

Micronekton and their importance in the northern California Current ecosystem

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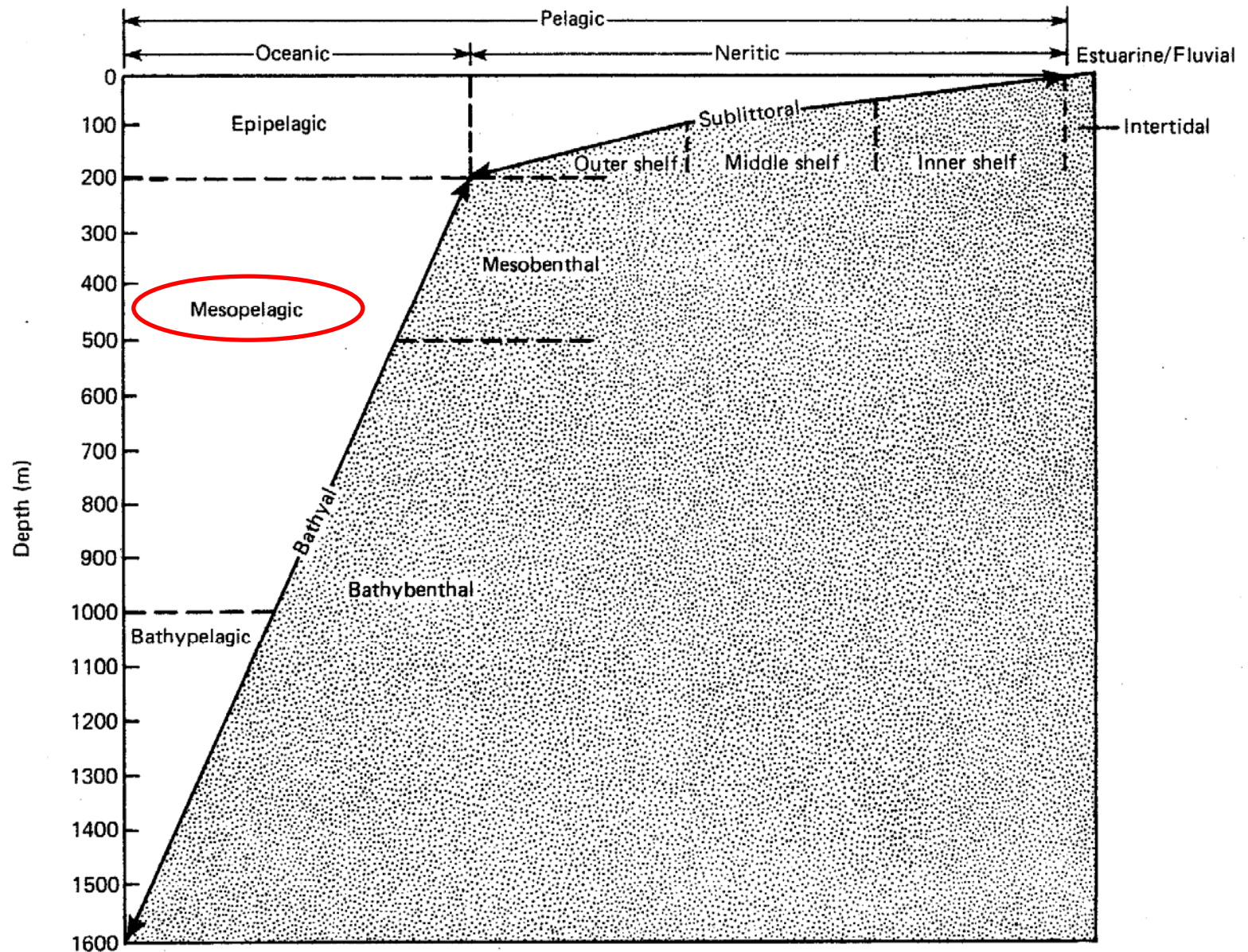
Newport, Oregon 97365



What are Micronekton?



Where do they live?



Why are they important?

Important to marine ecosystems due to:

- substantial biomass**
- ubiquitous occurrence**
- intermediate body sizes**
- facilitate transfer of energy to higher trophic levels and the deep sea**

Outline of Presentation

- **History of research in N. Calif. Current**
- **Species composition, density, and distribution patterns**
- **Early life history of dominant species**
- **Trophic relationships**
- **New ways to examine their biology and behaviour**

History of Micronekton Research in the Northern California Current

Dr. William G. Pearcy – studied micronekton from 1961 to 1990 – published > 40 papers



Species composition and density - Off Oregon -

OSU Micronekton Cruises (1961-69)

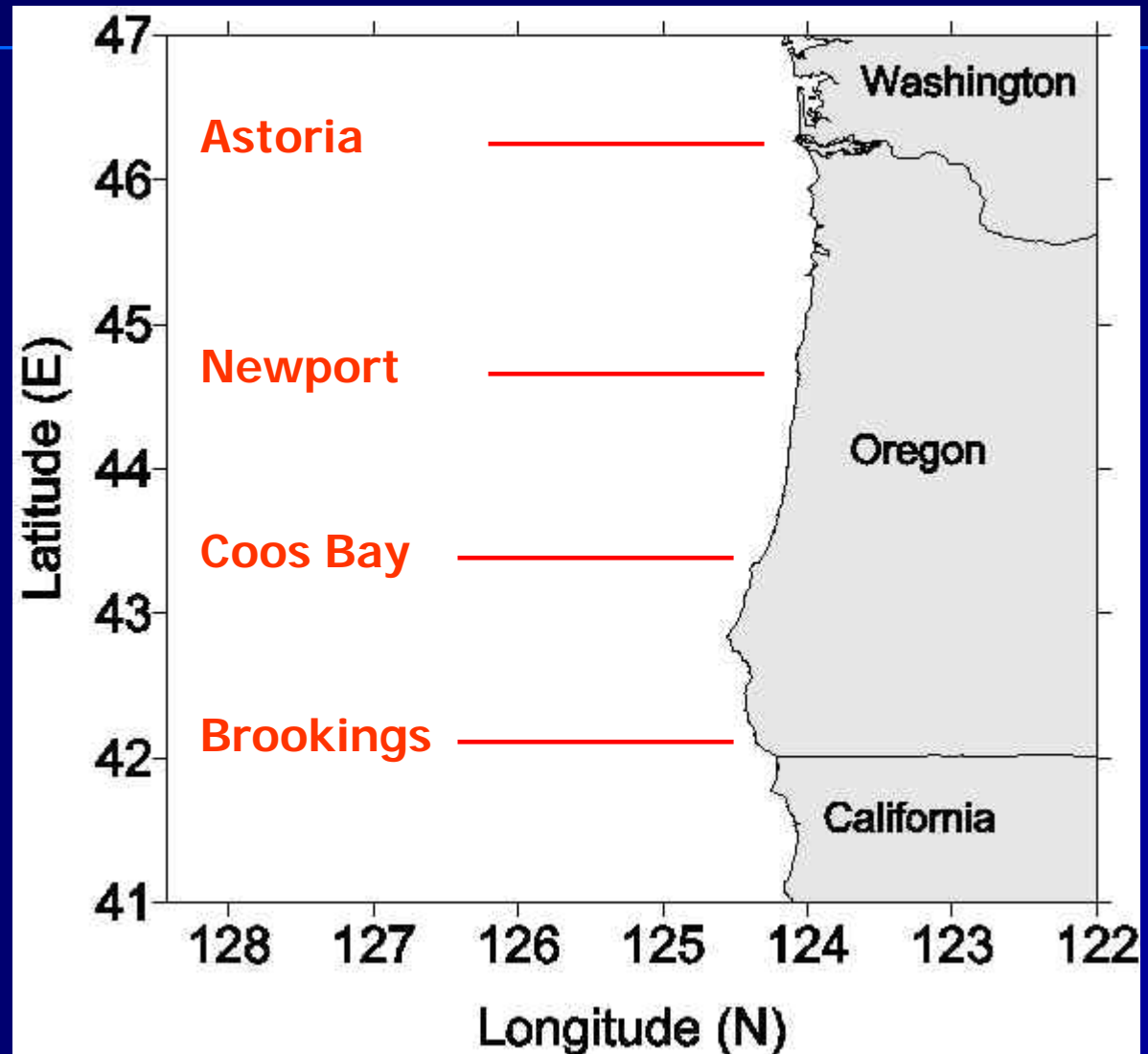
- Used 1.8 m Isaacs-Kidd Midwater trawl
- Oblique tows to 200 m
- Used multiple codend system in 1970s and 1980s to examine vertical distribution of micronekton



