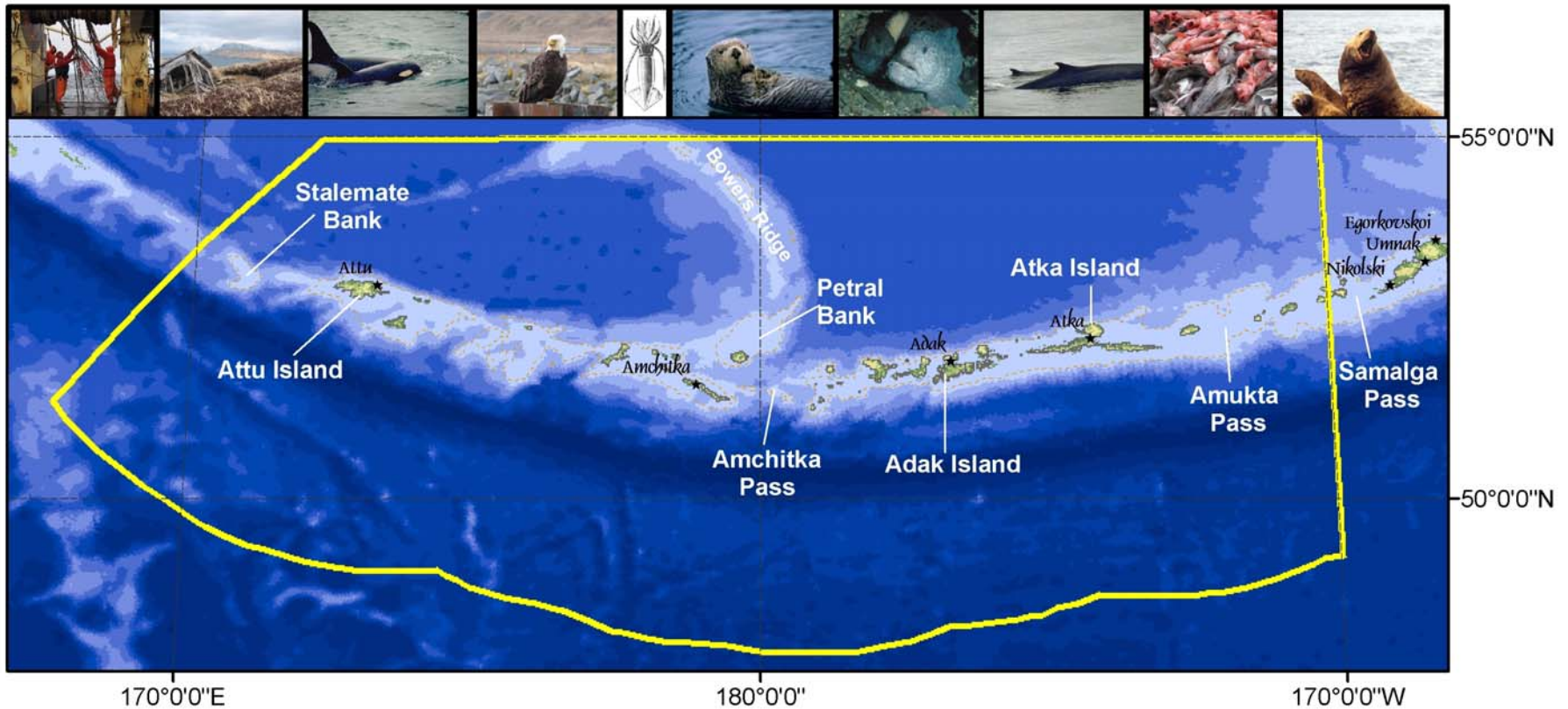


# Aleutian Islands Fishery Ecosystem Plan



For the NPFMC Ecosystem Committee  
SSC, AP, and Council  
March 2007

# We request specific feedback...

What are we missing?      More useful organization?

1. Introduction / purpose / need
2. Geographic description
3. Understanding the AI Ecosystem

Other information / sources?

Other interactions?

4. Ecosystem Assessment
- Add uncertainty (qualitative)?
- Alternative presentation?

5.-9. Sections to be completed pending comments

## Goal of FEP

- Provide better scientific information and measurable indicators to evaluate and promote ecosystem health, sustainable fisheries, and vibrant communities in the Aleutian Islands region

## FEP concept for Alaska\*

- Policy and planning document
- Applies to all fisheries in the Aleutian Islands ecosystem
- Specific management changes still occur through existing processes
  
- FEP is not a legal, binding document – it is an educational tool for the Council, to provide an ecosystem context for fishery management

\* (other regions may do things differently)

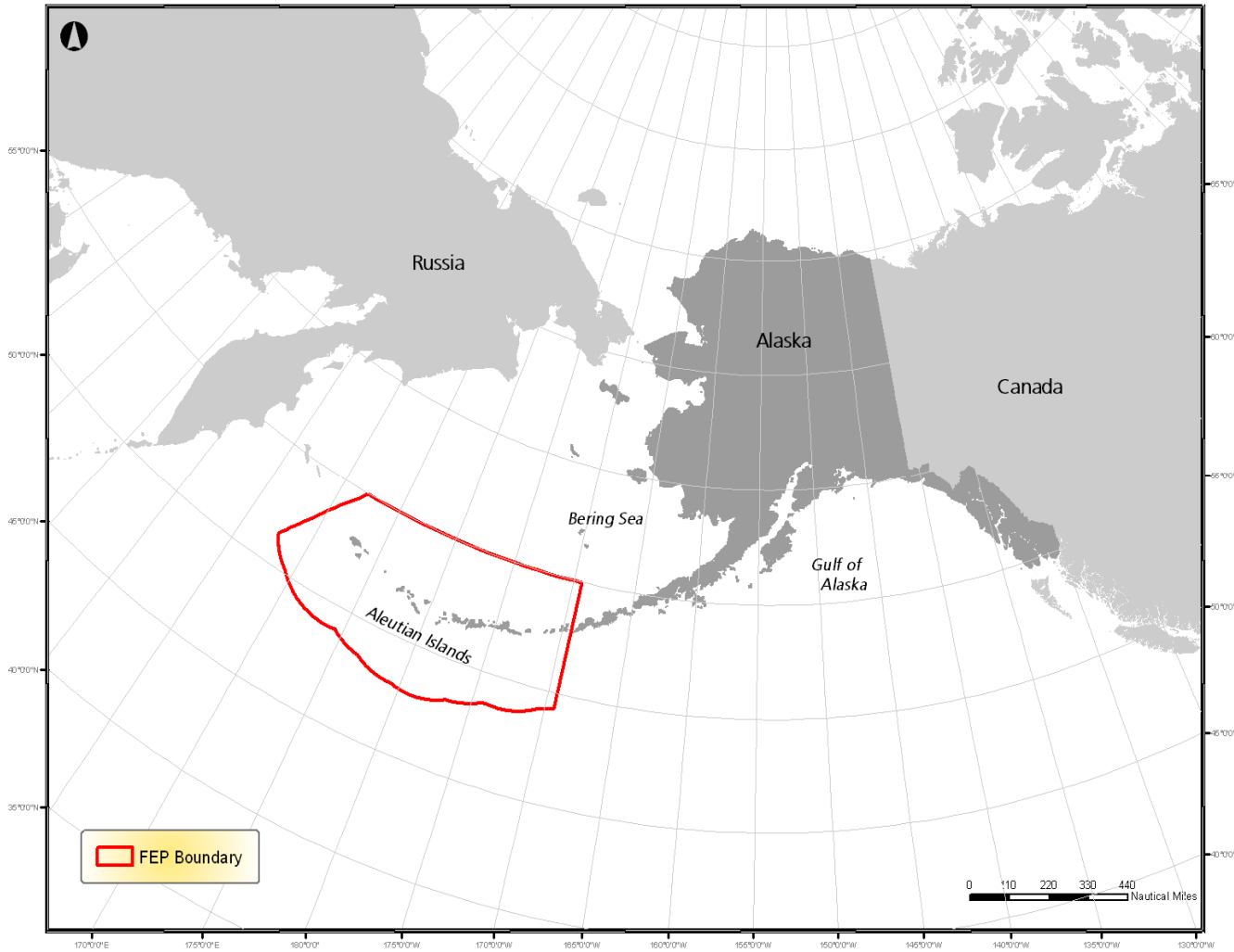
# Need for FEP in AI

- Stewardship
  - AI unique environment
  - Opportunity to better integrate emerging knowledge of the functioning of the marine ecosystem
  - AI is the least predictable Alaska marine ecosystem, therefore may need to use other tools
- Leadership
  - Ecosystem approaches to management, including FEPs, ongoing nationally
  - Opportunity to help define standard, see whether FEPs are useful tool

# FEP Purposes

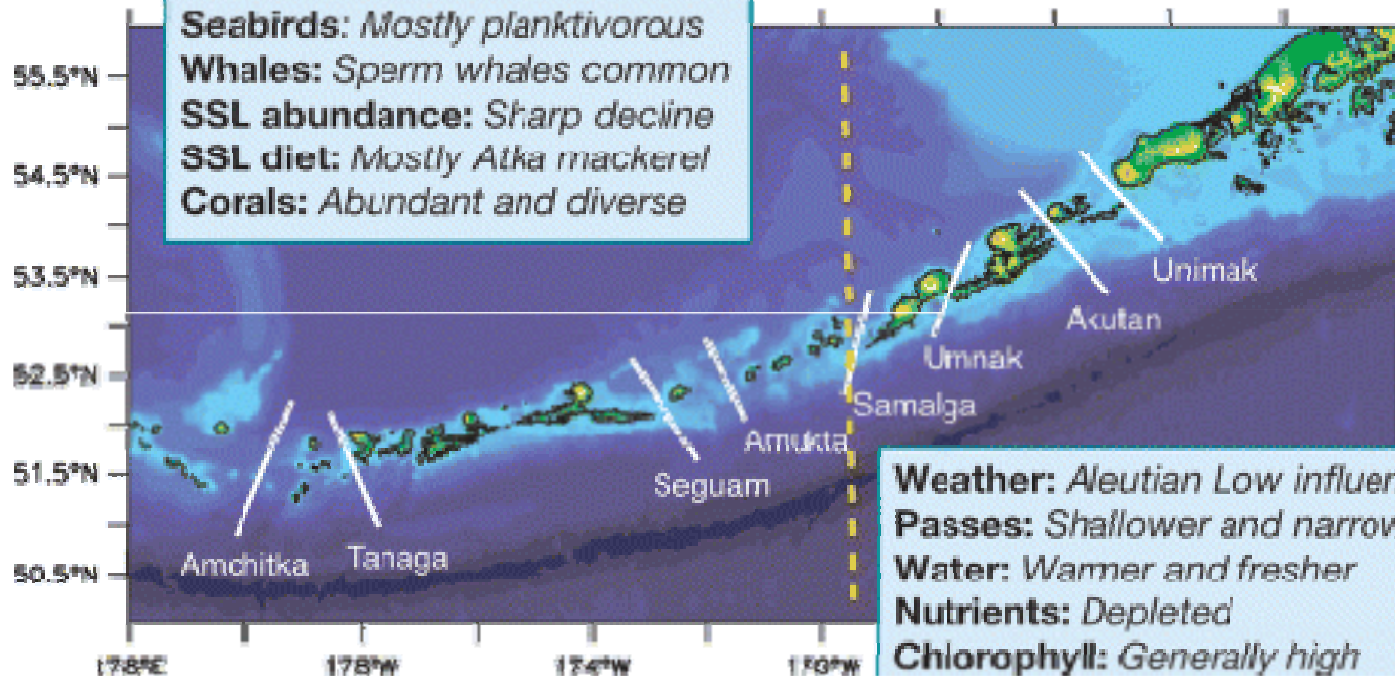
1. Integrate AI information across FMPs
2. Identify ecosystem indicators for the AI
3. Develop and refine tools, i.e. models
4. Identify uncertainty / research needs
5. Assist Council with management objectives and understanding cumulative effects

# AI Ecosystem Boundary for FEP



# Why at Samalga Pass?

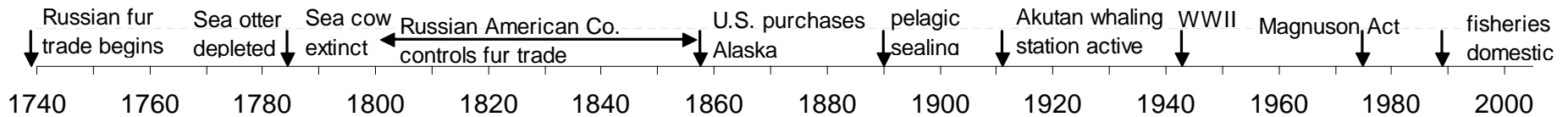
**Weather:** Asian influenced  
**Passes:** Deeper and wider  
**Water:** Colder and saltier  
**Nutrients:** Abundant  
**Chlorophyll:** Generally low  
**Zooplankton species:** Oceanic  
**Fish:** Atka mackerel abundant  
**Seabirds:** Mostly planktivorous  
**Whales:** Sperm whales common  
**SSL abundance:** Sharp decline  
**SSL diet:** Mostly Atka mackerel  
**Corals:** Abundant and diverse



**Weather:** Aleutian Low influenced  
**Passes:** Shallower and narrower  
**Water:** Warmer and fresher  
**Nutrients:** Depleted  
**Chlorophyll:** Generally high  
**Zooplankton species:** Neritic  
**Fish:** Atka mackerel scarce  
**Seabirds:** Mostly piscivorous  
**Whales:** Fin & humpback common  
**SSL abundance:** Moderate decline  
**SSL diet:** Mixed, pollock  
**Corals:** Sparse and similar



# Aleutian Islands Ecosystem Processes: Visualizing relationships in Section 3



## 3.1 Historical context

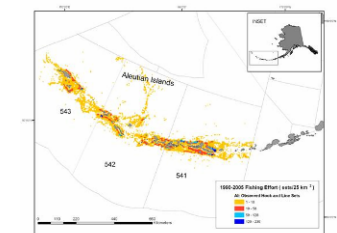
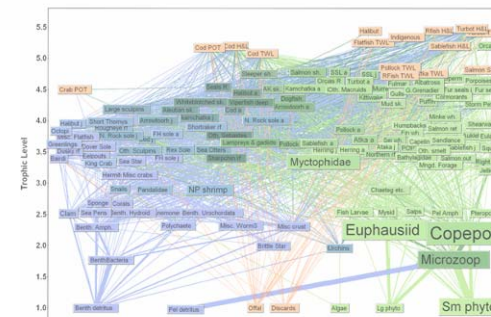
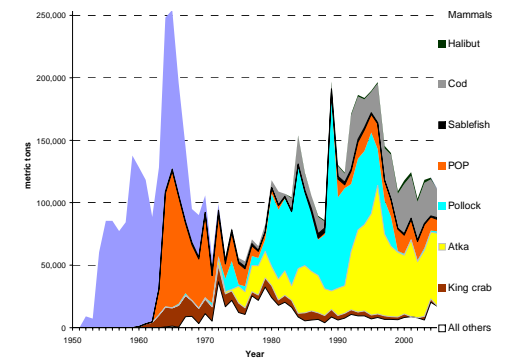
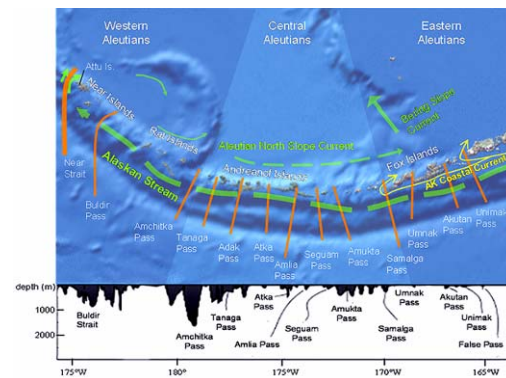
## 3.2 Physical relationships

## 3.3 Biological relationships

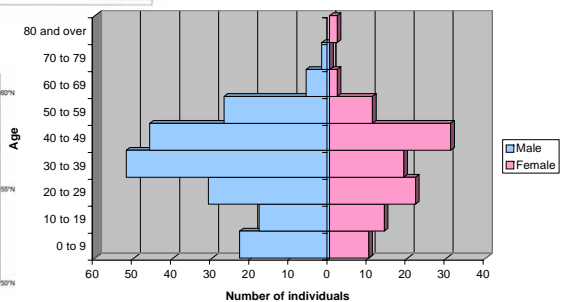
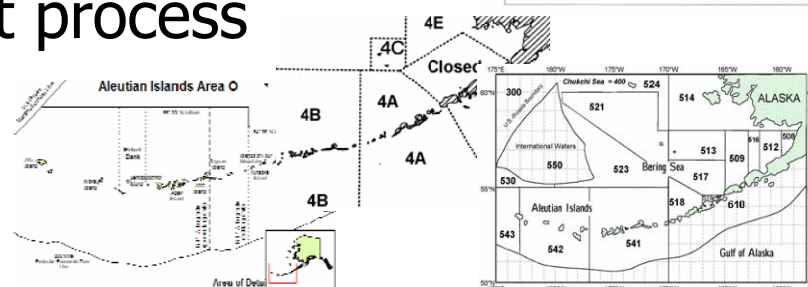
## 3.4 Socioeconomic relationships

