–92.

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