Species composition and density - Off Oregon -

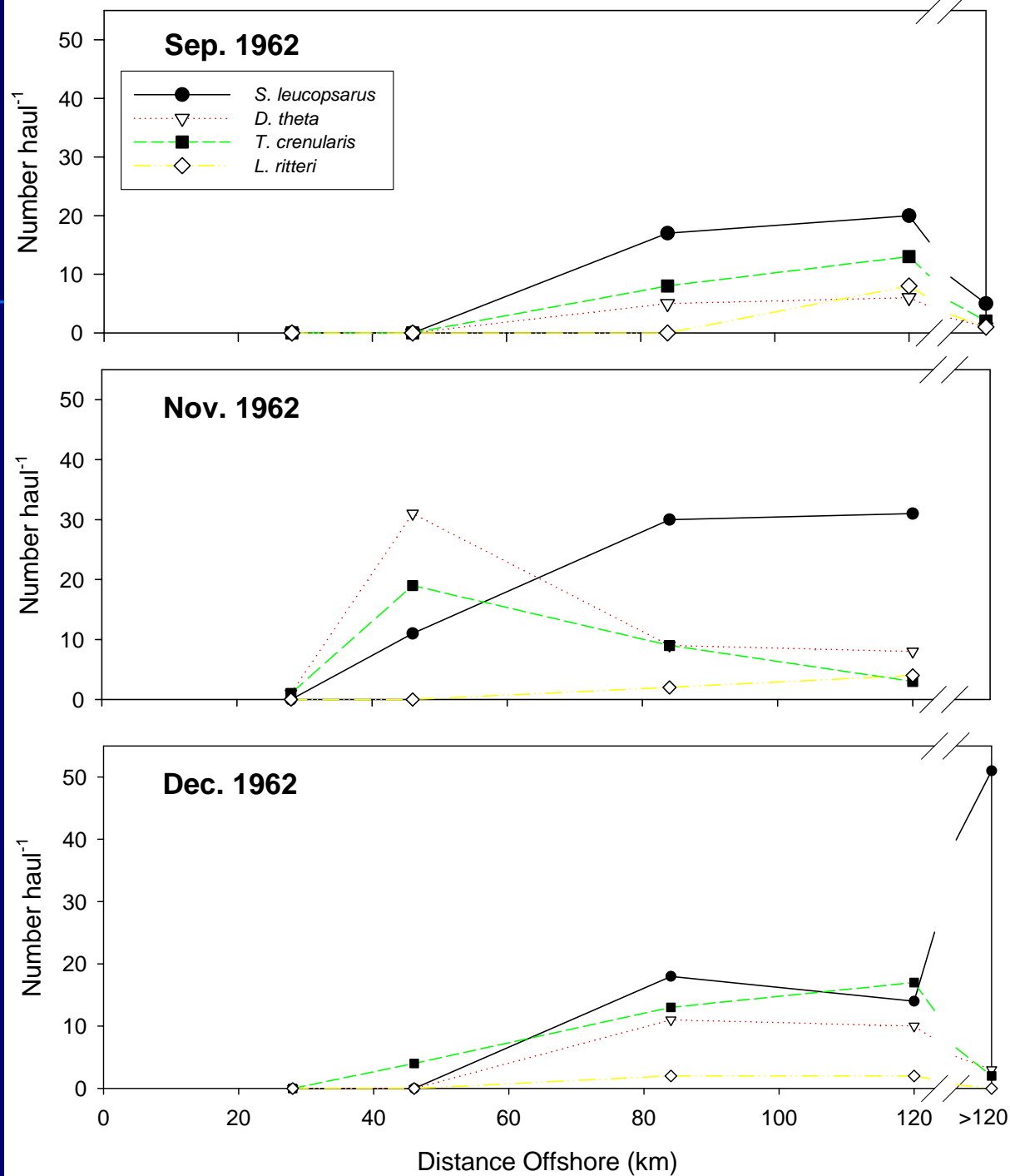
Sampled
Four
Transect
Lines

Sampled at
Monthly
Intervals



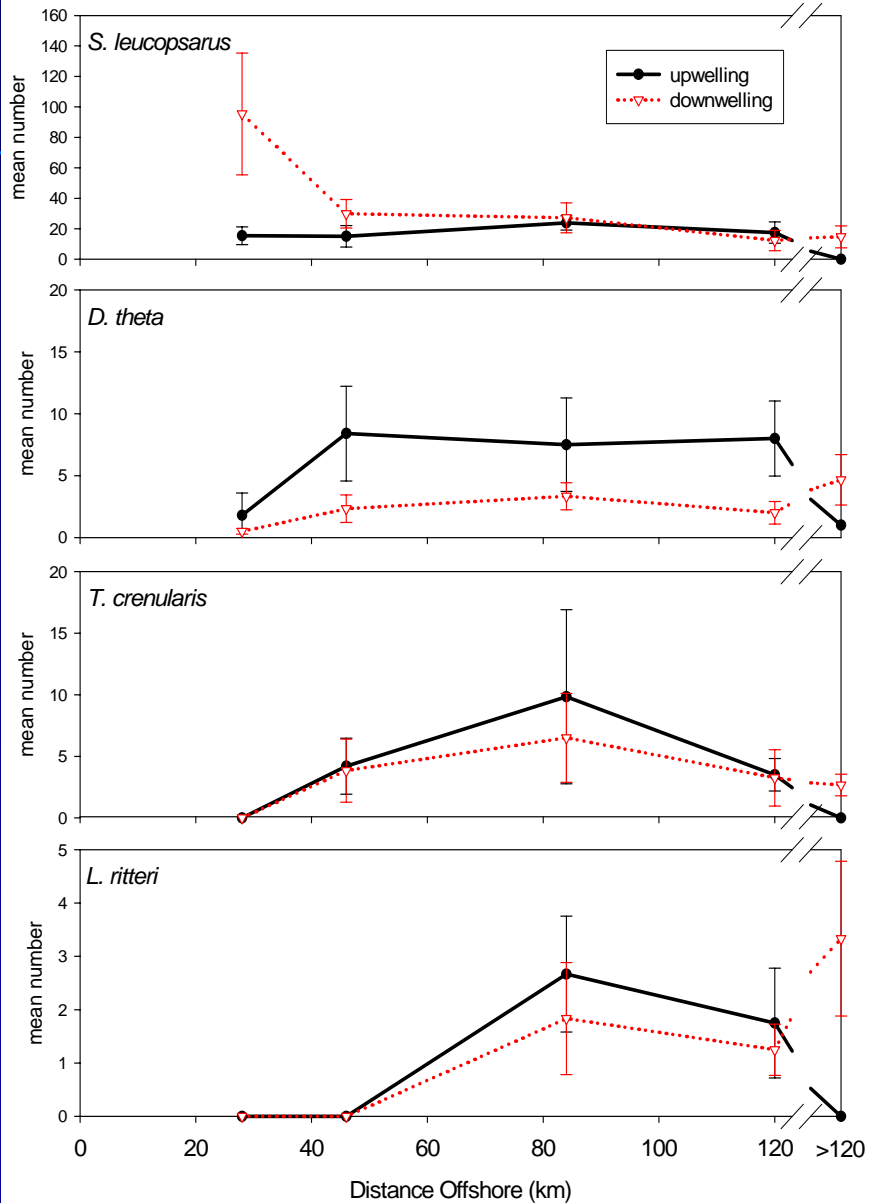
Inshore-Offshore Variations

(Brodeur et al., 2003,
J. Oceanogr. 59:515-535)

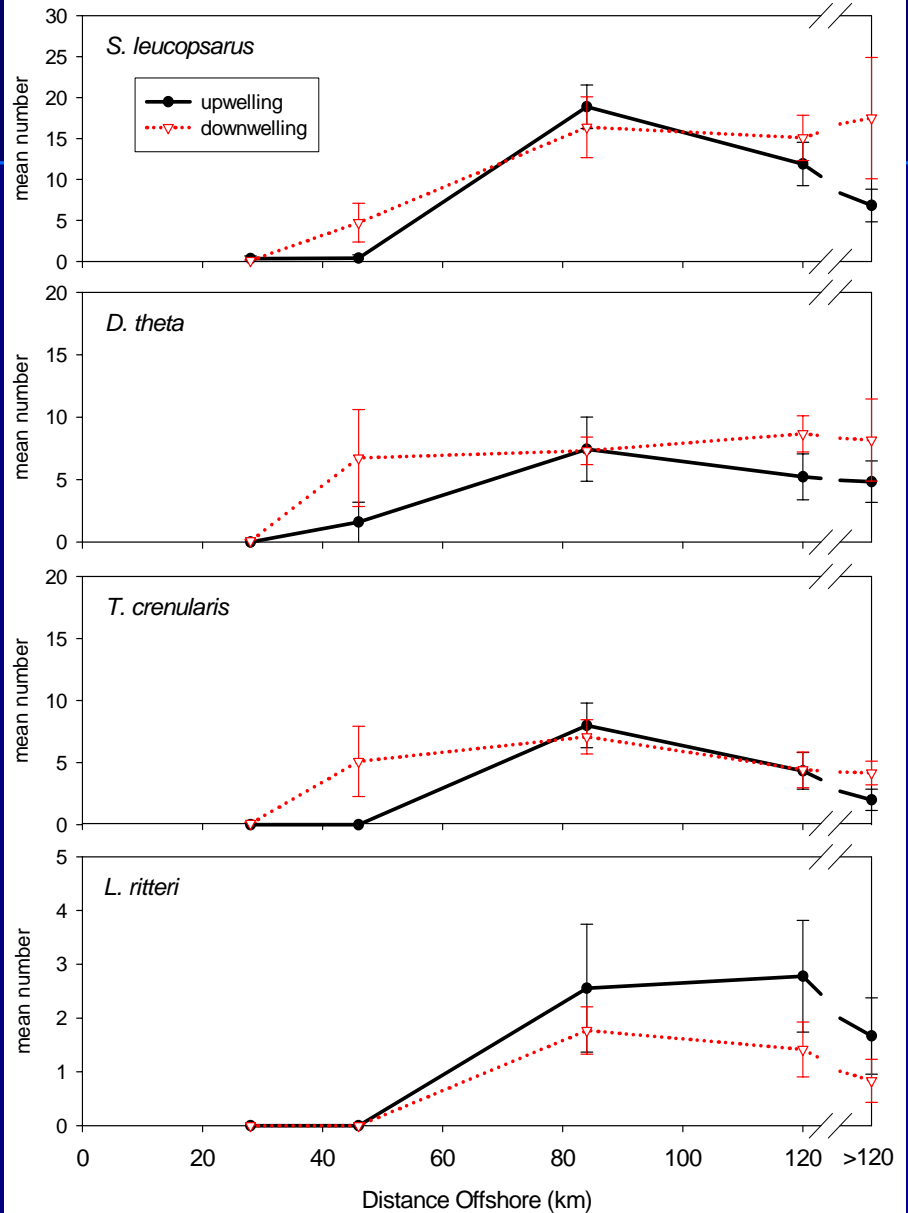


Seasonal Variations (Brodeur et al., 2003, *J. Oceanogr.* 59:515-535)

Astoria



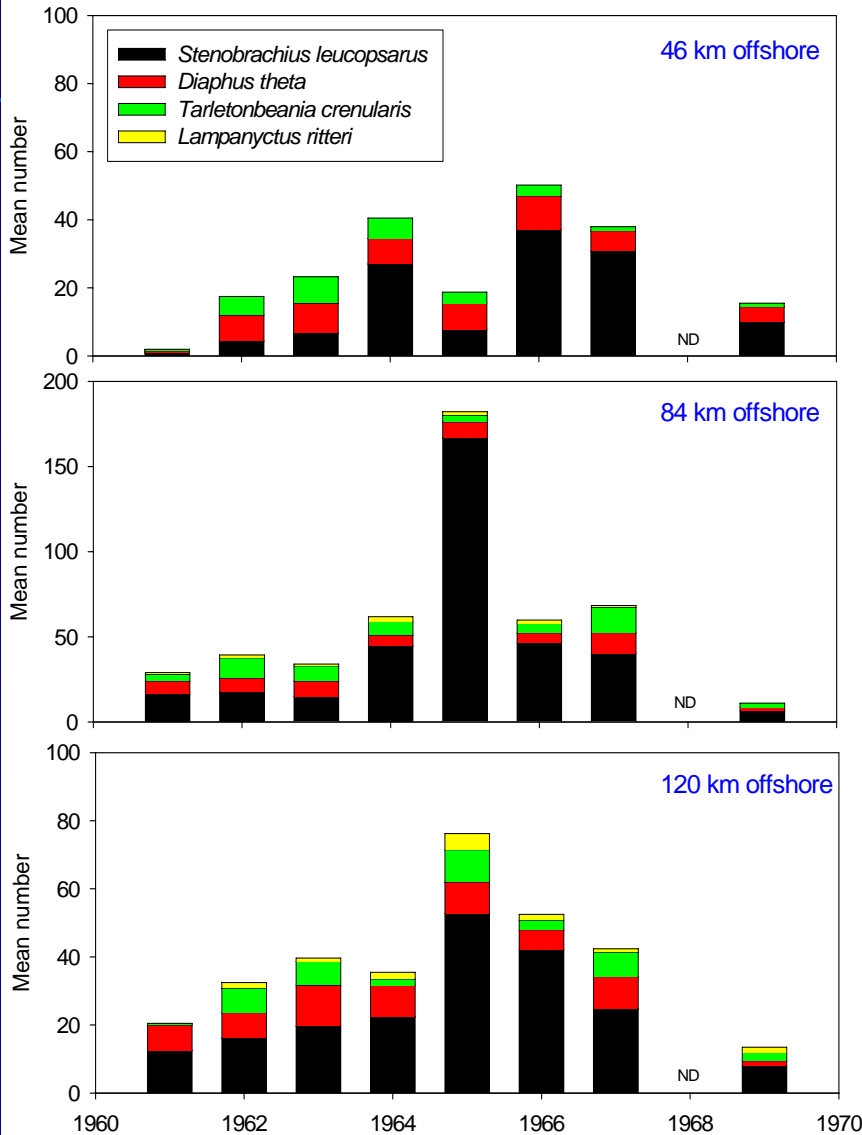
Newport



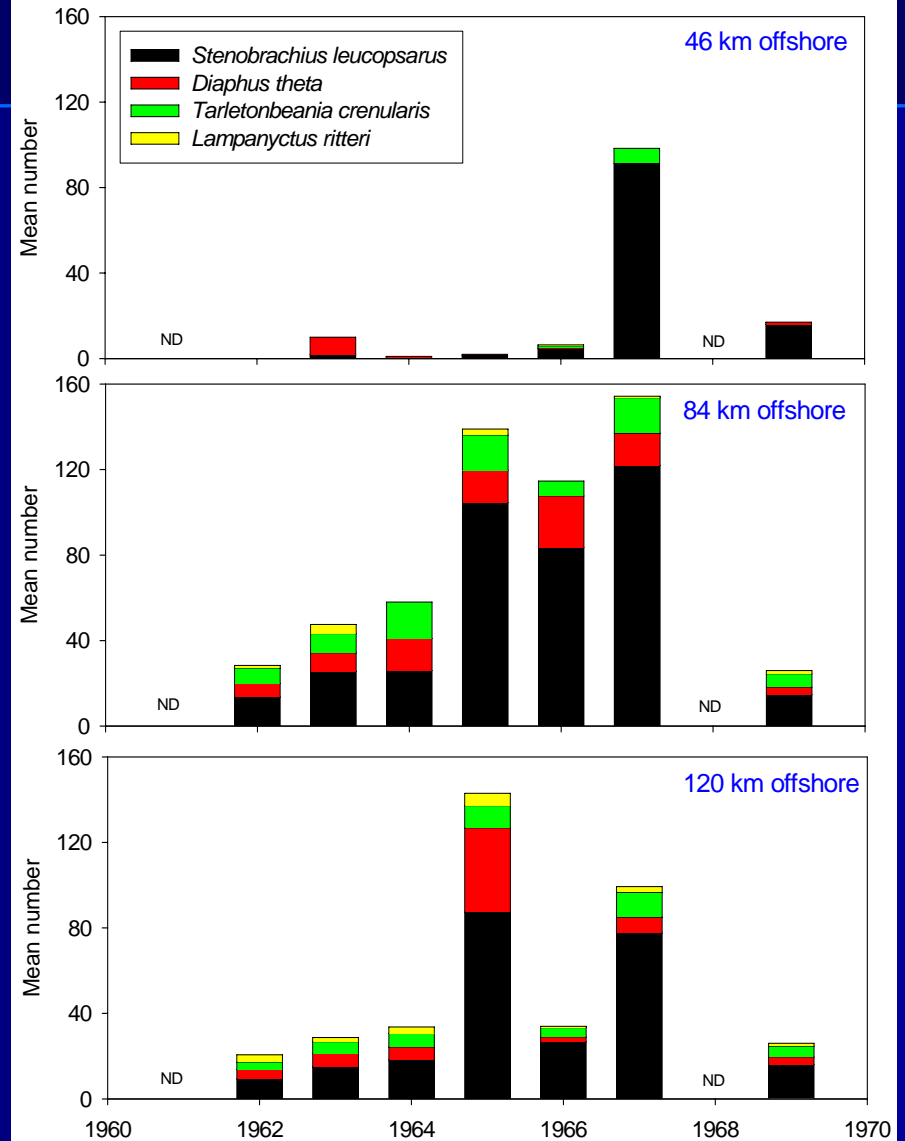
Interannual Variations

(Brodeur et al., 2003,
J. Oceanogr. 59:515-535)

Newport Hydroline
 Downwelling Season (Nov - Apr)