## 3.5 Management process

## 3.6 Interactions



2000 Population Structure  
Adak  
Data source: US Census

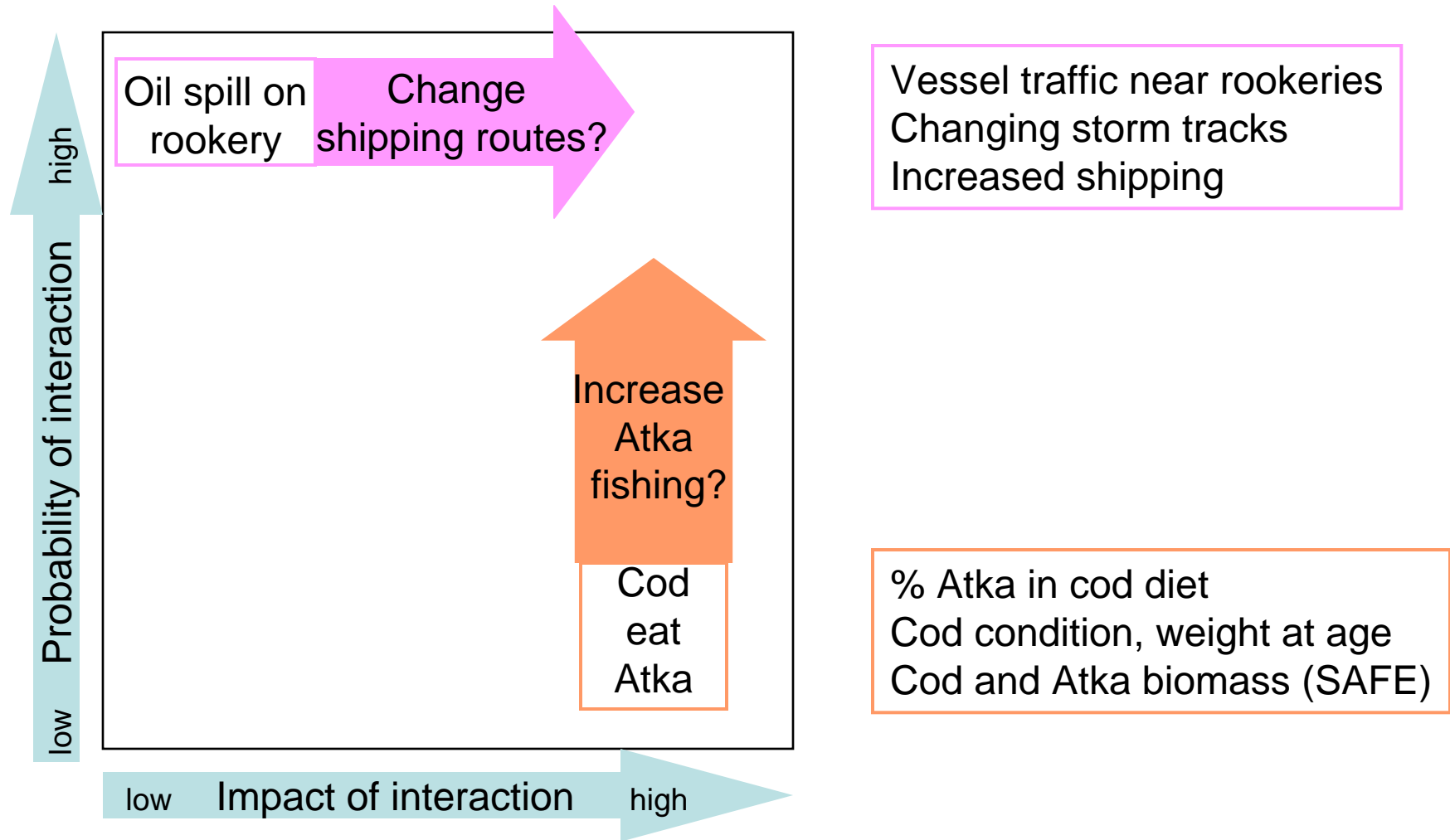


# Interactions → Ecosystem Assessment

## Section 4

### 4.1 Risk Assessment

### 4.2 Indicators



# Next steps

1. Take your feedback, community feedback, and team feedback to edit the current sections (1-5).
2. AI FEP Team workshop April 5-6 where we use these results to...
3. Highlight implications for human use of ecosystem (section 6)
4. Suggest priorities for analysis and further research (section 7)
  - within the next year
  - over longer timeframes (2 years, 5 years, 10 years, etc.)
5. Make Recommendations for the Council and (section 8)
6. Summarize the “value added” by FEP process (section 9)

Final review in June 2007



“Would you please elaborate on ‘then something bad happened’?”

# AI FEP Team membership

|                           |                               |
|---------------------------|-------------------------------|
| Kerim Aydin, NMFS AFSC    | Ecosystem / food web modeling |
| Steve Barbeaux, NMFS AFSC | Pollock biology, assessment   |
| Forrest Bowers, ADF&G     | Crab and state fisheries      |
| Vernon Byrd, USFWS, AKRO  | Birds and mammals             |
| Diana Evans, NPFMC        | FEP policy, implementation    |
| Sarah Gaichas, NMFS AFSC  | Ecosystem / food web modeling |
| Carol Ladd, NOAA PMEL     | Physical oceanography         |
| Sandra Lowe, NMFS AFSC    | Atka mackerel bio, assessment |
| John Olson, NMFS AKRO     | Habitat, GIS                  |
| Jennifer Sepez, NMFS AFSC | Anthropology, socioeconomics  |
| Paul Spencer, NMFS AFSC   | Rockfish biology, assessment  |
| Francis Wiese, NPRB       | Research, seabirds            |



Ecosystem Dynamics of  
the Aleutian Islands:

Food webs, space, and scale

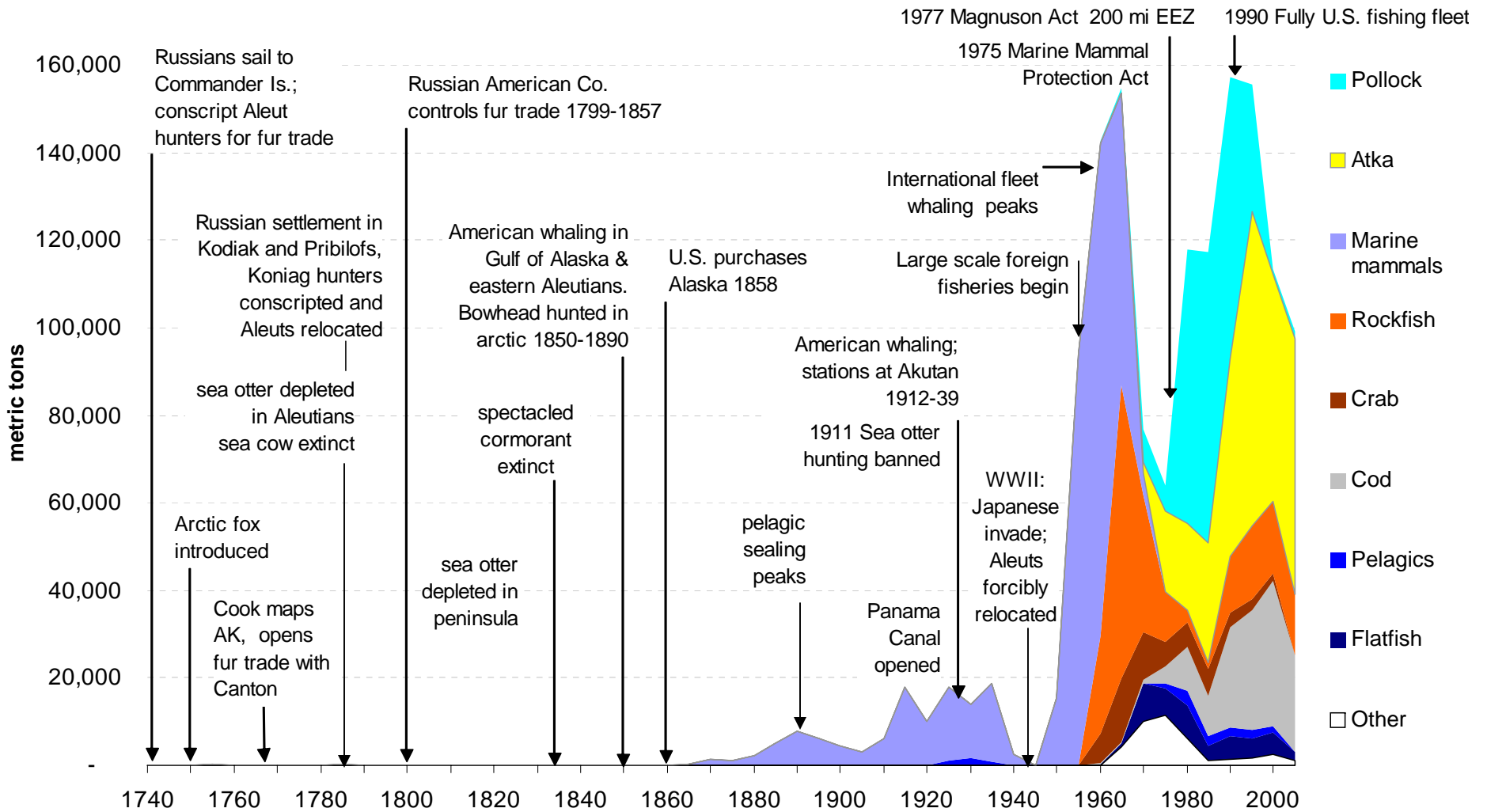
Dr. Ivonne Ortiz, UW SAFS

Ivonne's dissertation work is the basis for much of  
biological interactions section of the FEP.

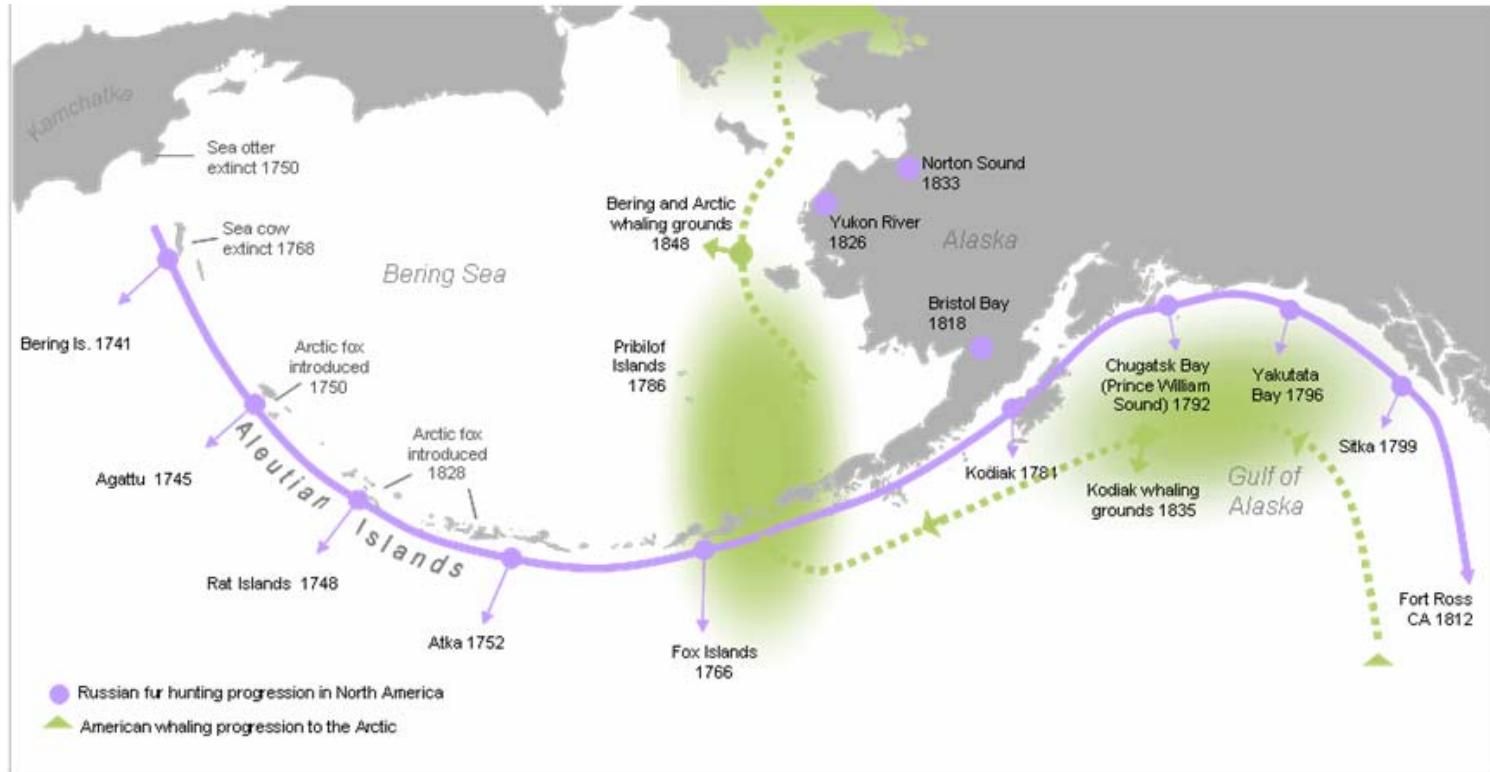
Thank you Ivonne.



# Aleutian Islands Exploitation History



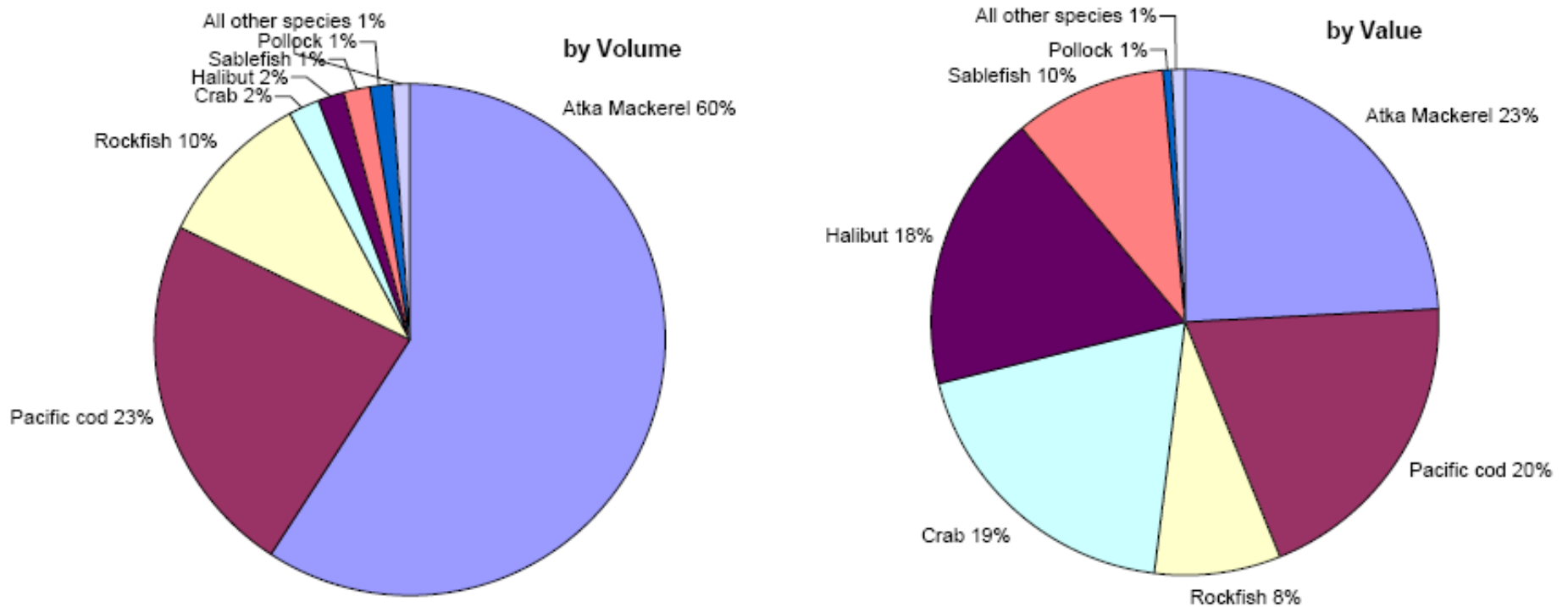
# Historical exploitation patterns in space 1740-1858