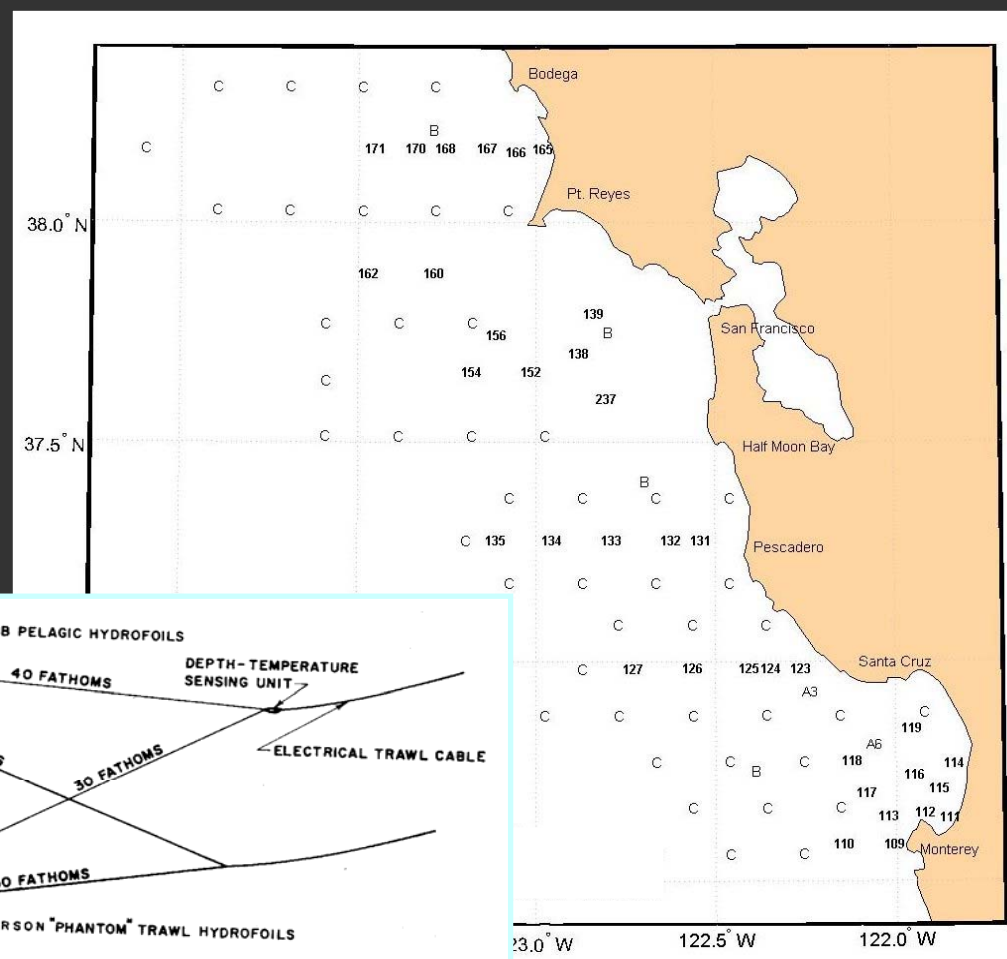
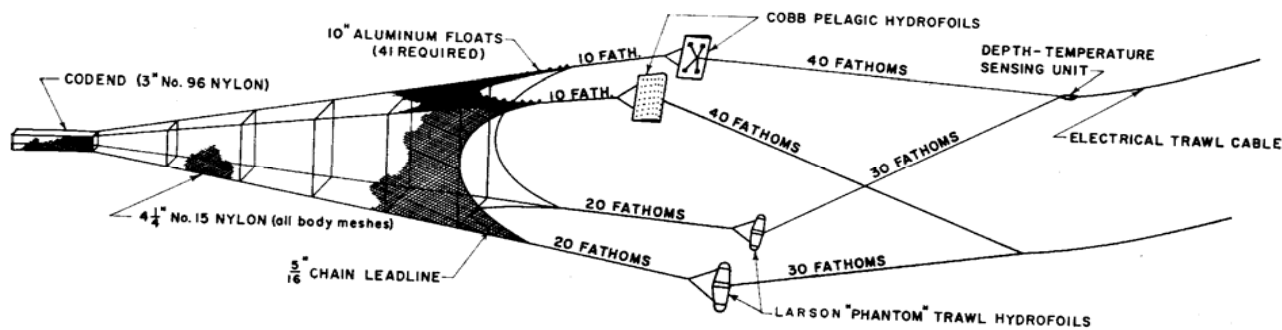
Newport Hydroline
 Upwelling Season (May - Oct)



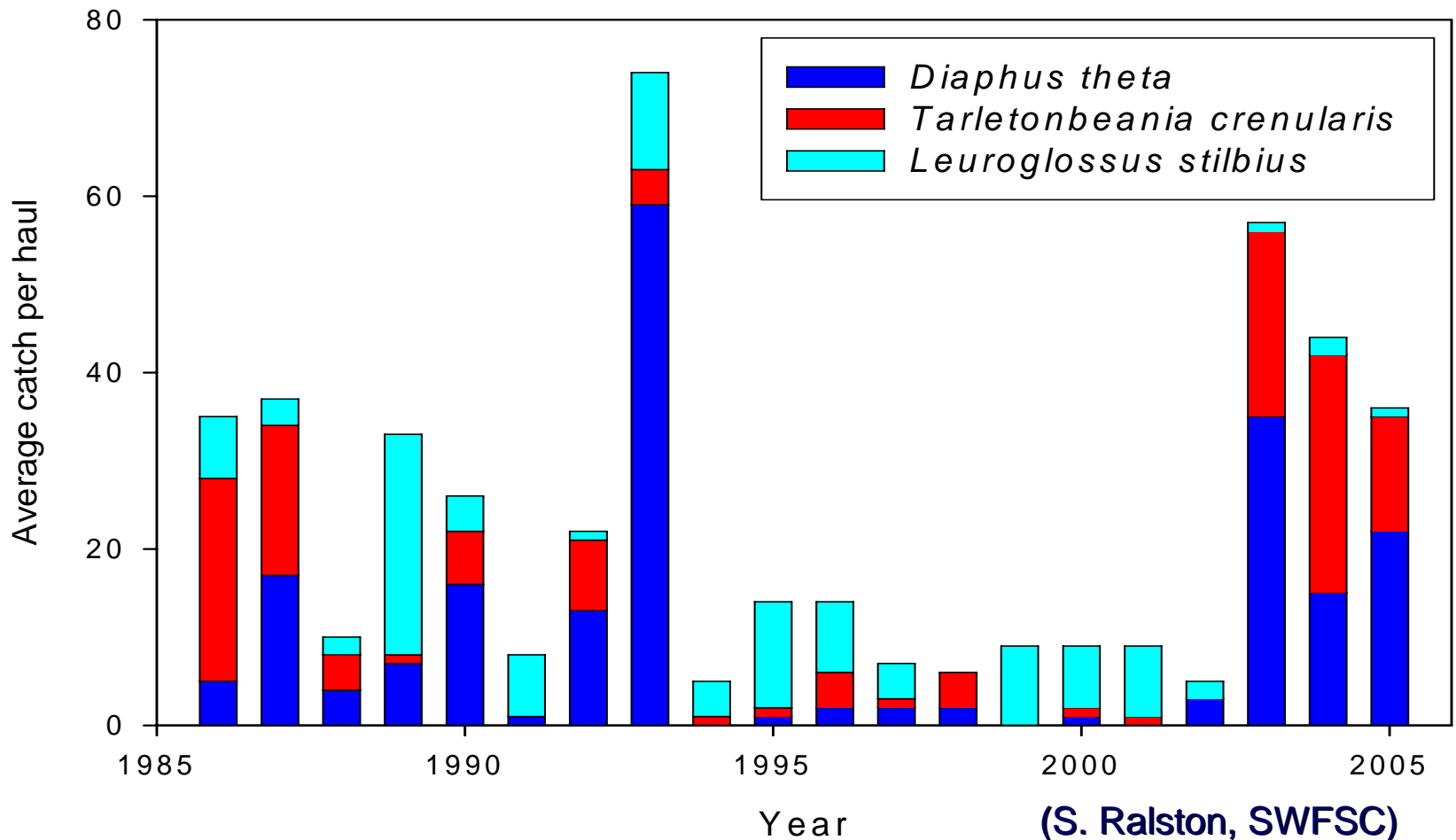
Species composition and density off Central California

NMFS Juvenile Rockfish Surveys (1986-2005)

- Pelagic Cobb trawl (140 m² mouth area, 0.15 cm codend mesh)
- 3 cruises a year
- Tows at 30 m depth



Species composition and density off Central California

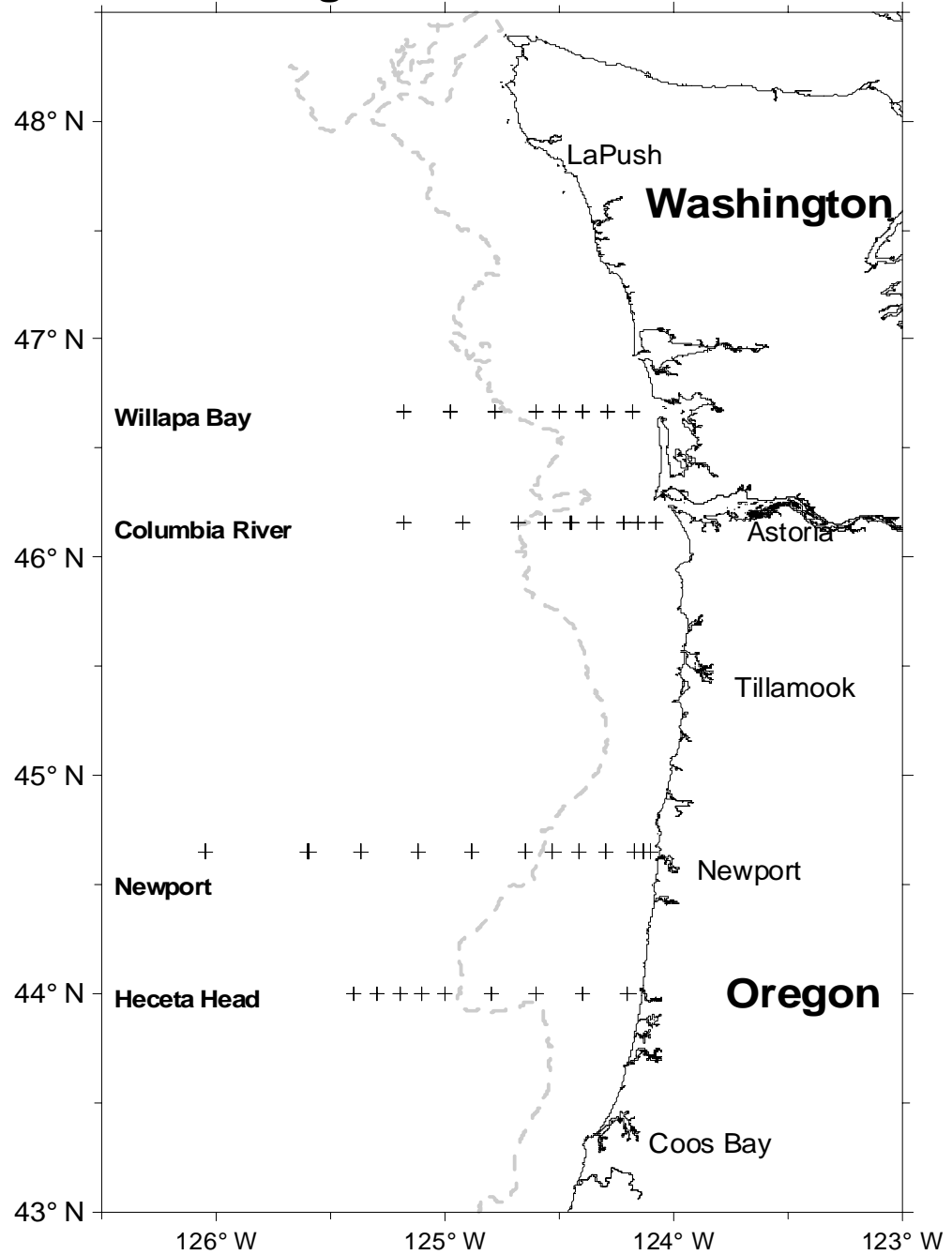


Juvenile and Larval Fish Surveys

- Began June 2004 – 4 to 5 cruises a year



Target Station Locations



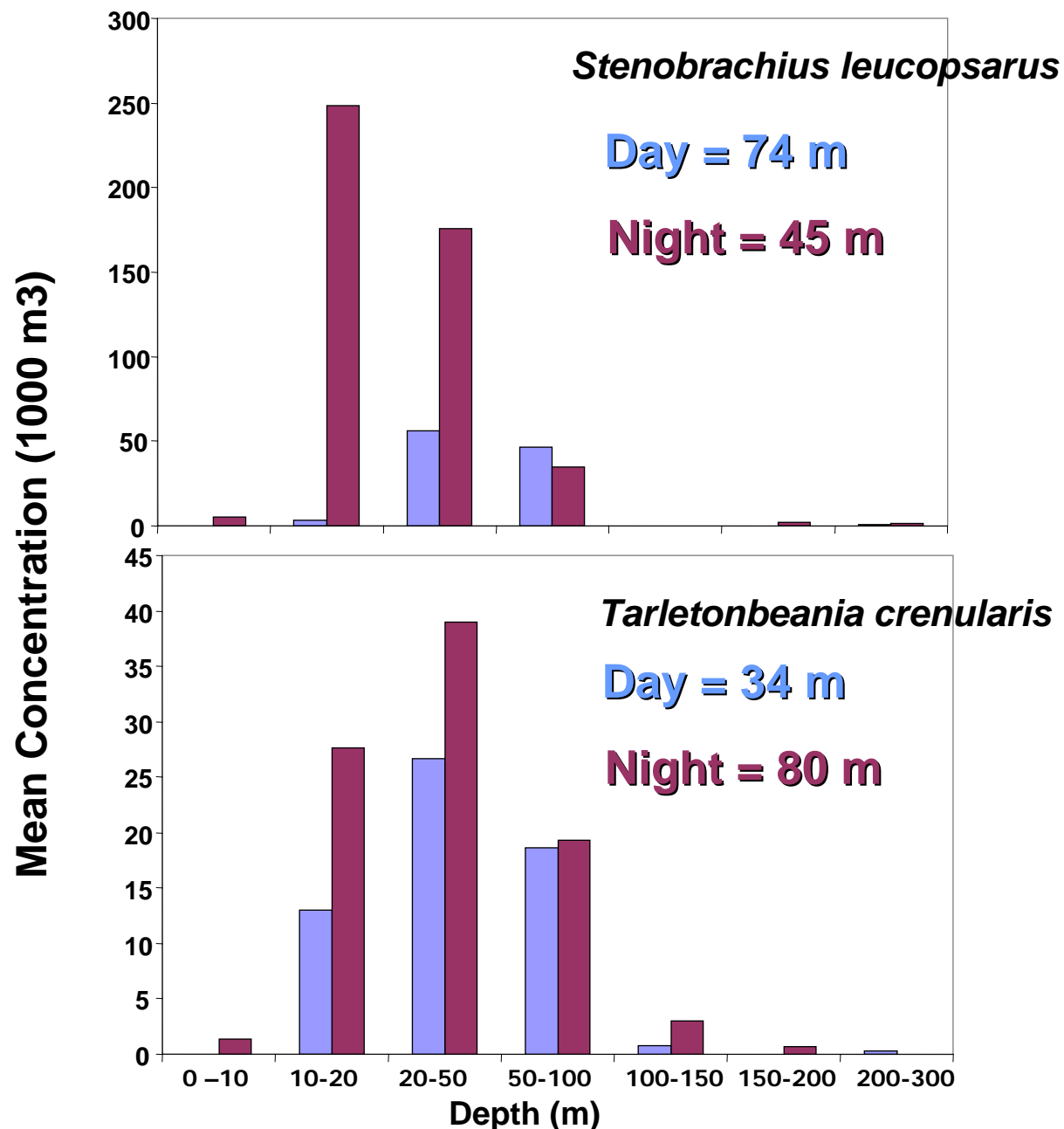
Larval Fish Surveys

Dominant Larval Taxa

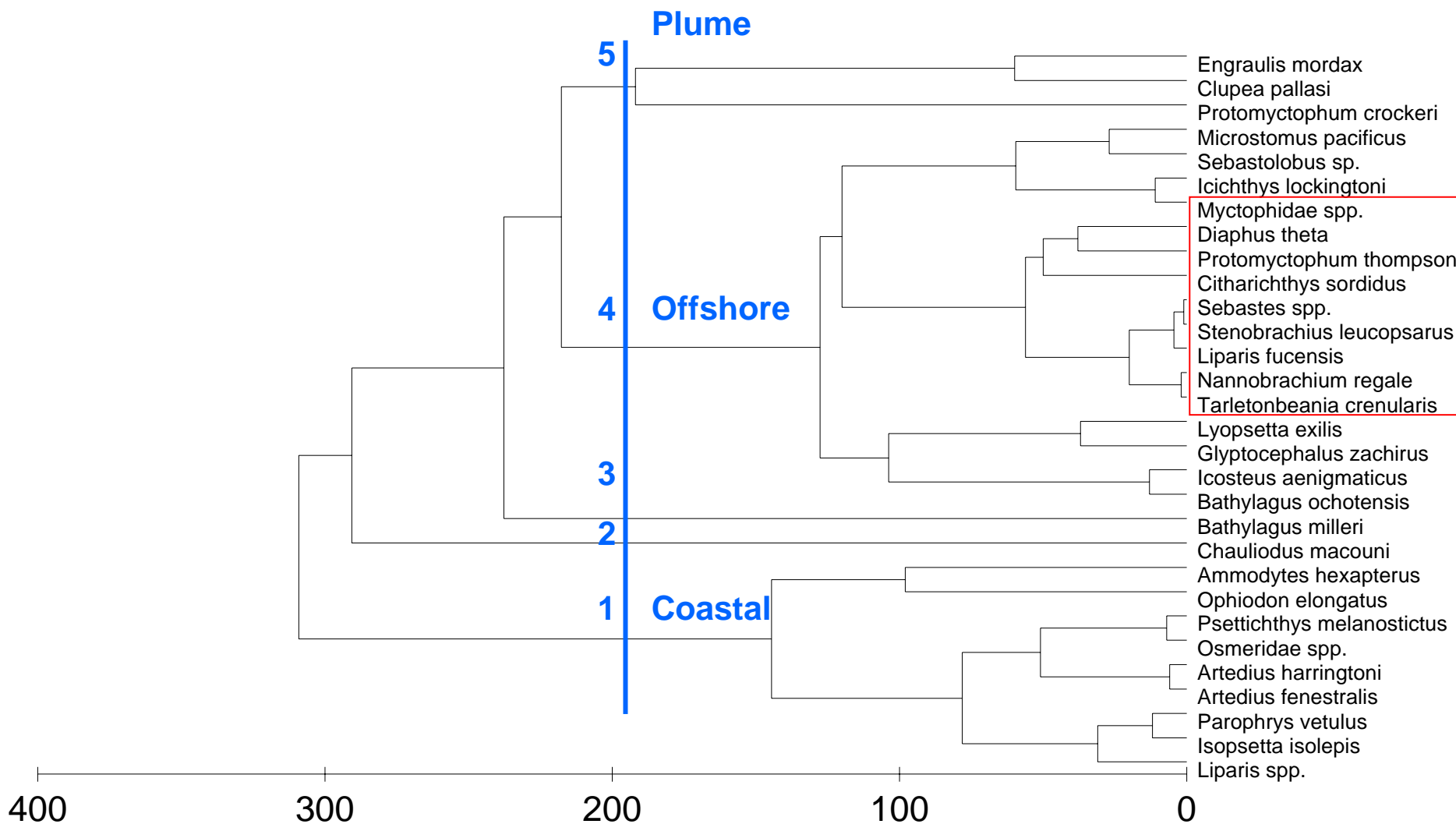
Taxa	Common Name	Frequency Occurrence	Mean Concentration (no./1000 m³)
<i>Engraulis mordax</i>	Northern anchovy	0.34	112.44
<i>Sebastes</i> spp.	Rockfishes	0.62	40.34
<i>Stenobranchius leucopsarus</i>	Northern lampfish	0.33	18.78
<i>Tarletonbeania crenularis</i>	Blue lanternfish	0.33	5.12

The 143 samples collected yielded 5765 fish larvae comprising 27 taxa in 16 families. Four dominant taxa represent 96% of total larvae.

Larval Fish Surveys



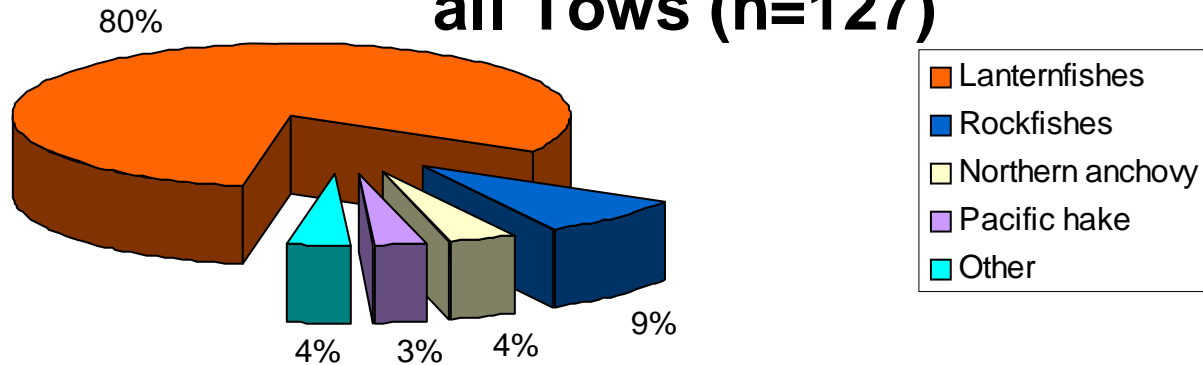
Larval Fish Surveys



Ranked similarities

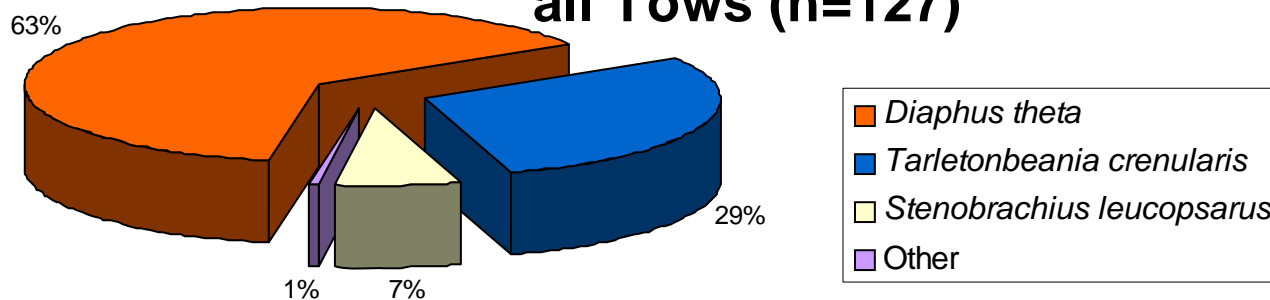
Juvenile Fish Surveys

Concentrations by Family for all Tows (n=127)



Percentages are based on standardized fish per 100,000 m³.

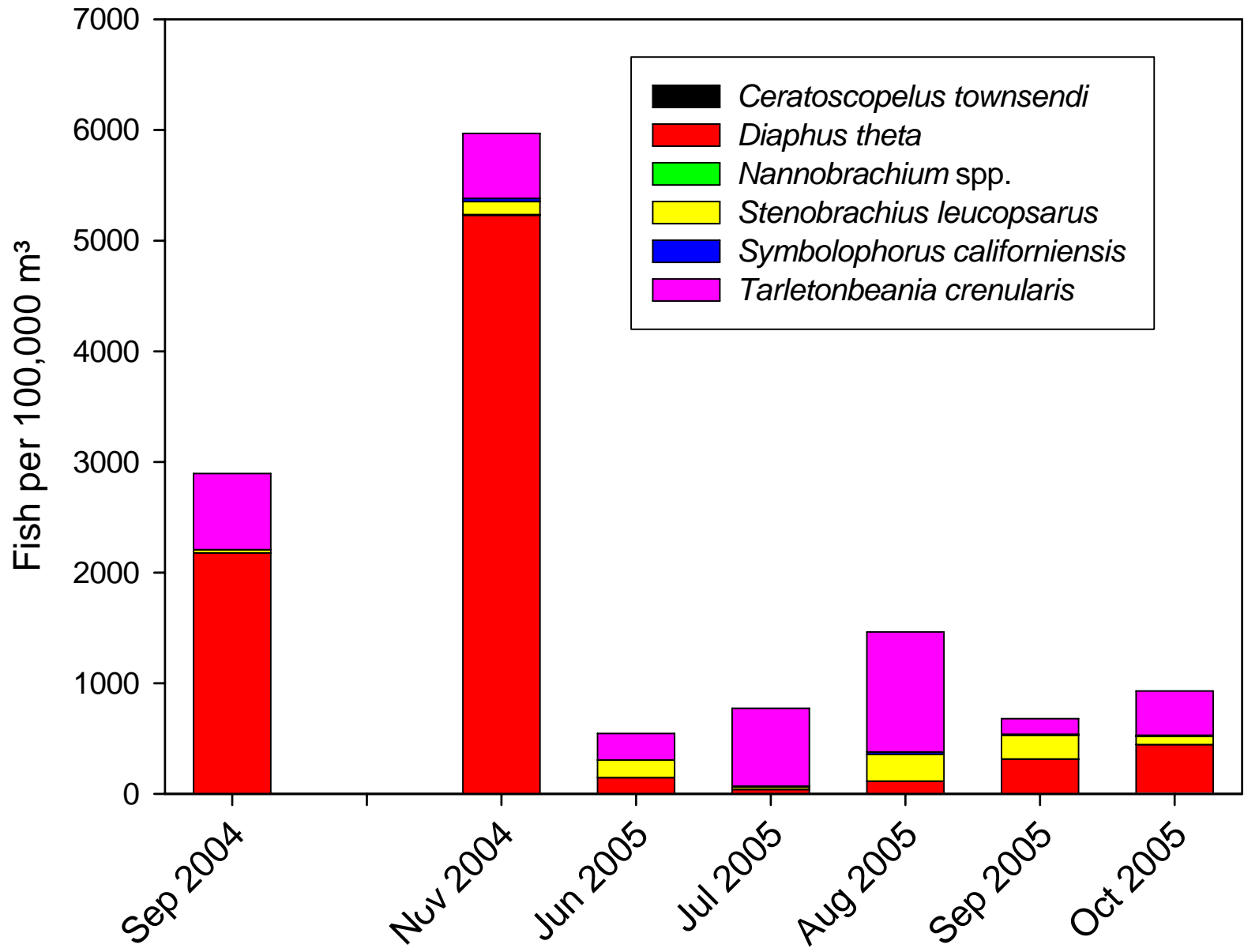
Concentrations of Myctophidae for all Tows (n=127)



Percentages are based on standardized fish per 100,000 m³.