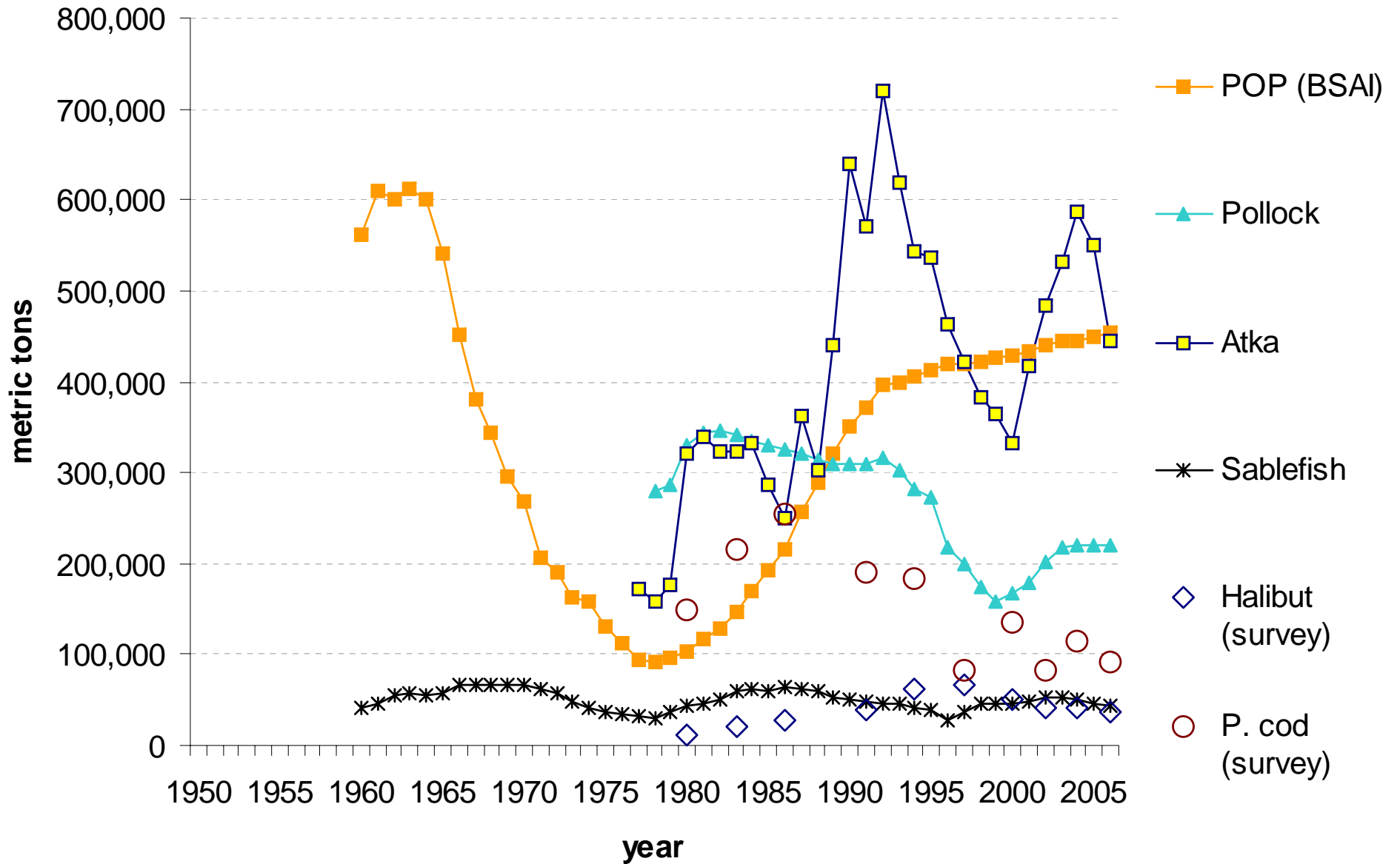


# 2005 volume and value of AI fisheries



**Figure 3-22** Fishery resources harvested in the Aleutian Islands Ecosystem (areas 541, 542, and 543) by volume and by value, in 2005.

# AI Fish stock assessment trends





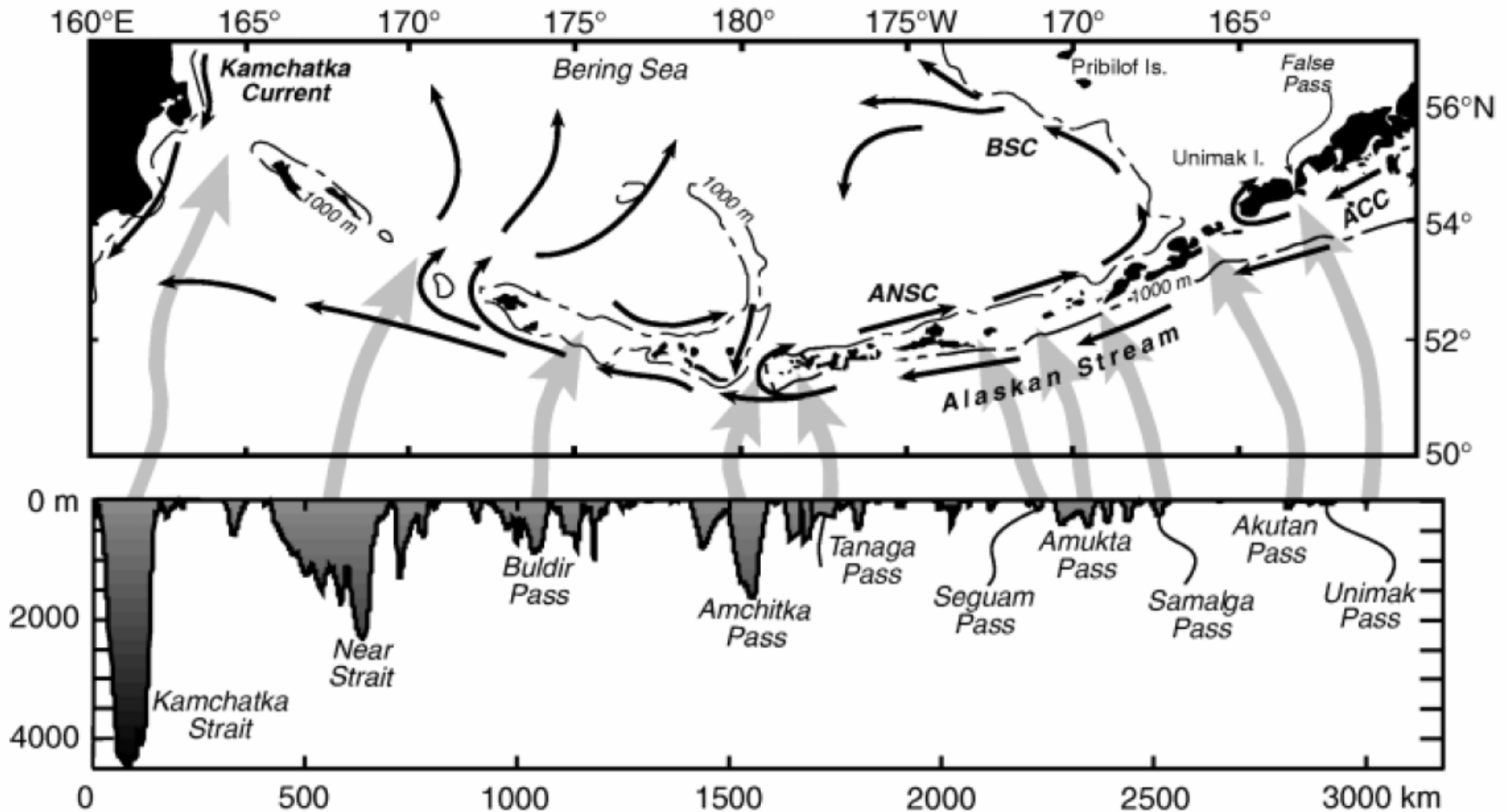
# Aleutian Islands Physical relationships



2,500 km island arc with over 300 islands and 40 volcanoes  
Near constant seismic activity as the Pacific plate slides under the North American Plate



# Aleutian Islands Physical relationships

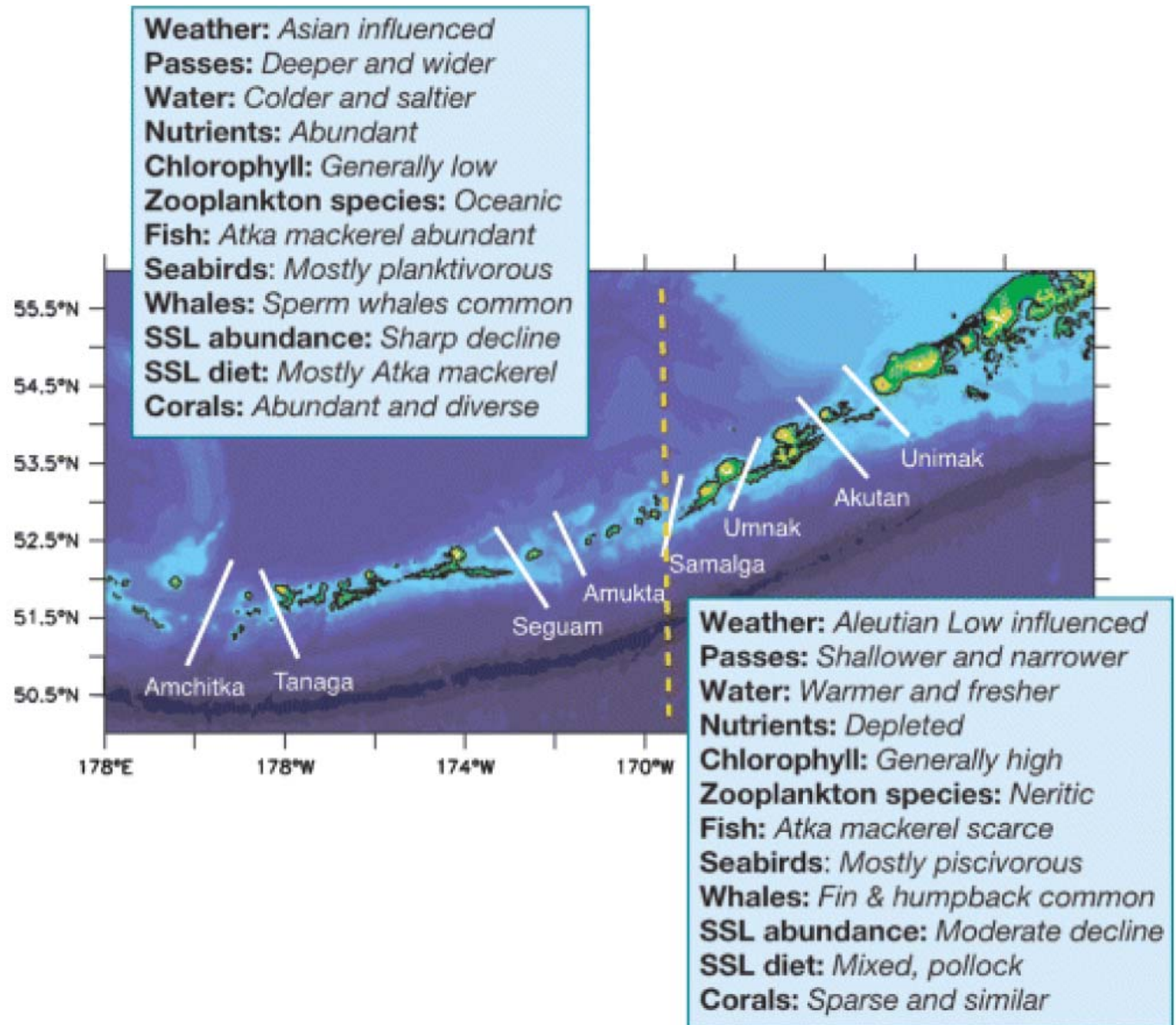


**Figure 3-6** The mean circulation along the Aleutian Arc is shown together with geographic place names, The lower panel shows the depth of the passes in the Aleutian Arc. Reprinted from Stabeno et al. 2005.

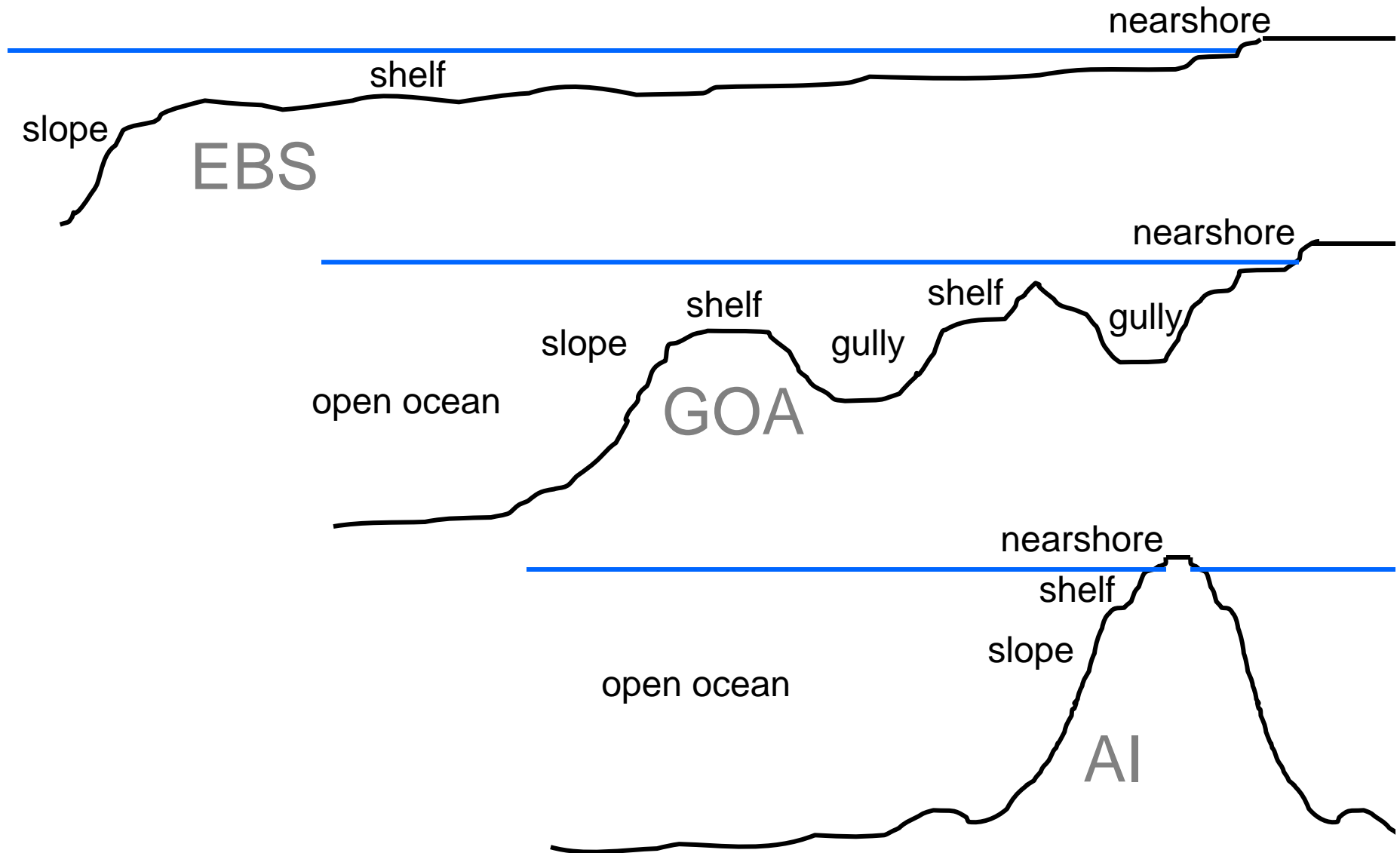
Note: ANSC = Aleutian North Slope Current, ACC = Alaska Coastal Current, BSC = Bering Sea Current.