Juvenile Fish Surveys

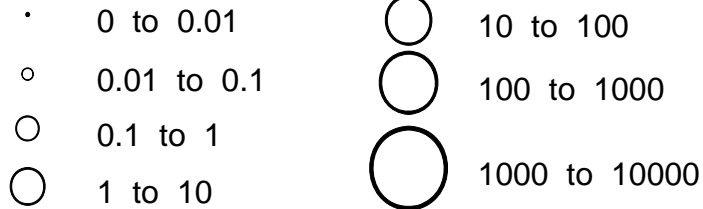
Myctophidae concentrations by Cruise



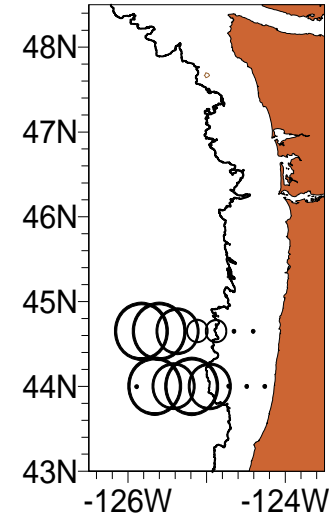
Juvenile Fish Surveys

Diaphus theta

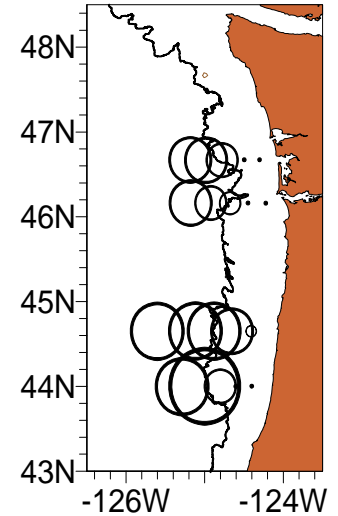
Number of individuals captured per 100,000 m³



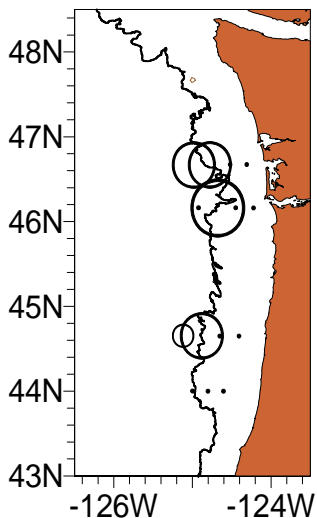
Sep 2004



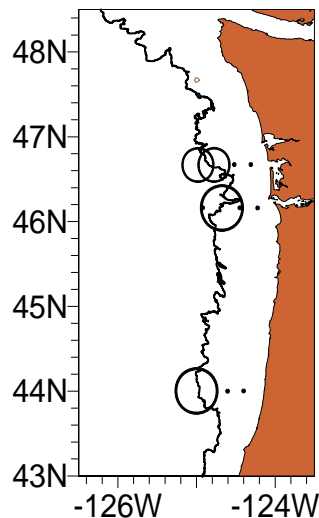
Nov 2004



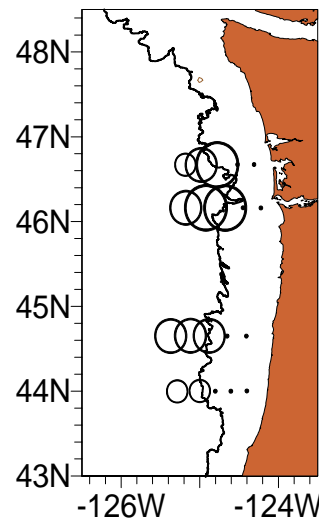
Jun 2005



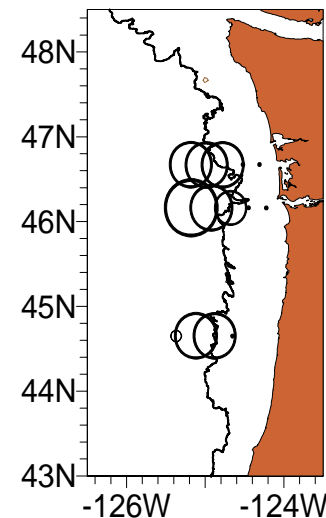
Jul 2005



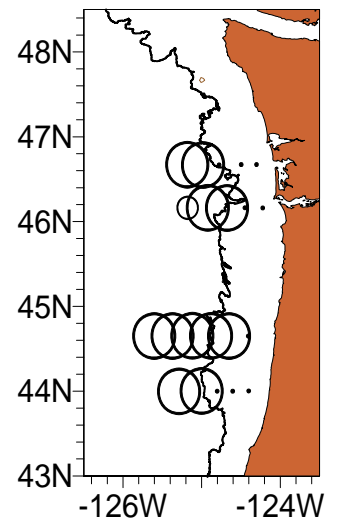
Aug 2005



Sep 2005

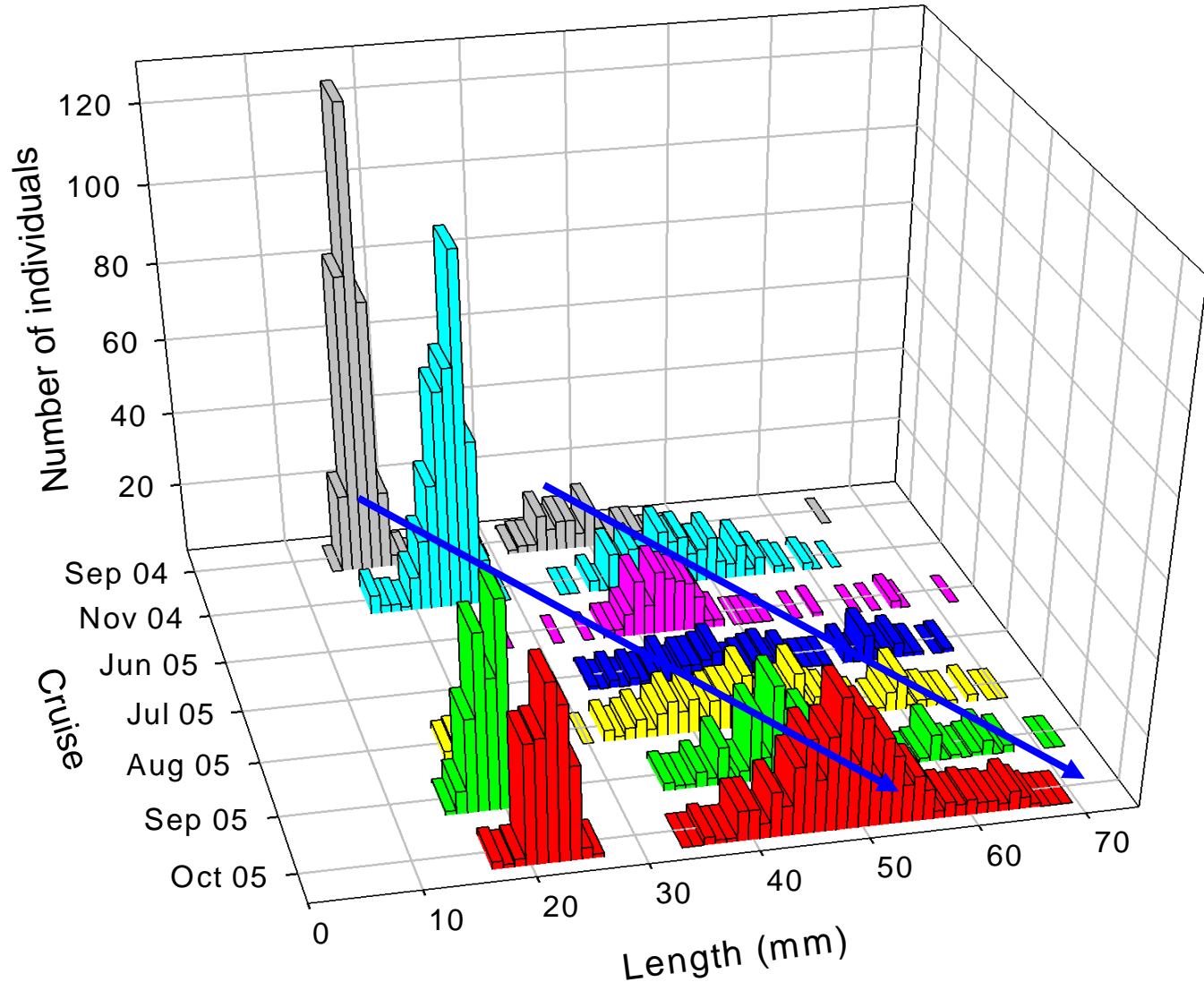


Oct 2005



Juvenile Fish Surveys

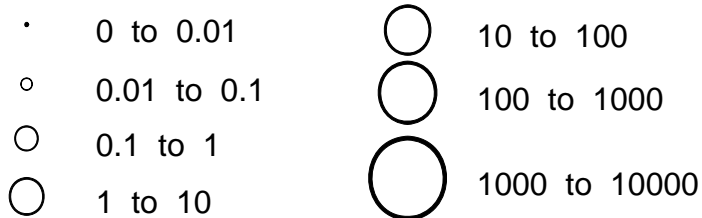
Diaphus theta length distributions by month



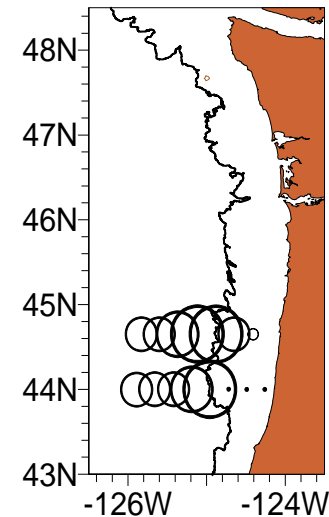
Juvenile Fish Surveys

Tarletonbeania crenularis

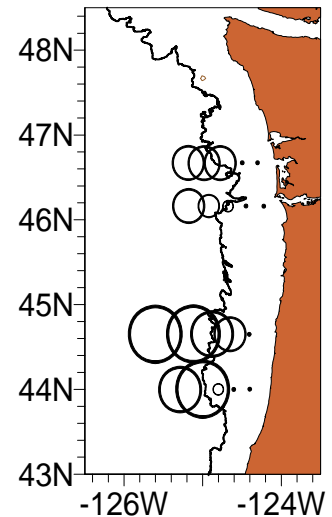
Number of individuals captured per 100,000 m³