# Aleutian Islands Physical relationships

Along the chain, other physical and biological relationships continue to change through space (Ortiz 2007)

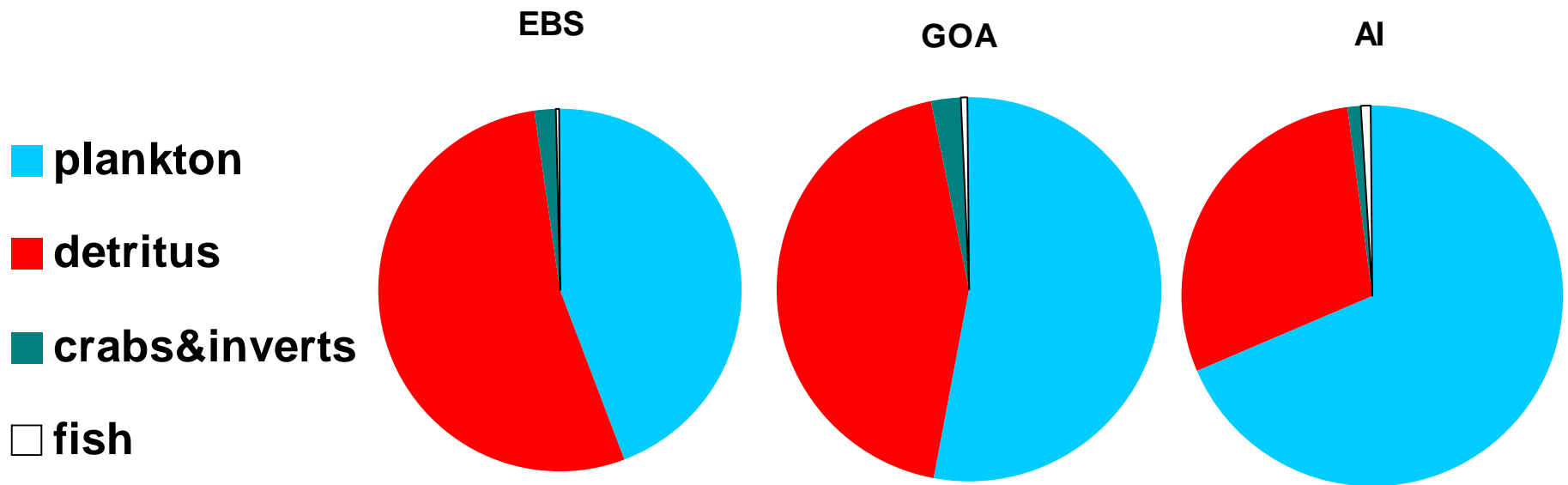


# Physical relationships affect energy flow





# Consumption in all three ecosystems

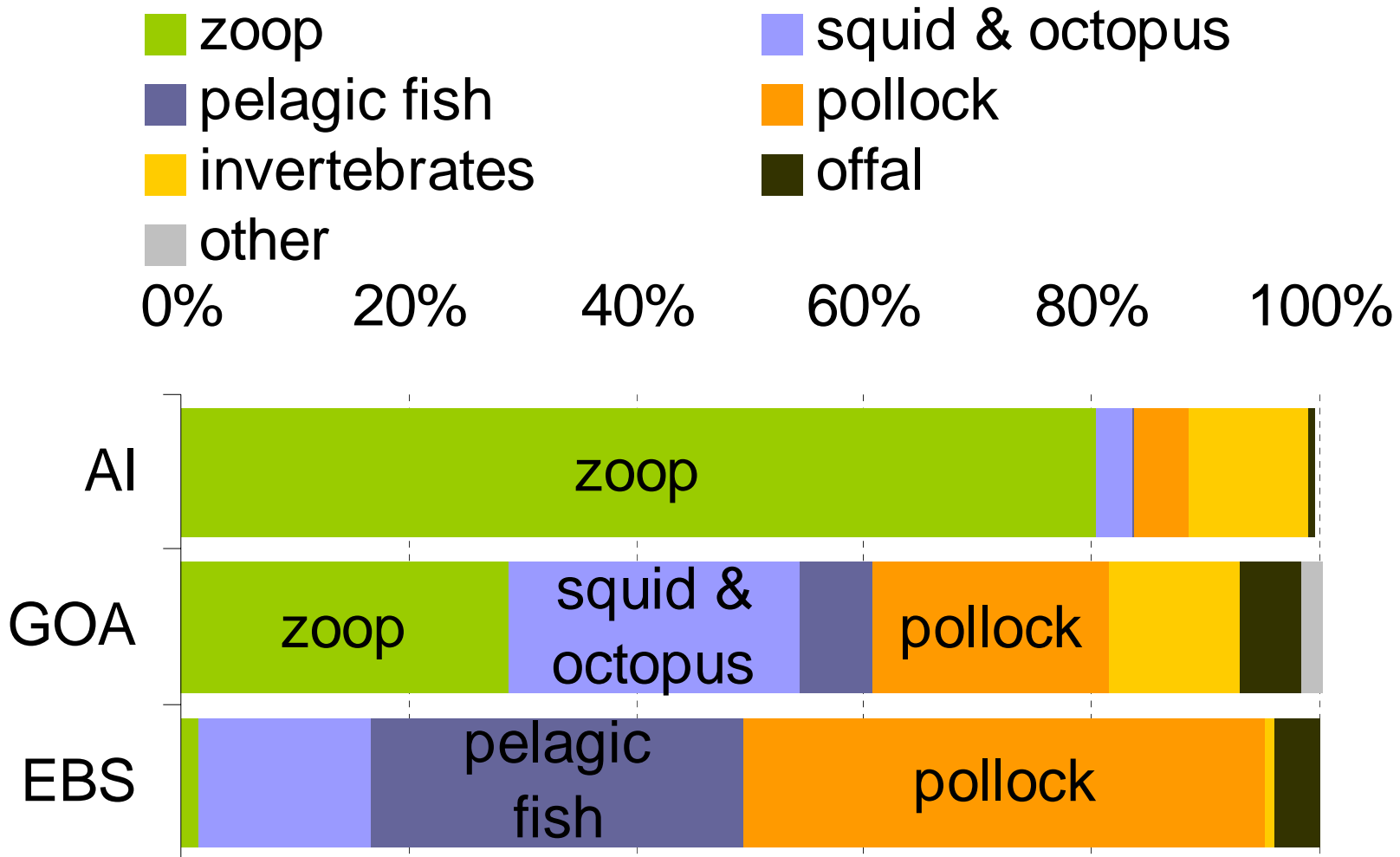


The Eastern Bering sea is **detritus / benthic** dominated

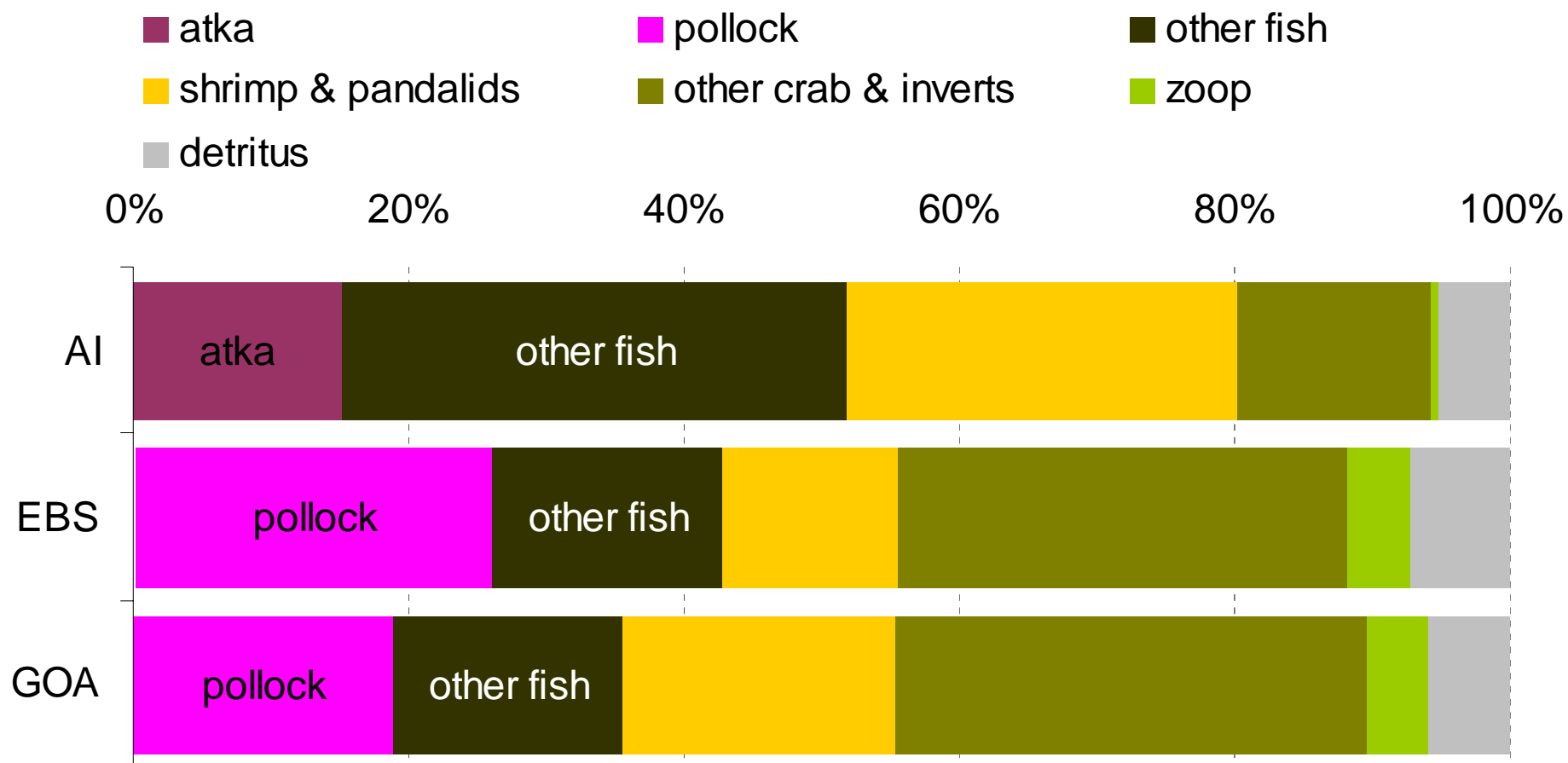
The Gulf of Alaska is intermediate

The Aleutian Islands is **plankton / pelagic** dominated

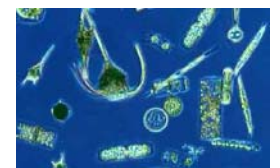
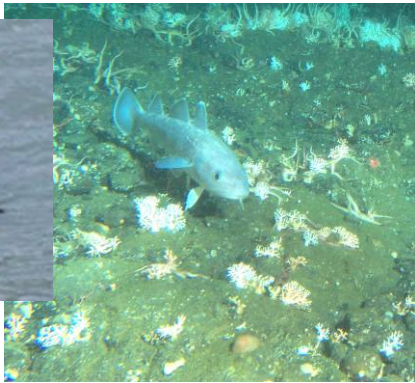
# Consumption by sablefish in all three systems



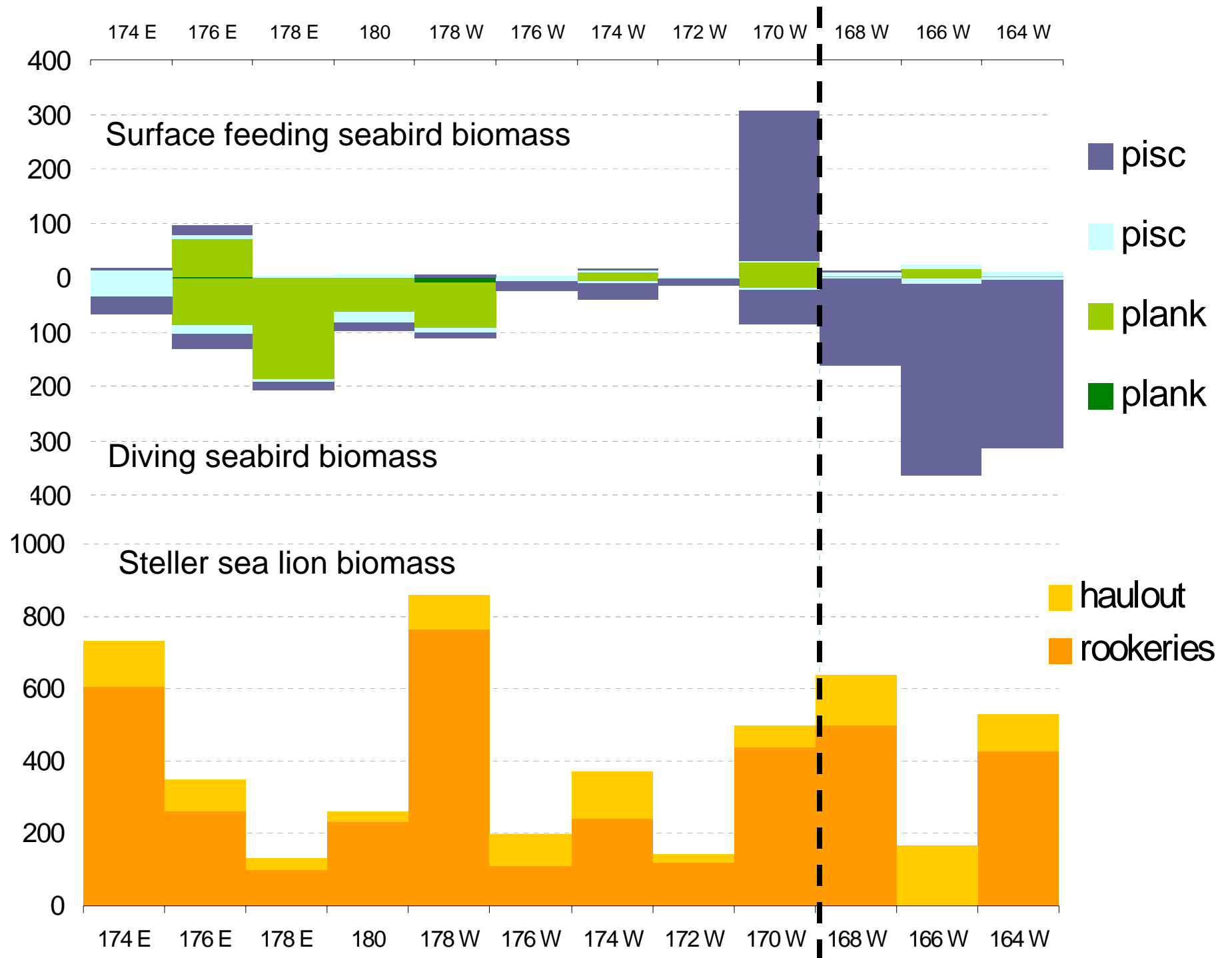
# Comparing Pacific cod diets



# Aleutian Islands Biological relationships









# Building a model food web requires

Biomass (B)

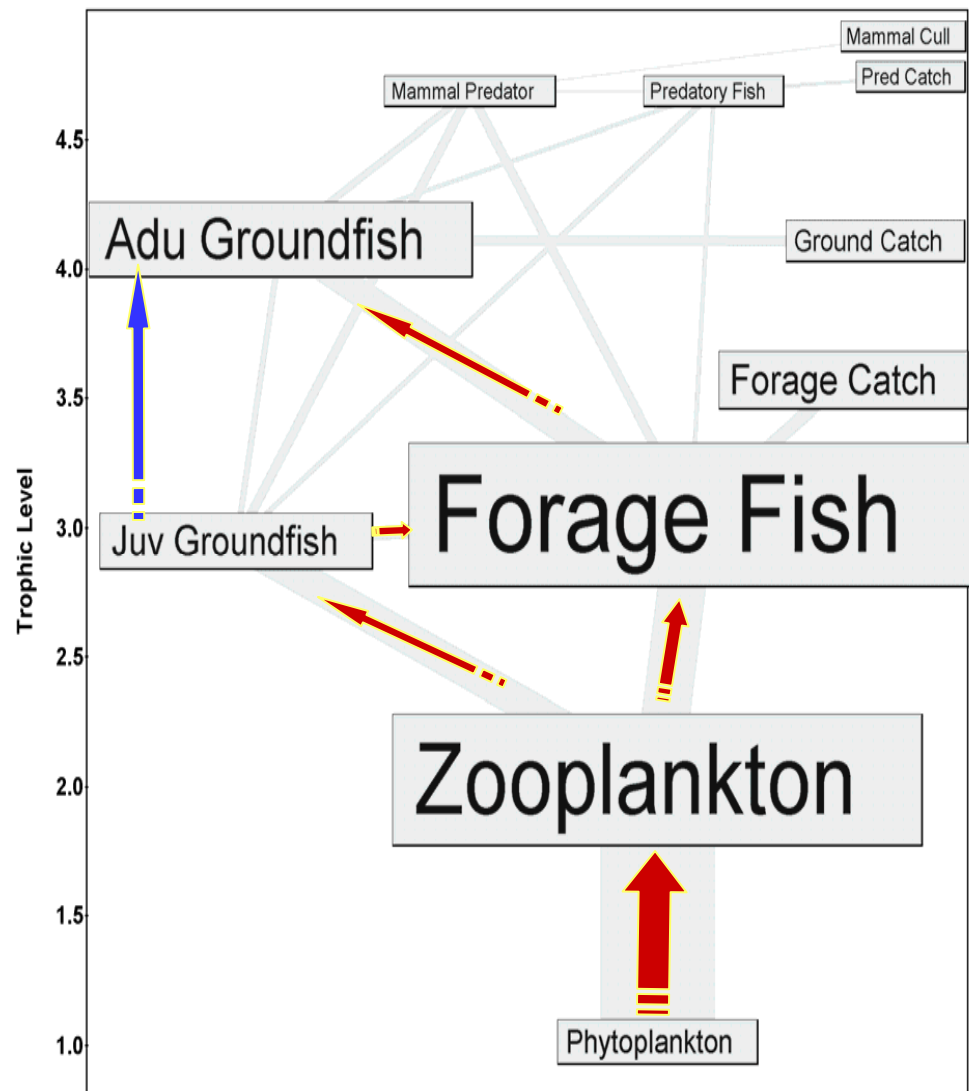
Population growth rate  
or Production (P/B)

Fishery catch (F)

Consumption (Q/B)

Diet comp (DC)

For ALL groups!!