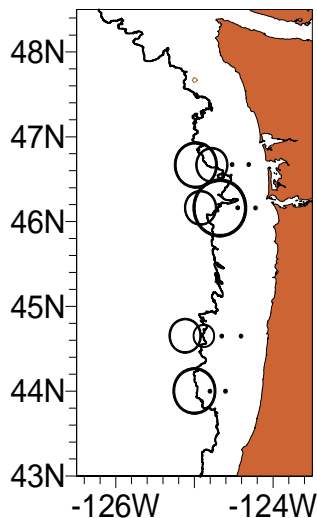
Sep 2004



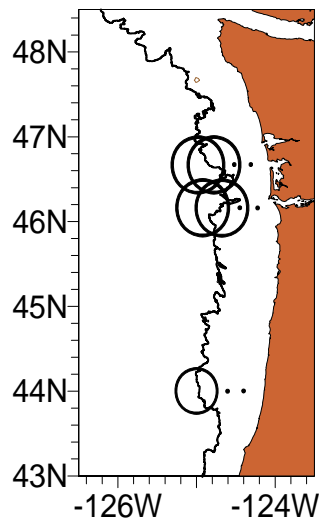
Nov 2004



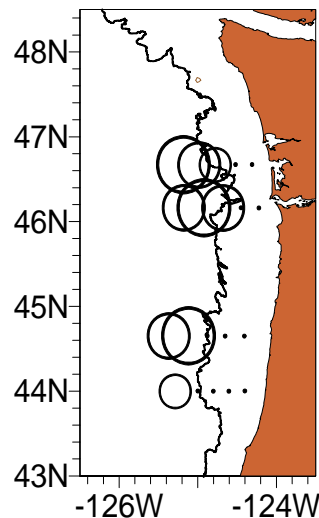
Jun 2005



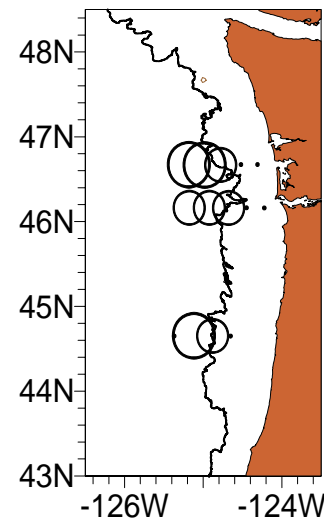
Jul 2005



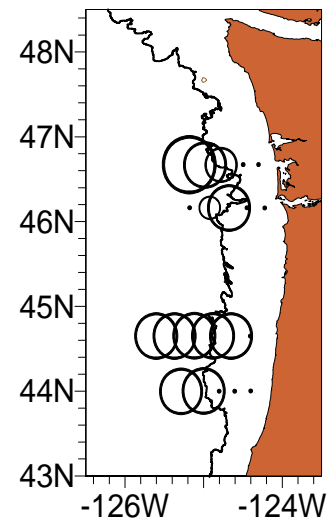
Aug 2005



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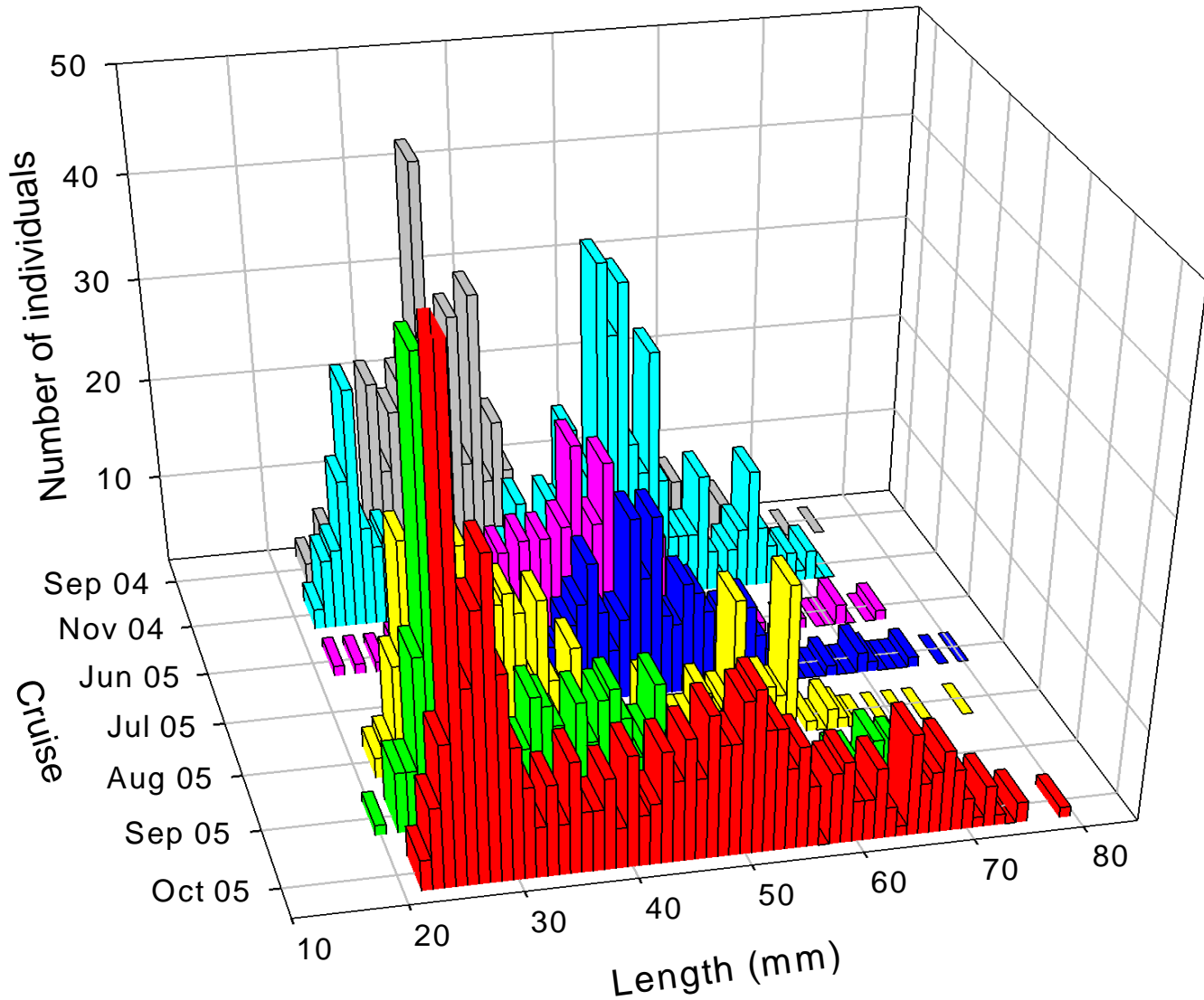


Oct 2005



Juvenile Fish Surveys

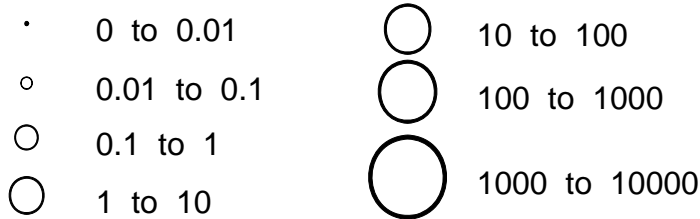
T. crenularis length distributions by month



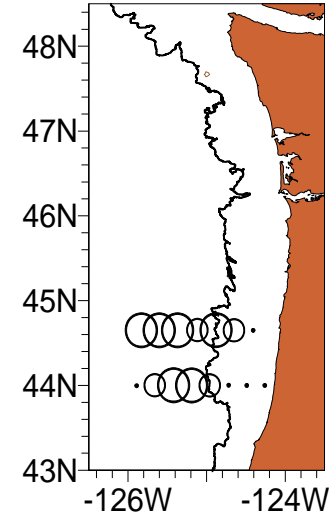
Juvenile Fish Surveys

Stenobrachius leucopsarus

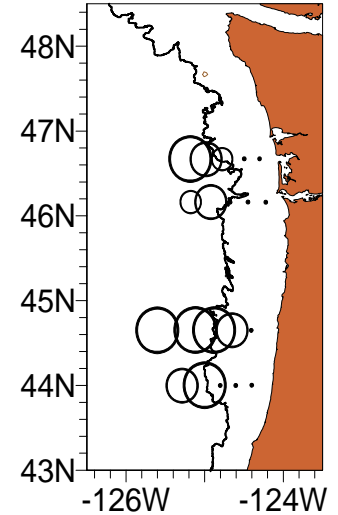
Number of individuals captured per 100,000 m³



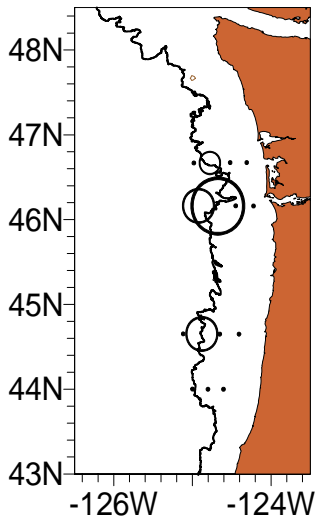
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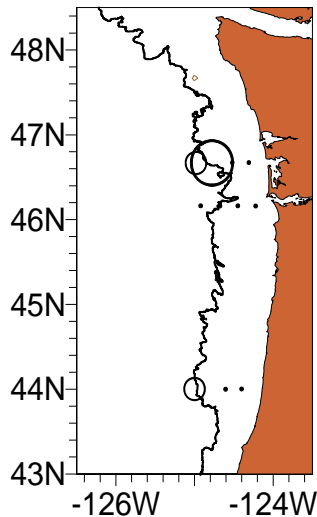
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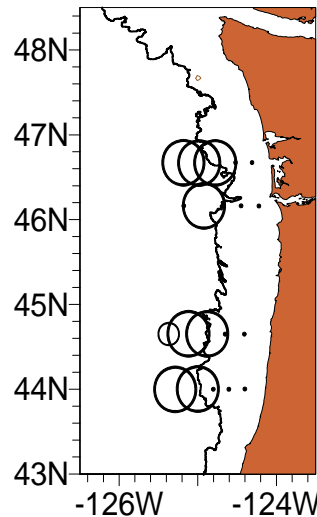
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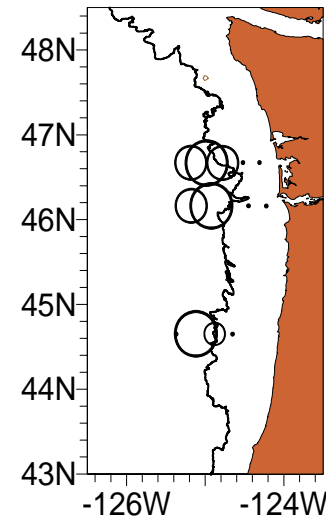
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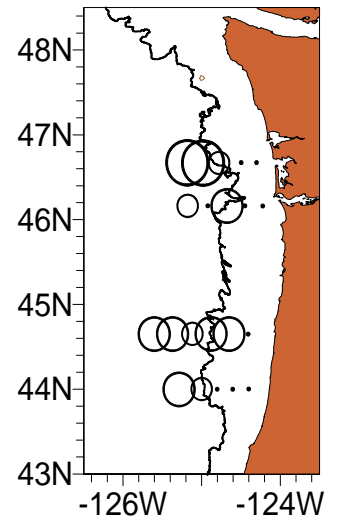
Aug 2005



Sep 2005

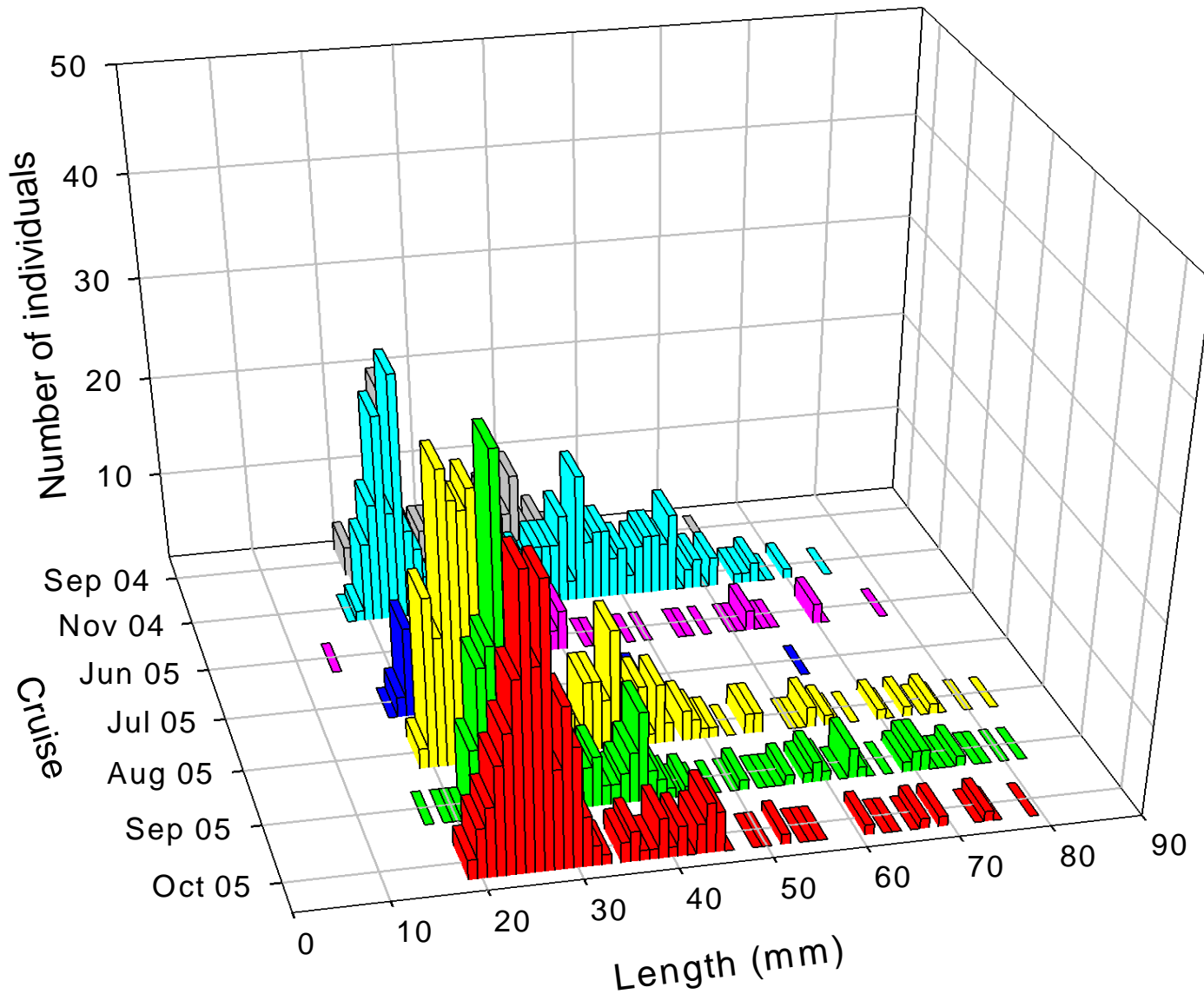


Oct 2005



Juvenile Fish Surveys

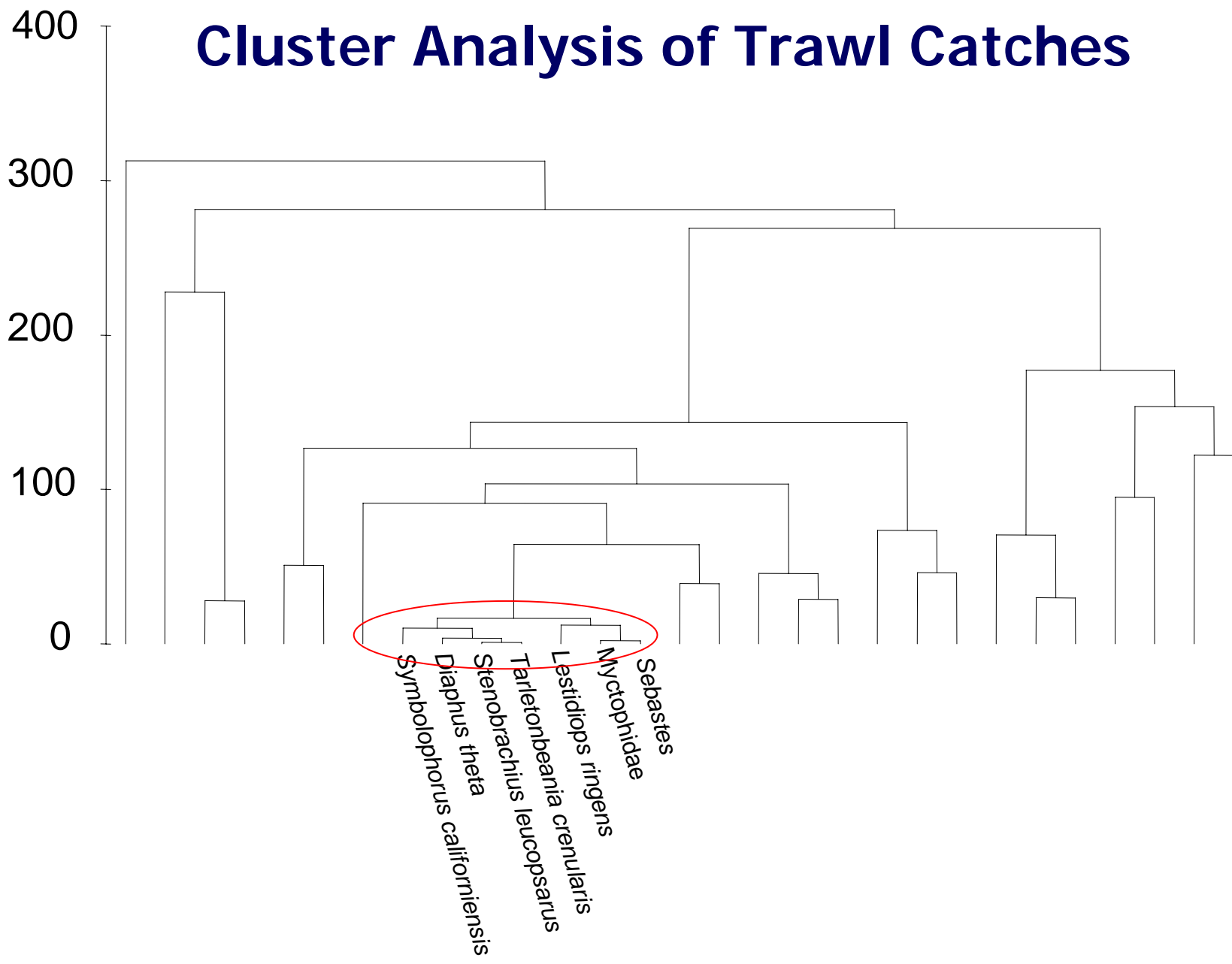
S. leucopsarus length distributions by month



Juvenile Fish Surveys

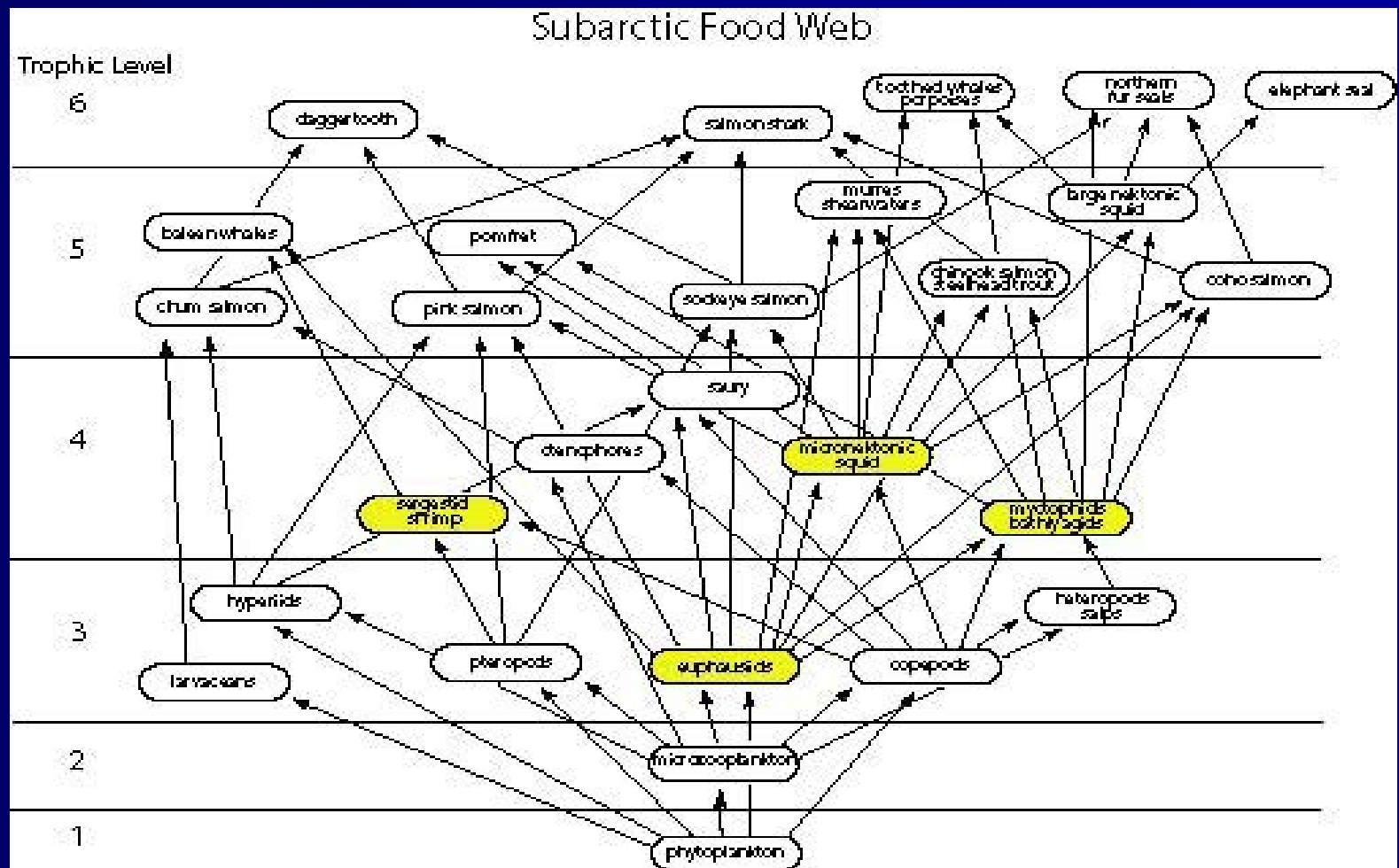
Cluster Analysis of Trawl Catches

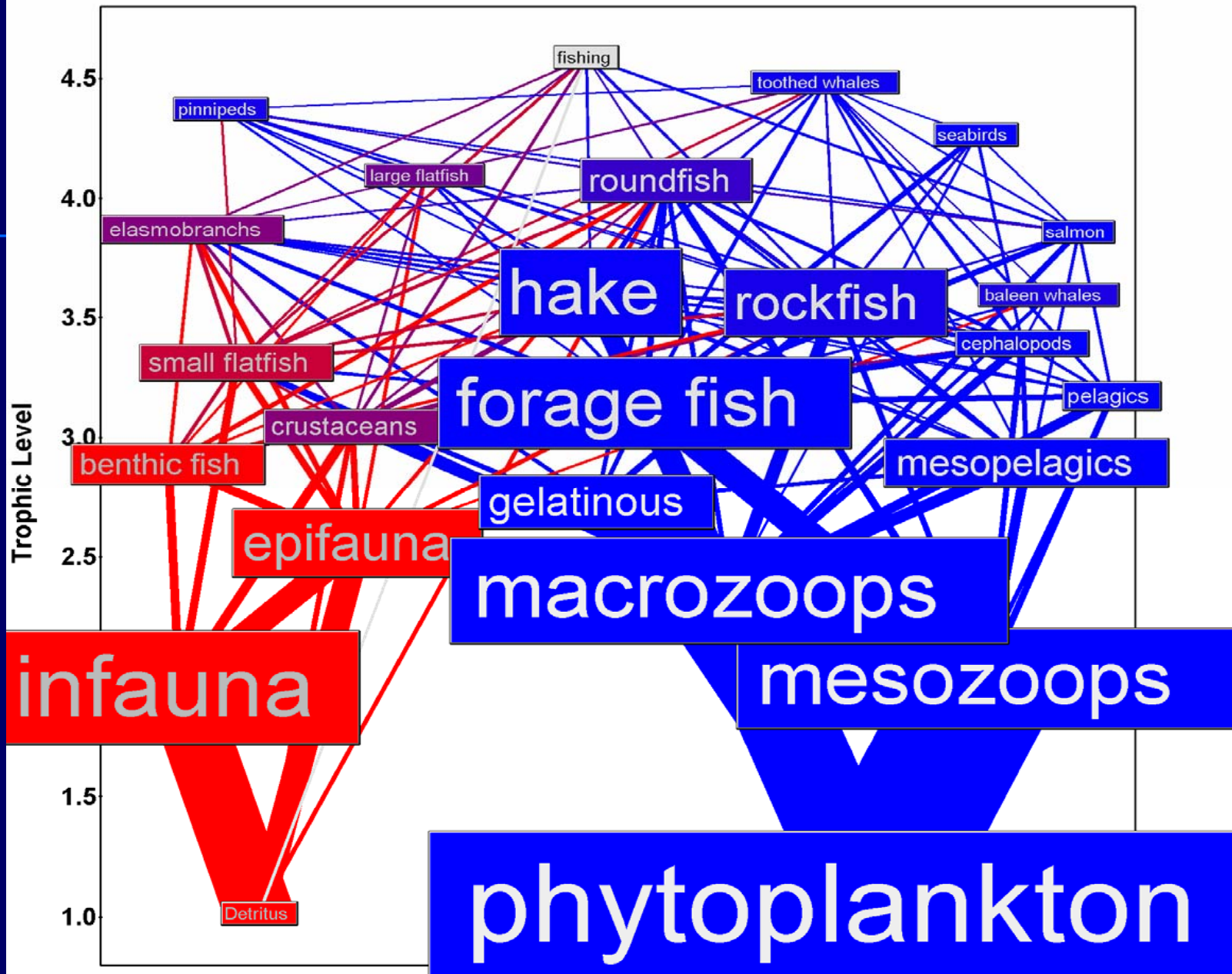
Ranked Dissimilarity



Mesopelagic Fish Importance to Oceanic Food Webs

(Brodeur et al., 1999, *Prog. in Oceanogr.* 43:365-397)










Dietary Composition (% Weight) In Astoria Canyon, Oregon

*Diaphus
theta*

*Stenobrachius
leucopsarus*

Copepods		0.0	8.3
Euphausiids		77.1	64.7
Pteropods		0.0	20.6
Hyperiid		22.2	5.9
Fishes		0.7	0.0