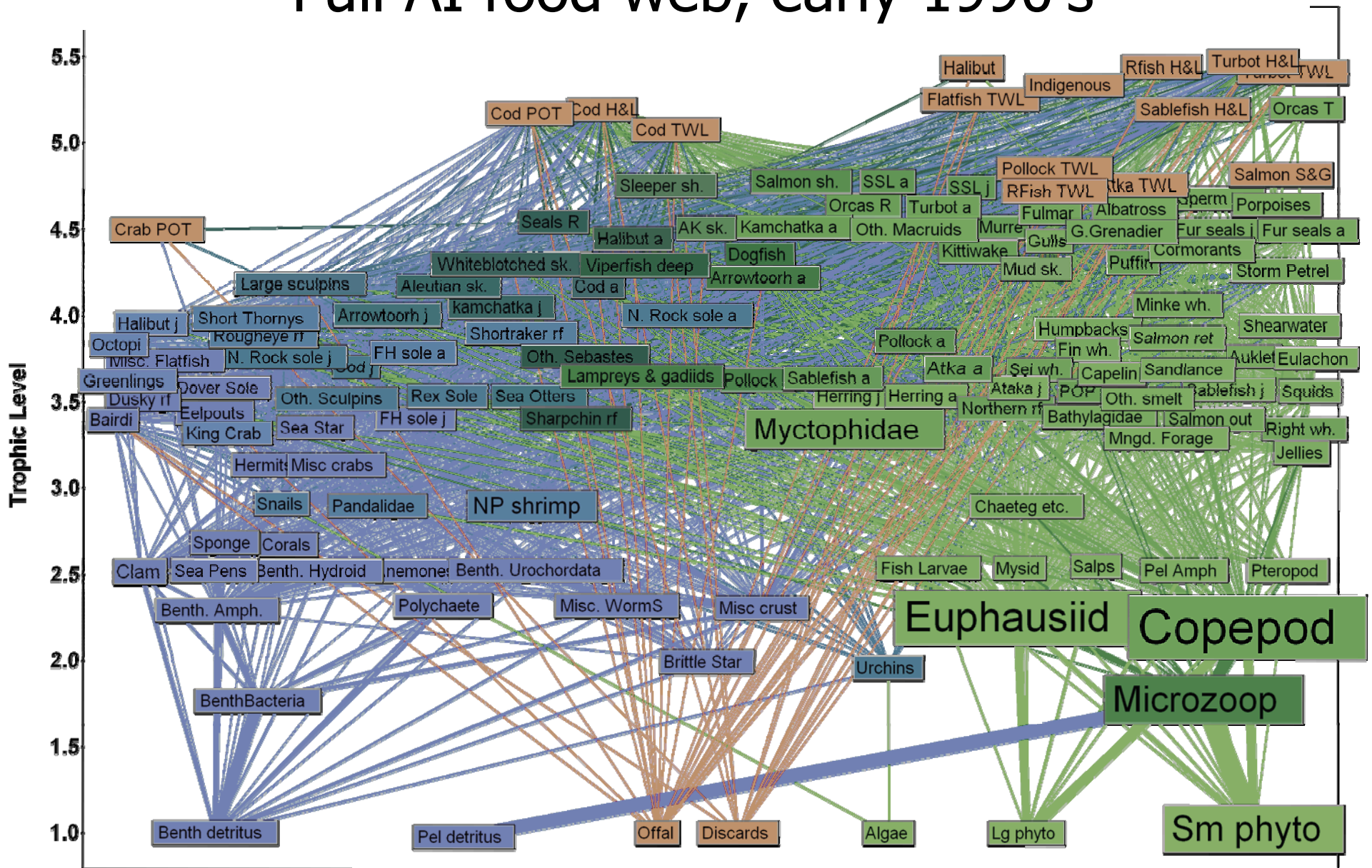
# Information sources for modeling

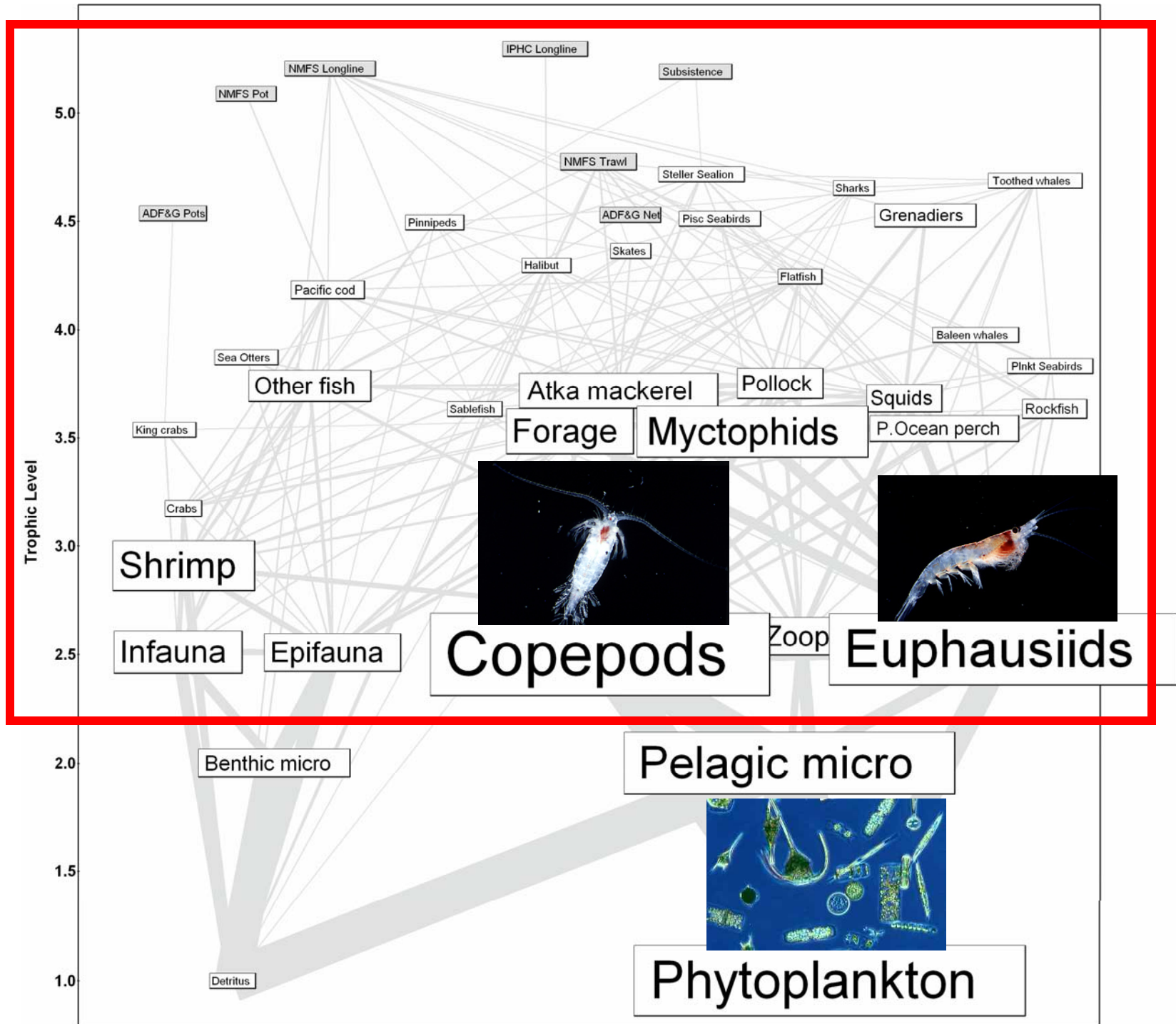
- ✓  Standard stock assessment data
  - Biomass or abundance index
  - Productivity information
- ✓  Fishery observation
  - Commercial catch
  - Incidental catch and discards
- ✓  Food habits collections
  - Multiple species and trophic levels
  - Multiple seasons