Sample size =

25

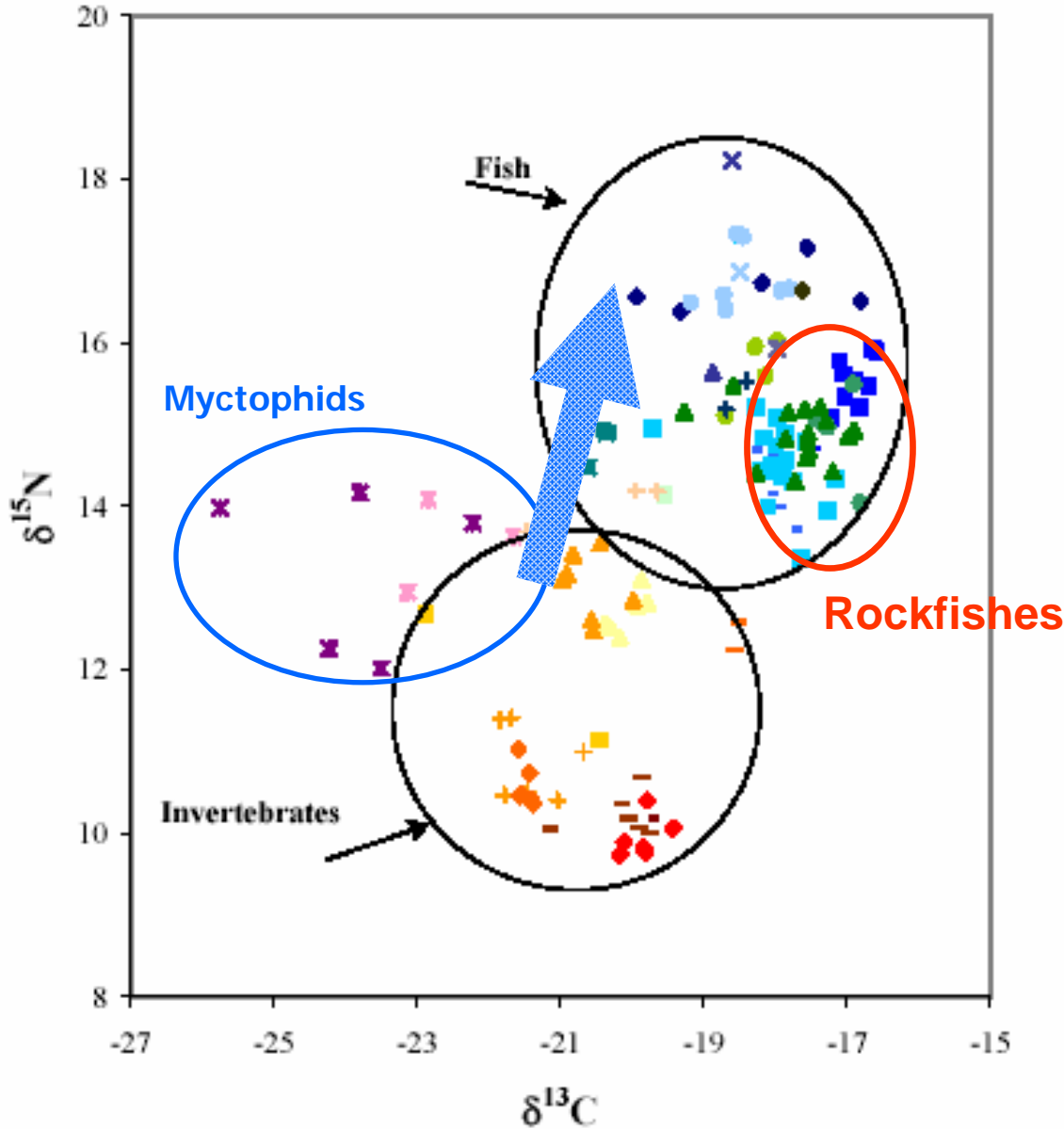
Size range =

48-81

27

53-96

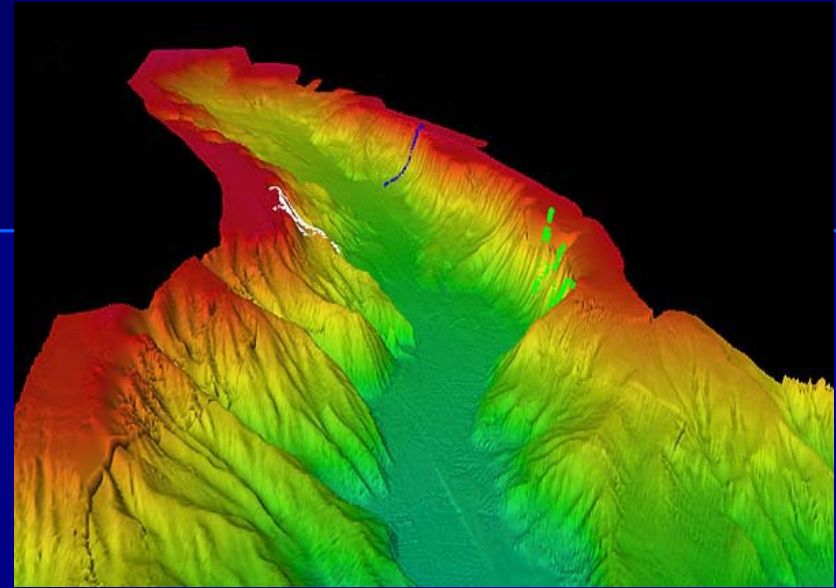




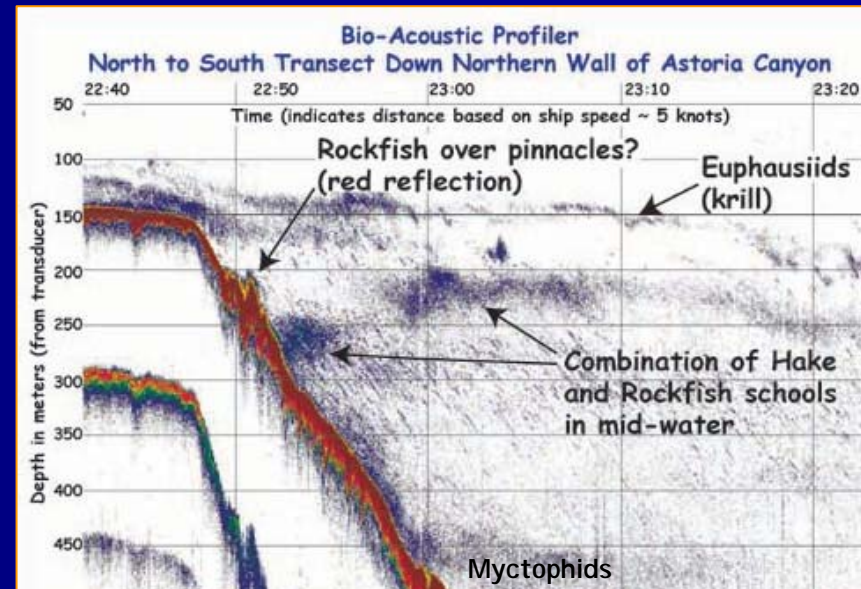
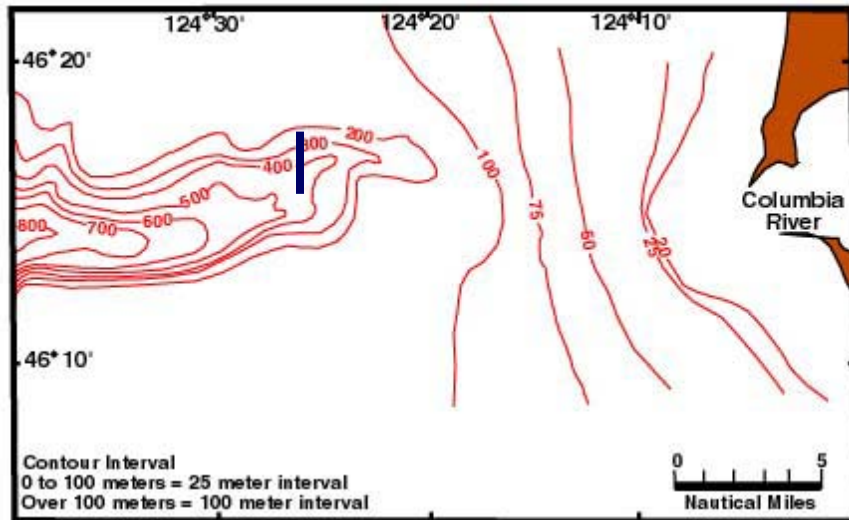
**Astoria Canyon
groundfish eat
mix of local prey
and offshore prey
(myctophids)**

(Bosley et al., 2004)

Using Unmanned Submersibles to Study Mesopelagic Organisms in Astoria Canyon



Bathymetry of Upper Astoria Canyon in Relation to Shoreline
(Modified from Carlson, 1967)





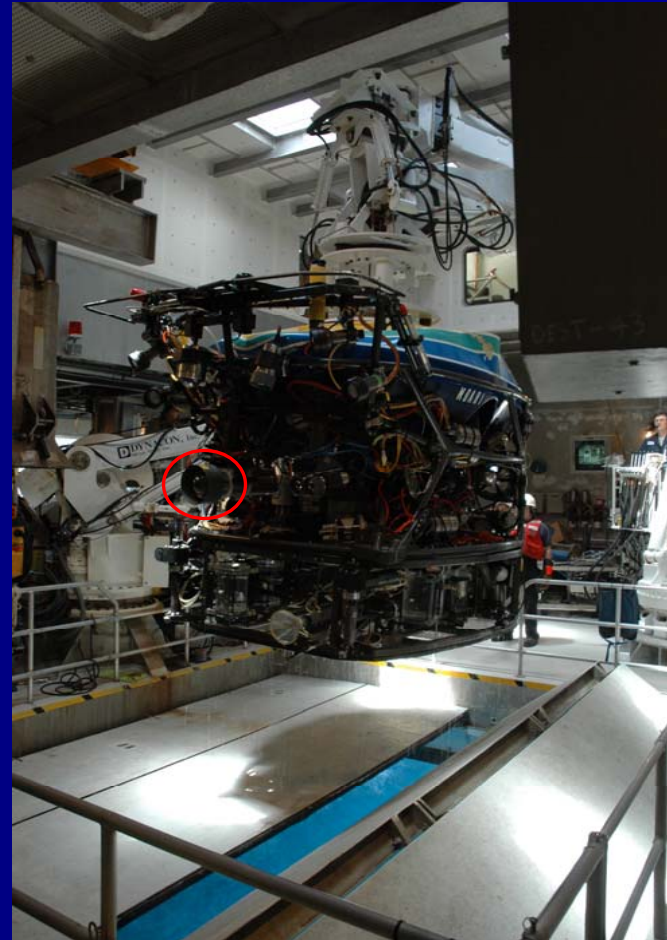
Deployment of ROPOS
ROV off NOAA vessel
Ron Brown in July 2001

Video of aggregation of
Tarletonbeania crenularis
in Astoria Canyon taken
by ROPOS ROV



R/V Western Flyer

August 2006 in Astoria Canyon



Mesopelagic Fishes

Myctophidae –
Lanternfishes

Bigfin lanternfish



(Symbolophorus californiensis)

Mesopelagic Fishes

Myctophidae –
Lanternfishes

Northern lampfish



(Stenobrachius leucopsarus)

Mesopelagic Fishes

Stomiidae

Dragonfishes

Pacific viperfish



(*Chauliodus macouni*)

Mesopelagic Fishes

- Bathylagidae –
Deepsea smelts

Slender blacksmelt



(Bathylagus pacificus)

Mesopelagic Fishes

Gonostomatidae
Bristlemouths

Black bristlemouth



(Cyclothone signata)

Mesopelagic Squids



(Galiteuthis spp.)

Mesopelagic Squids

Stubby squid



(Japattella heathi)

Mesopelagic Squids

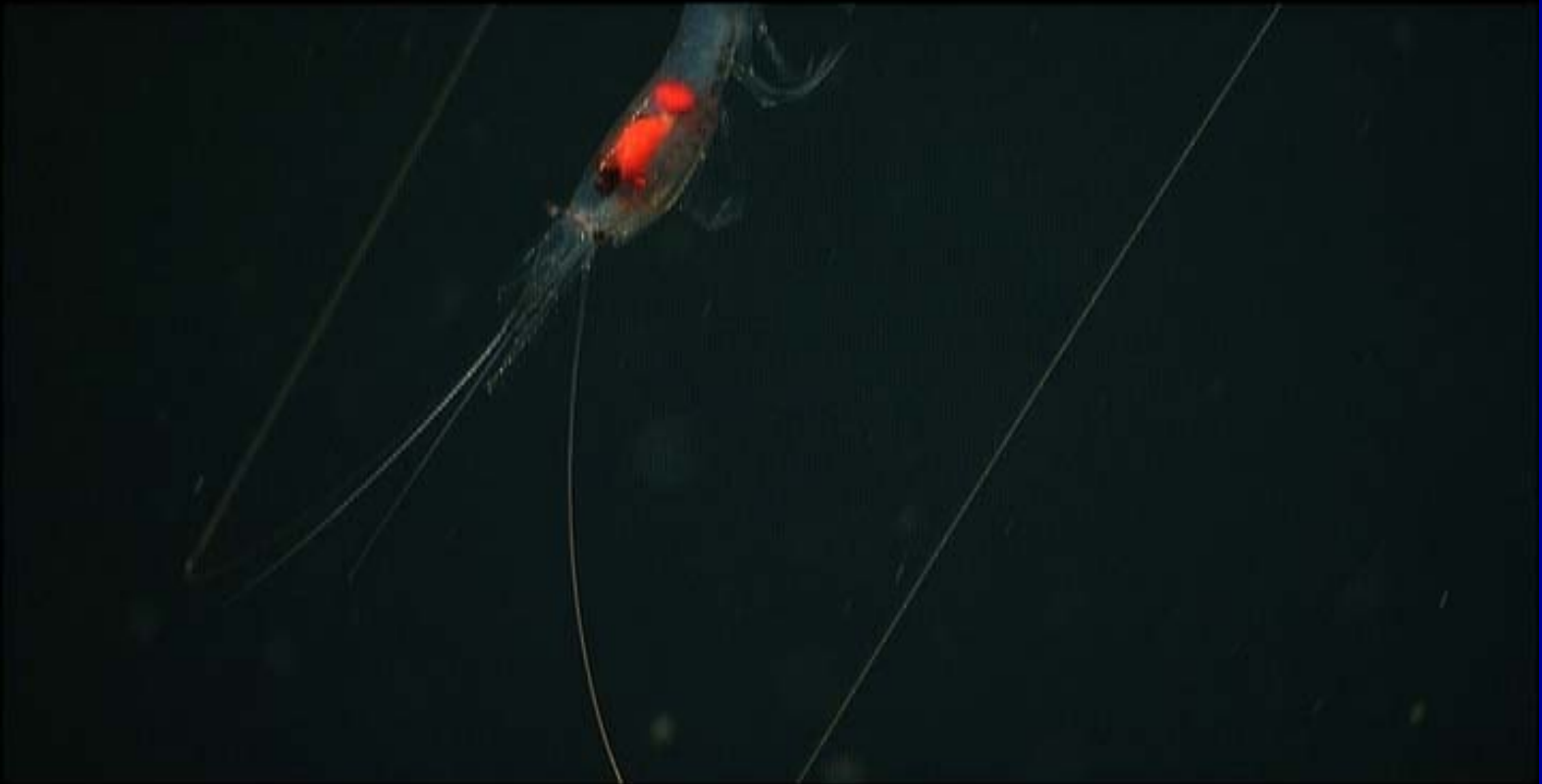
Eight-arm squid



(*Gonotopsis borealis*)

Mesopelagic Shrimp

Glass shrimp



(Sergestes similis)

Data Gaps and Future Studies

Need to know more about predators and predatory impact:

- we really don't know diet composition (or densities) of many predators in the open ocean
- eaten by many species that migrate between coastal and oceanic systems

Need to know more about spawning behaviours and migration patterns:

- when and where do the dominant species spawn
- indication of seasonal spawning/feeding migrations

Sampling problems of micronekton

- standardization of gear or methodology
- ⇒ acoustics and visual observations

Acknowledgements



Bill Pearcy – Oregon State University

Jason Phillips and Toby Auth – CIMRS

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Andrey Suntsov – NOAA NWFSC

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Research Institute

Waldo Wakefield, Julia Clemons, Bob Emmett
- NMFS Newport

.... **And thank you all for your attention!**