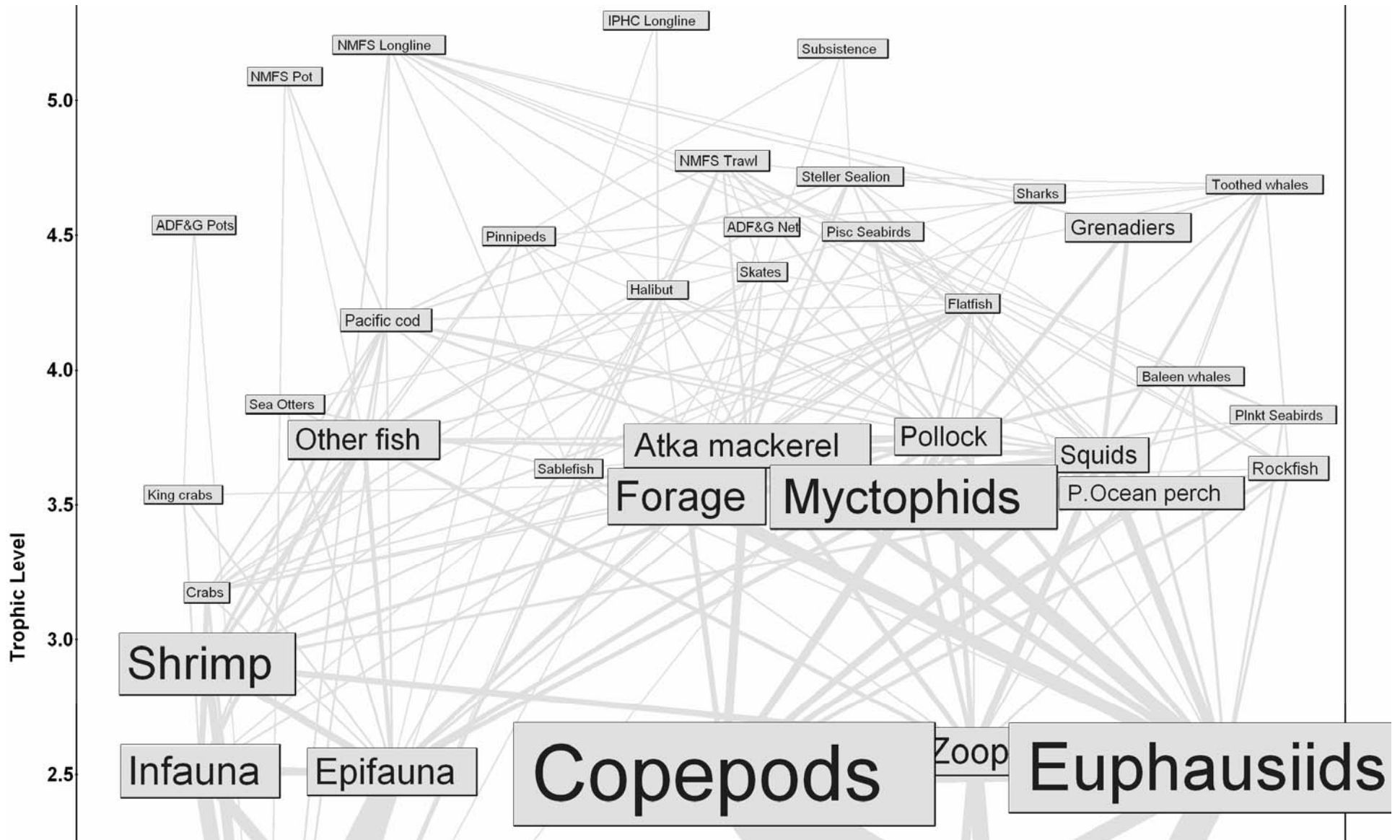
# Full AI food web, early 1990's

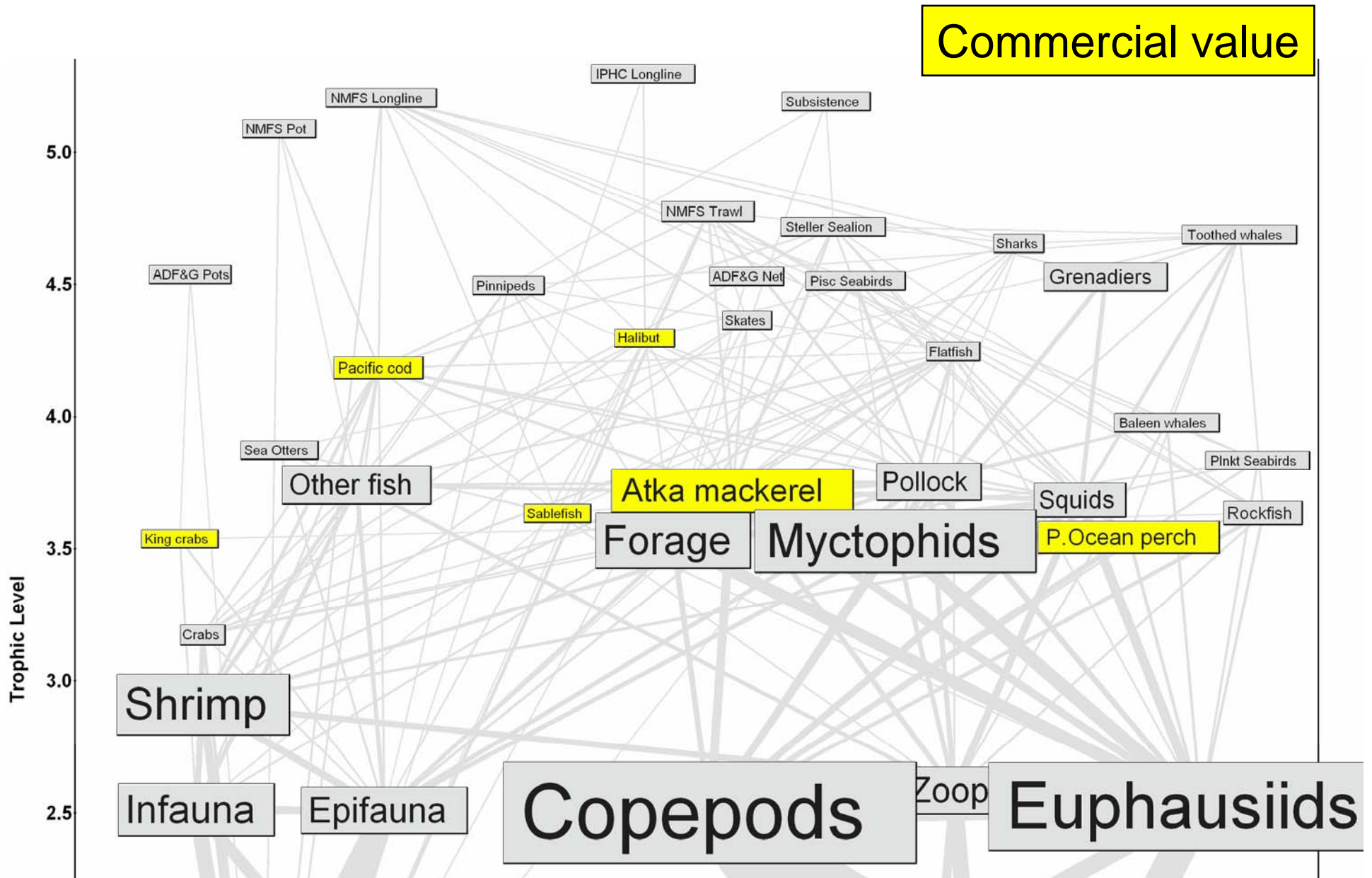


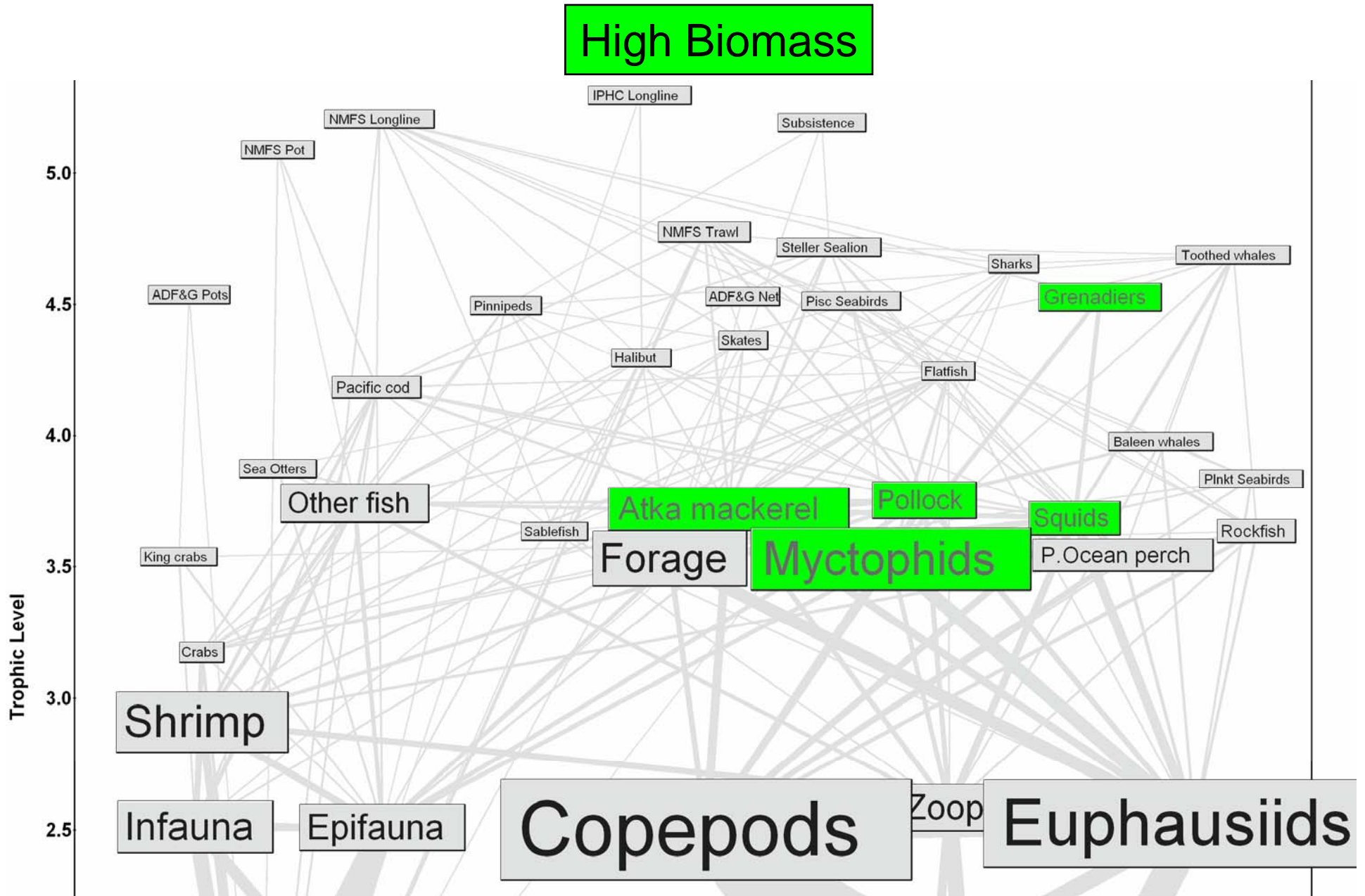




# Viewing the food web through our focus species

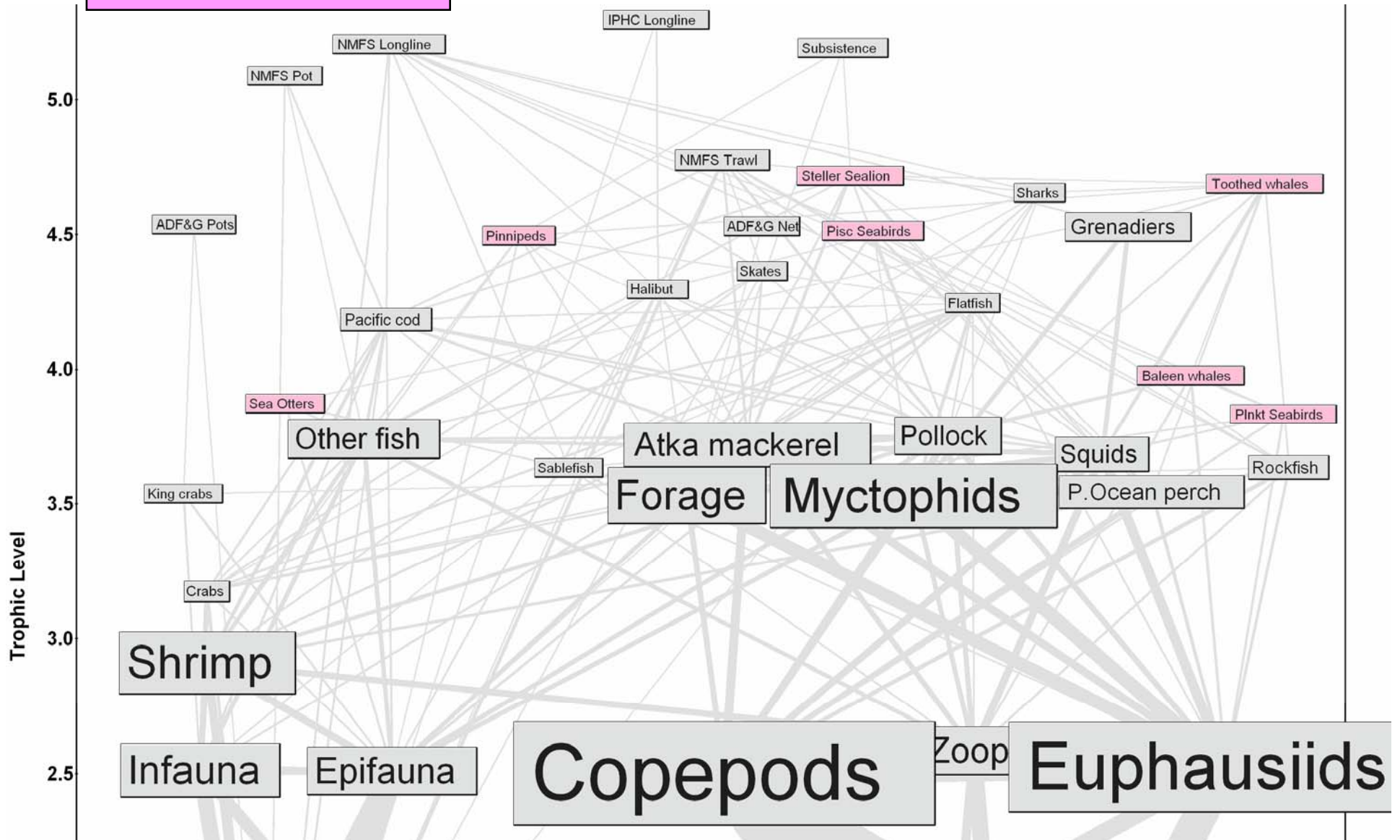








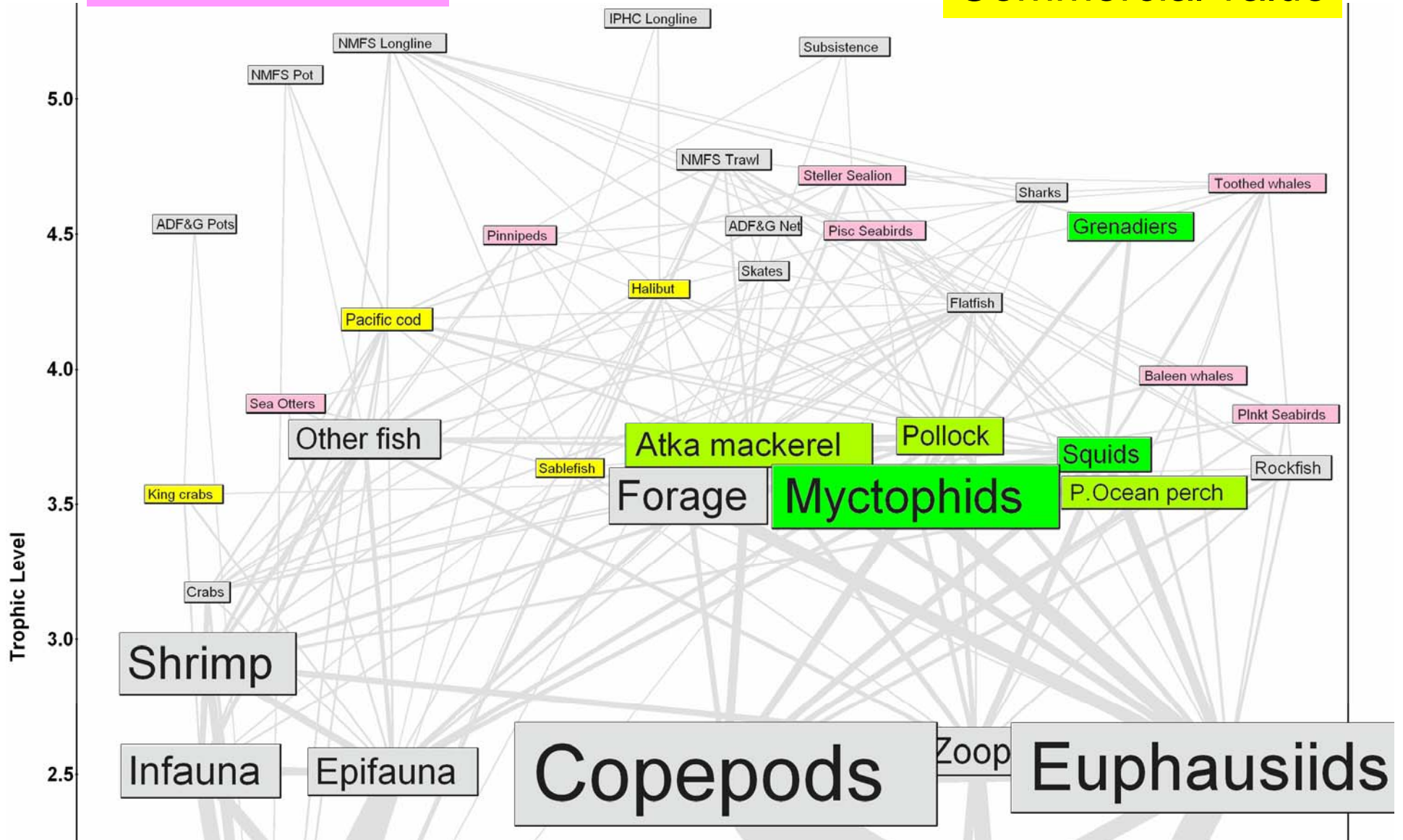
# Protected status



Protected status

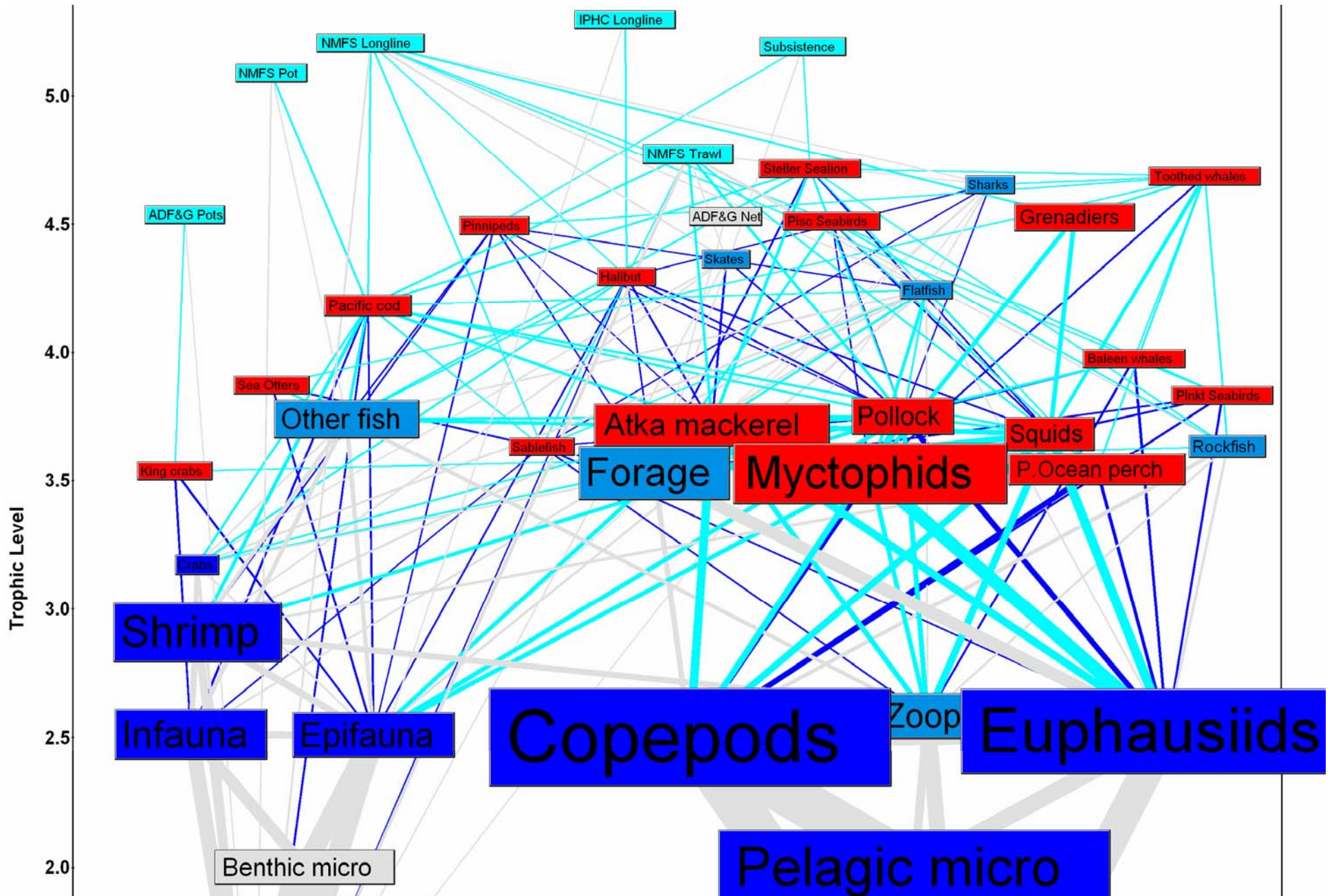
High Biomass

Commercial value





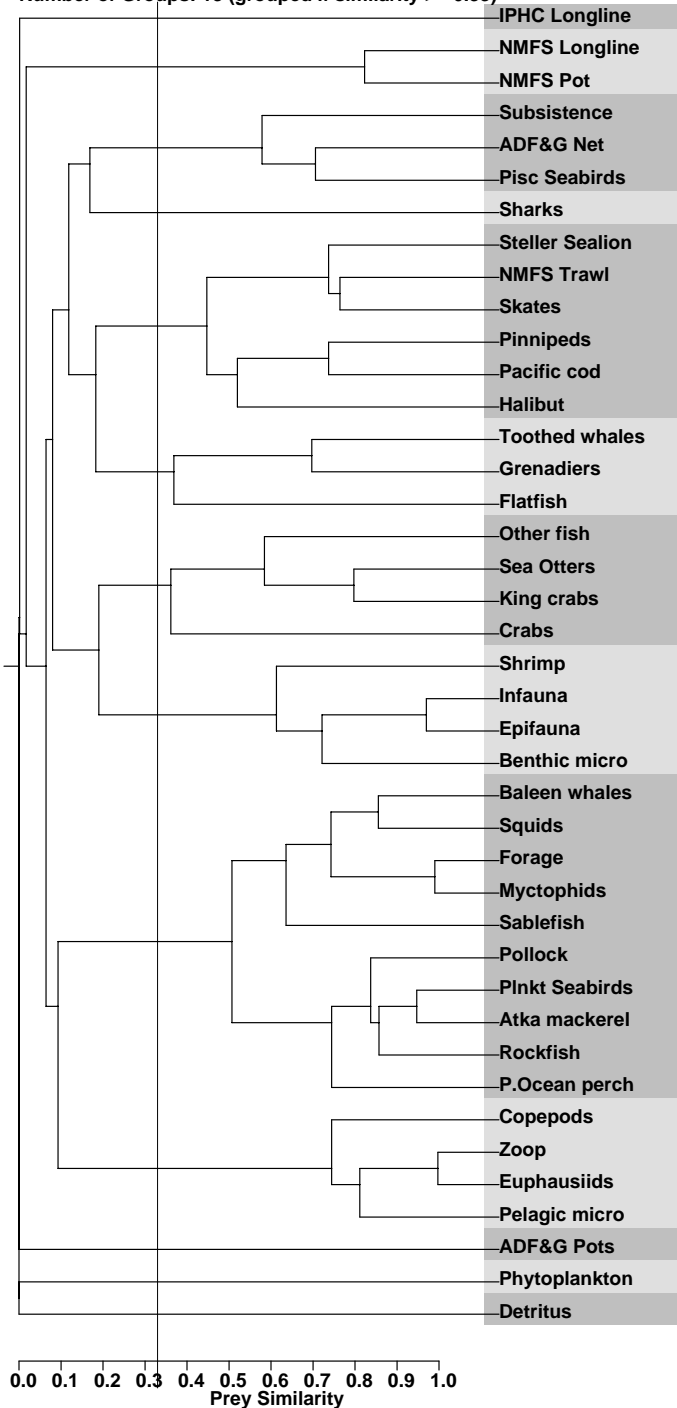
# Focus species interact with most of the food web



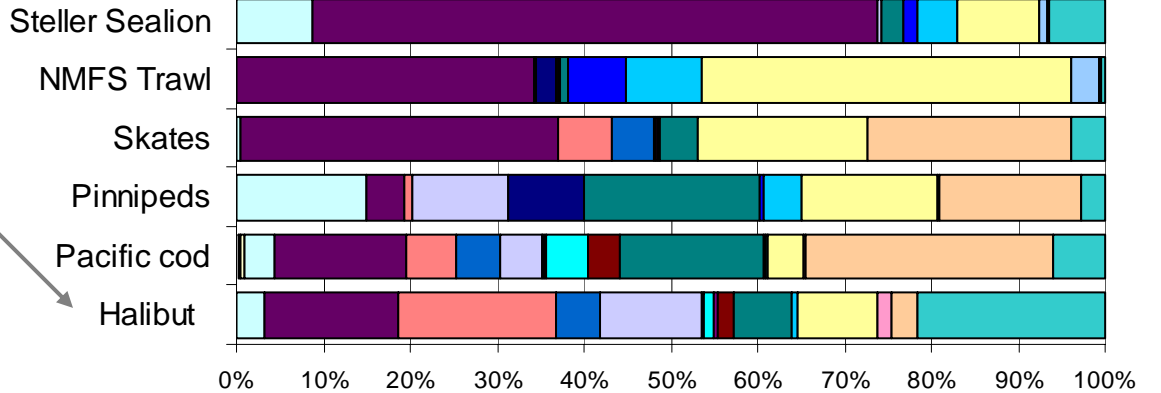


Number of Groups: 13 (grouped if similarity >= 0.33)

# Groups with similar diets

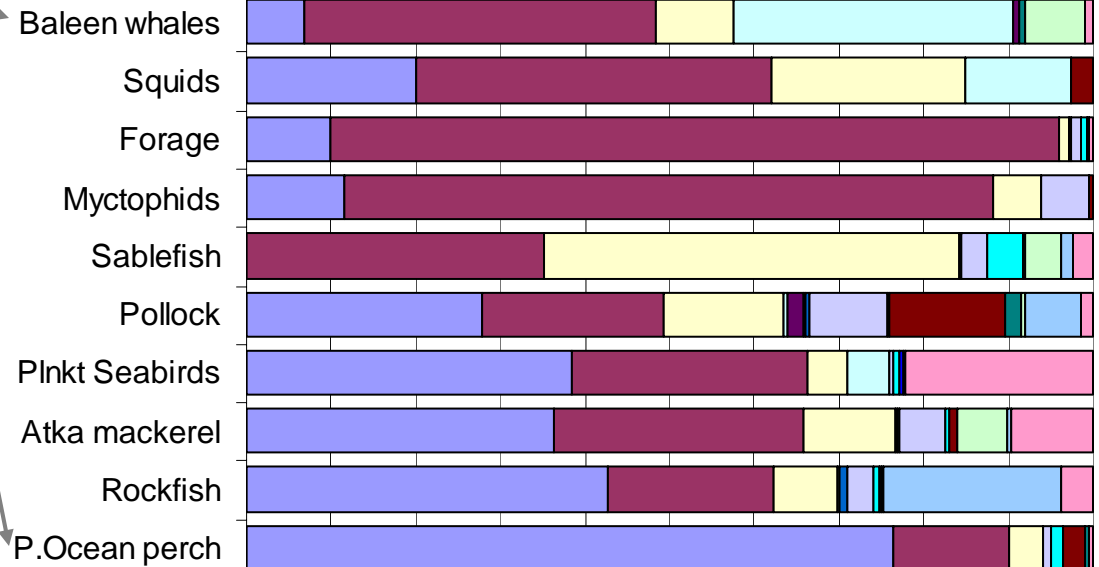


■ Forage 
 ■ Atka mackerel 
 ■ Crabs 
 ■ P.Ocean perch 
 ■ Pacific cod 
 ■ Pollock 
 ■ Shrimp 
 ■ Squids

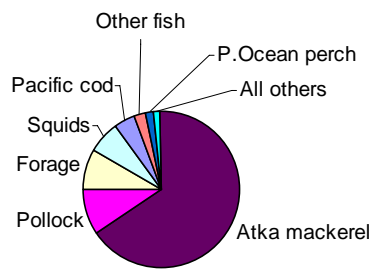


■ Copepods 
 ■ Euphausiids 
 ■ Zoop 
 ■ Forage

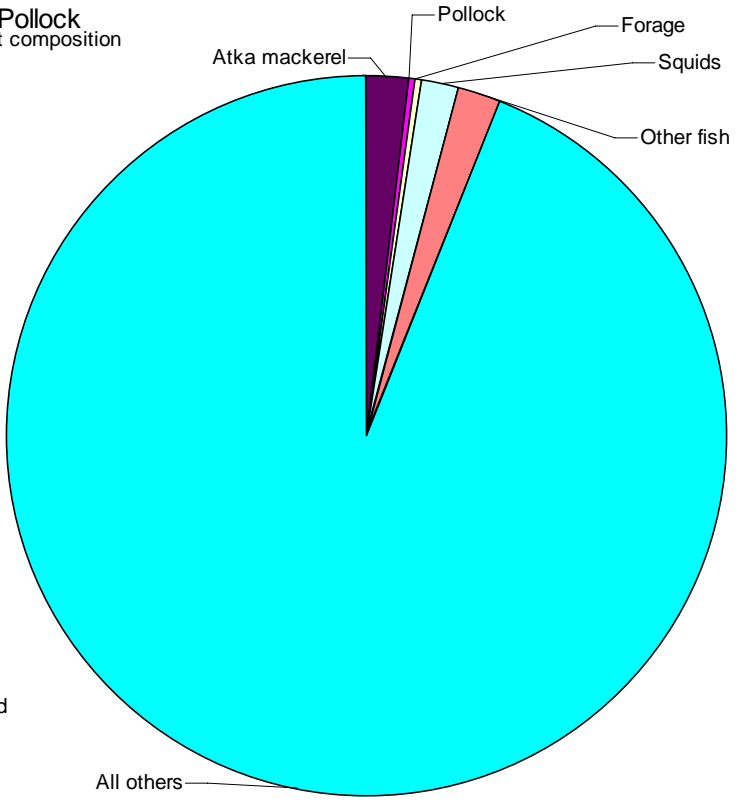
0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%



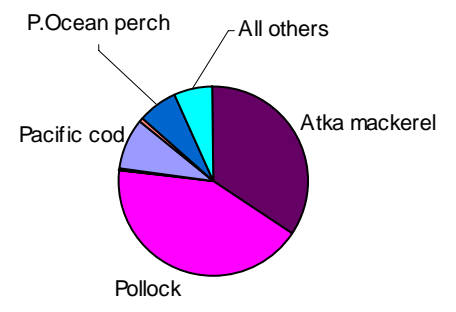
Steller Sealion diet composition



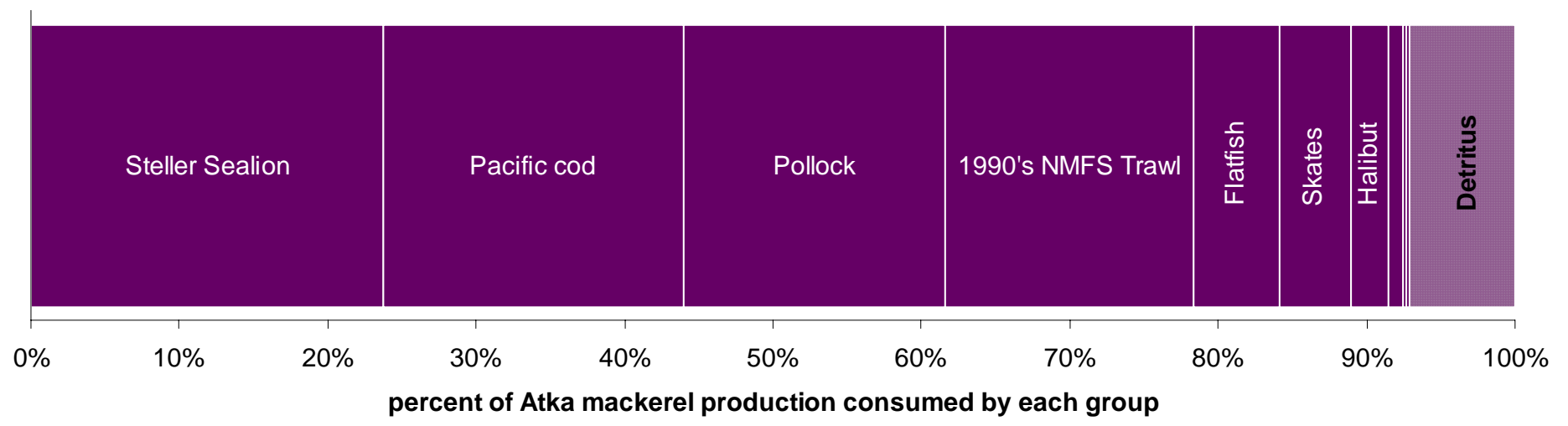
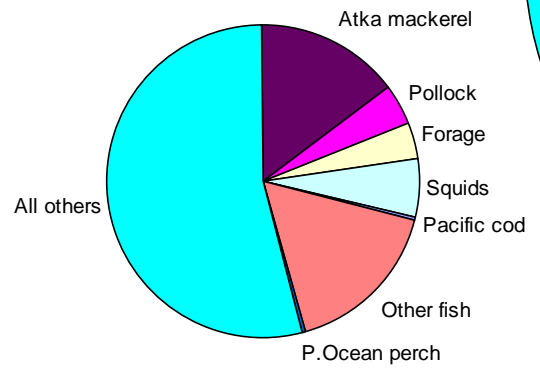
Pollock diet composition



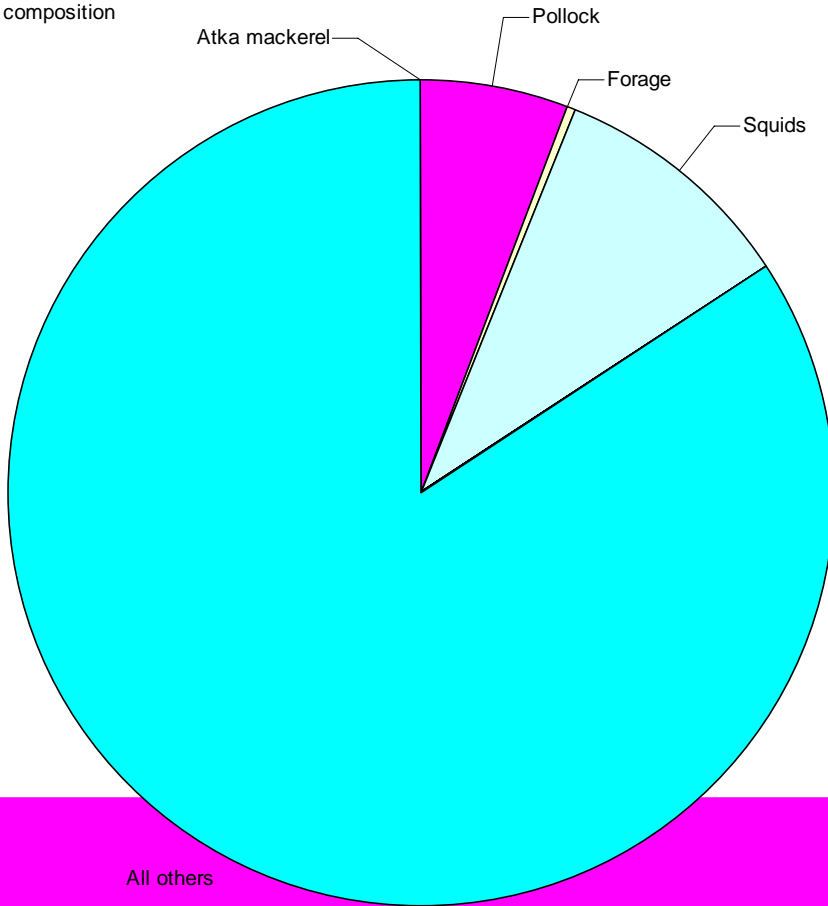
1990's NMFS Trawl catch composition



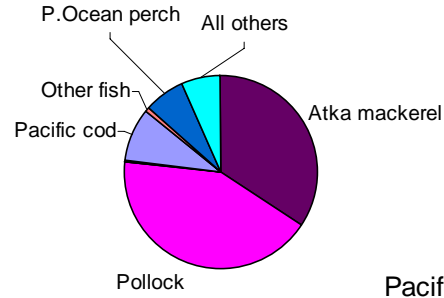
Pacific cod diet composition



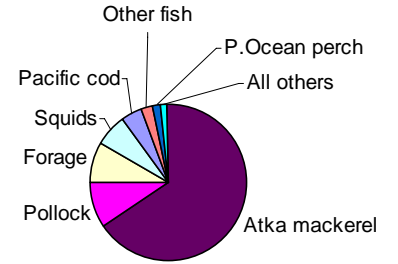
Atka mackerel diet composition



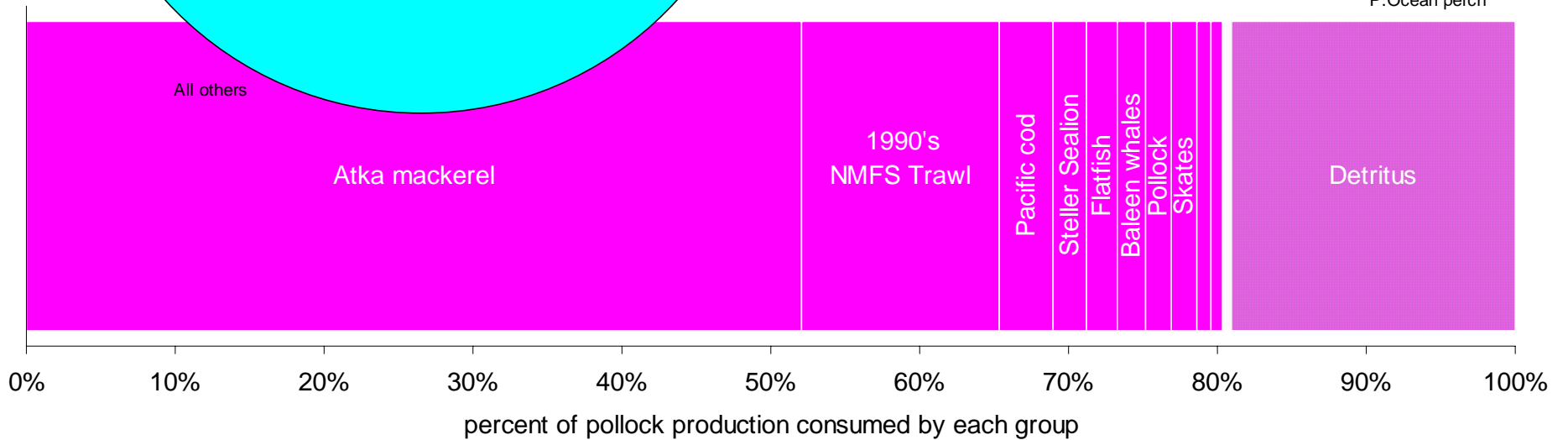
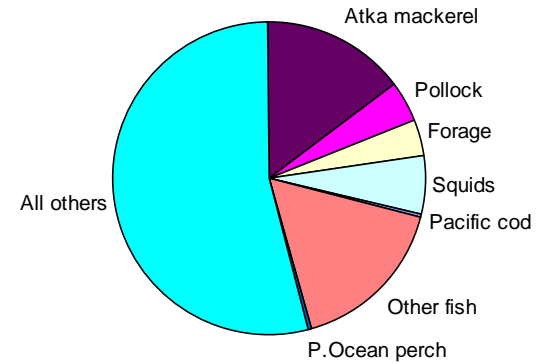
1990's NMFS Trawl catch



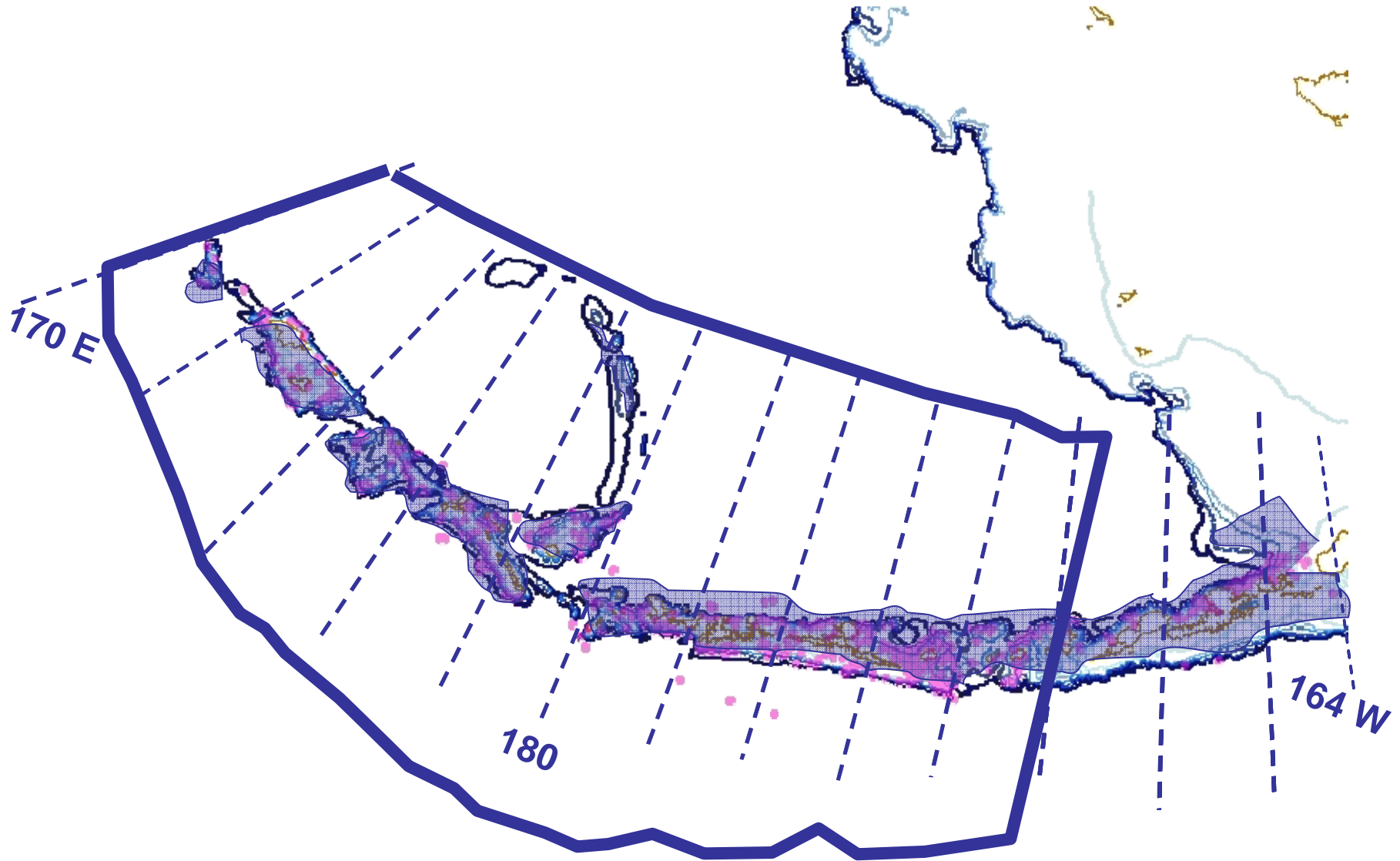
Steller Sealion diet composition



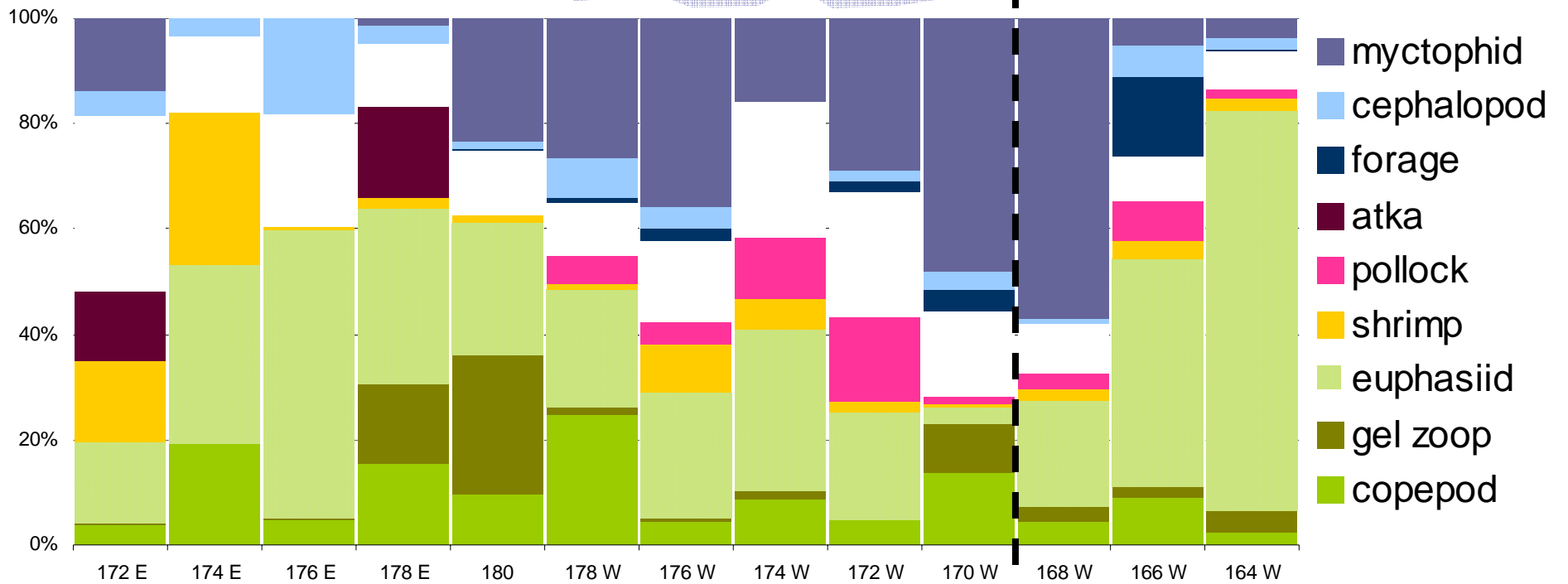
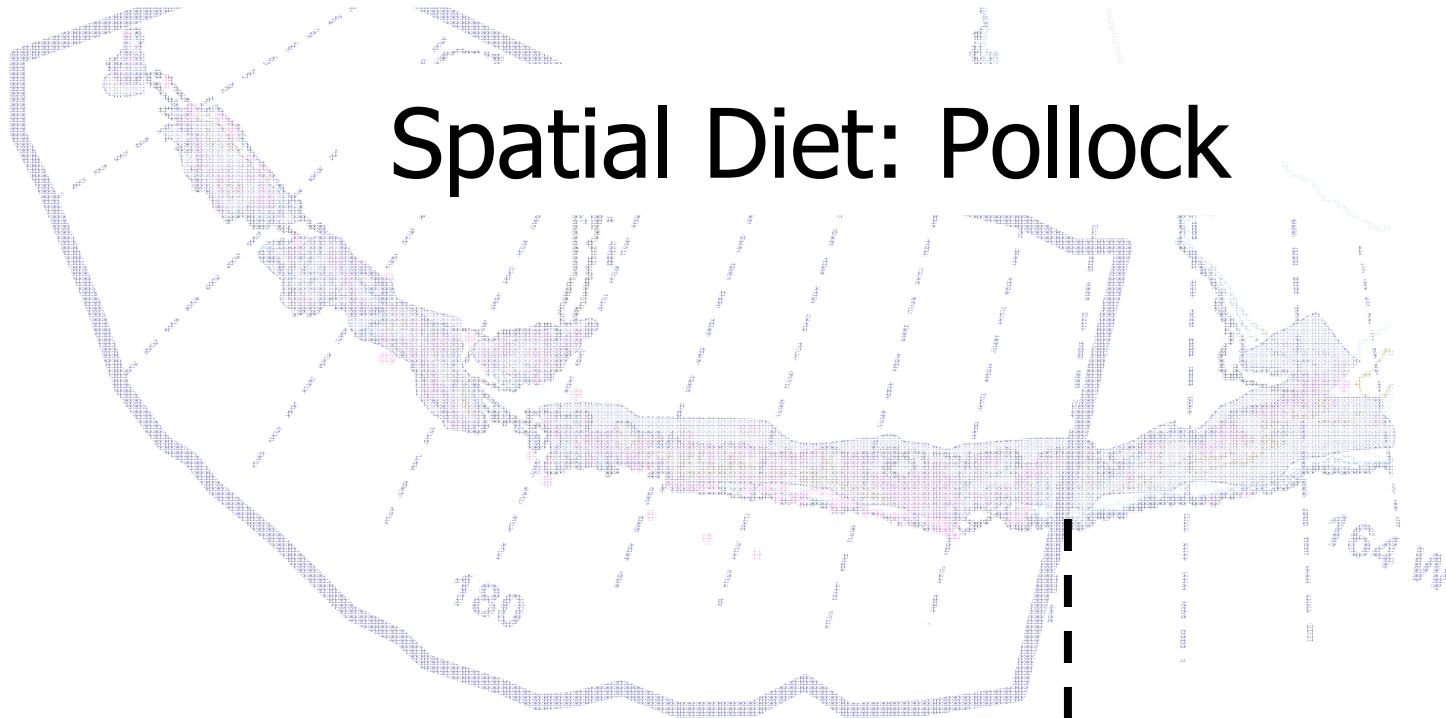
Pacific cod diet composition



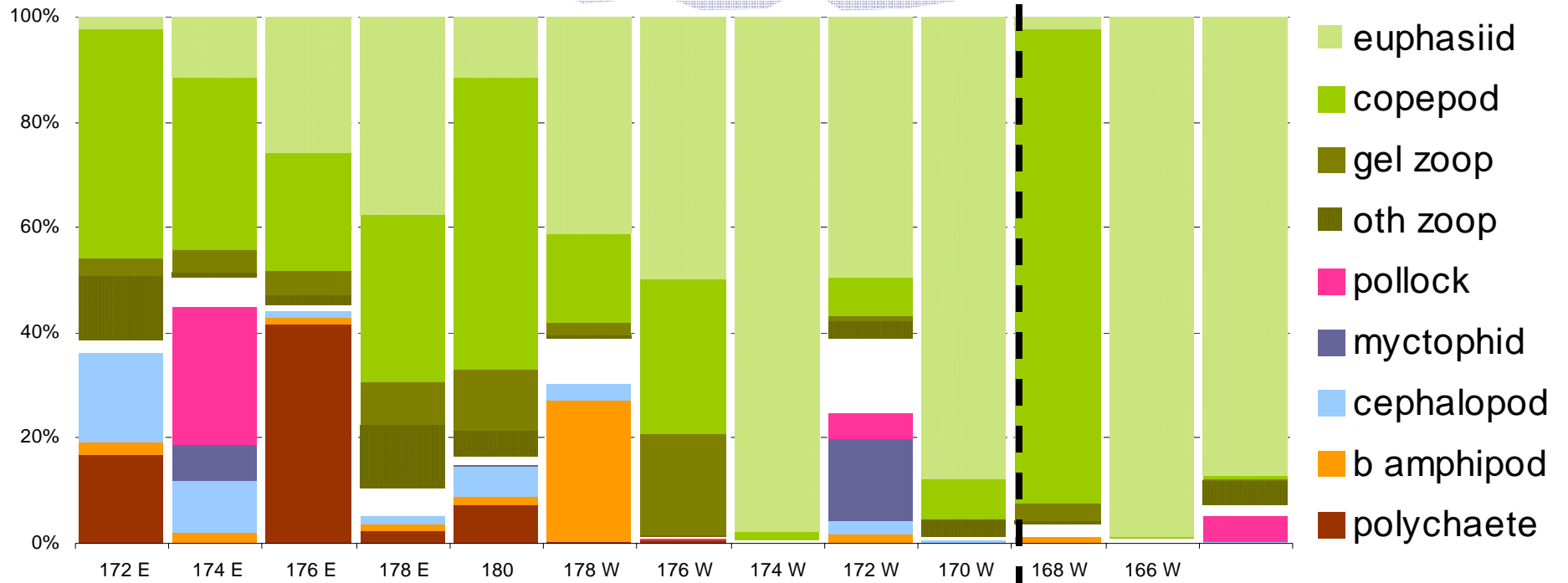
# Biological relationships: Survey data in 2 degree spatial blocks and by depth



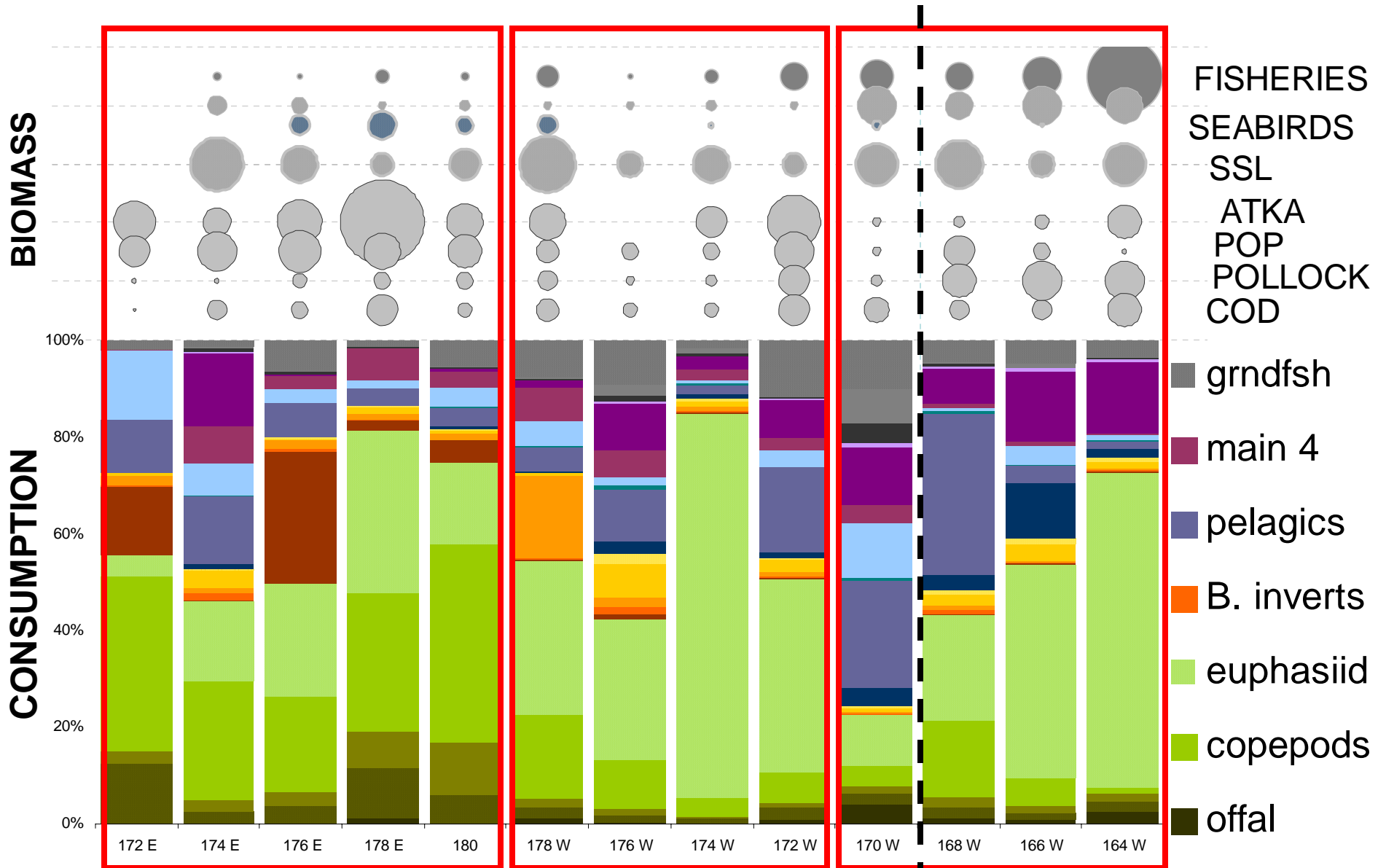
# Spatial Diet: Pollock



# Spatial Diet: Atka mackerel

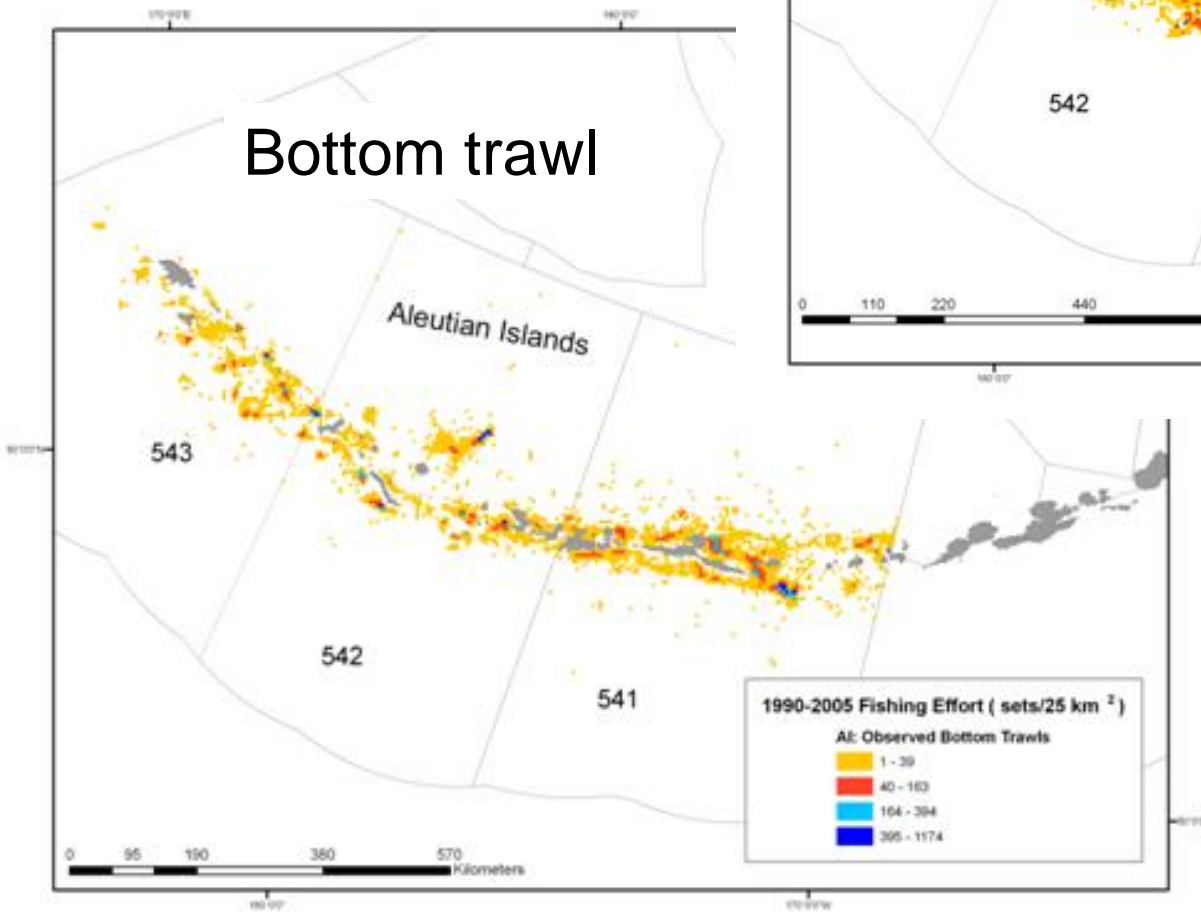
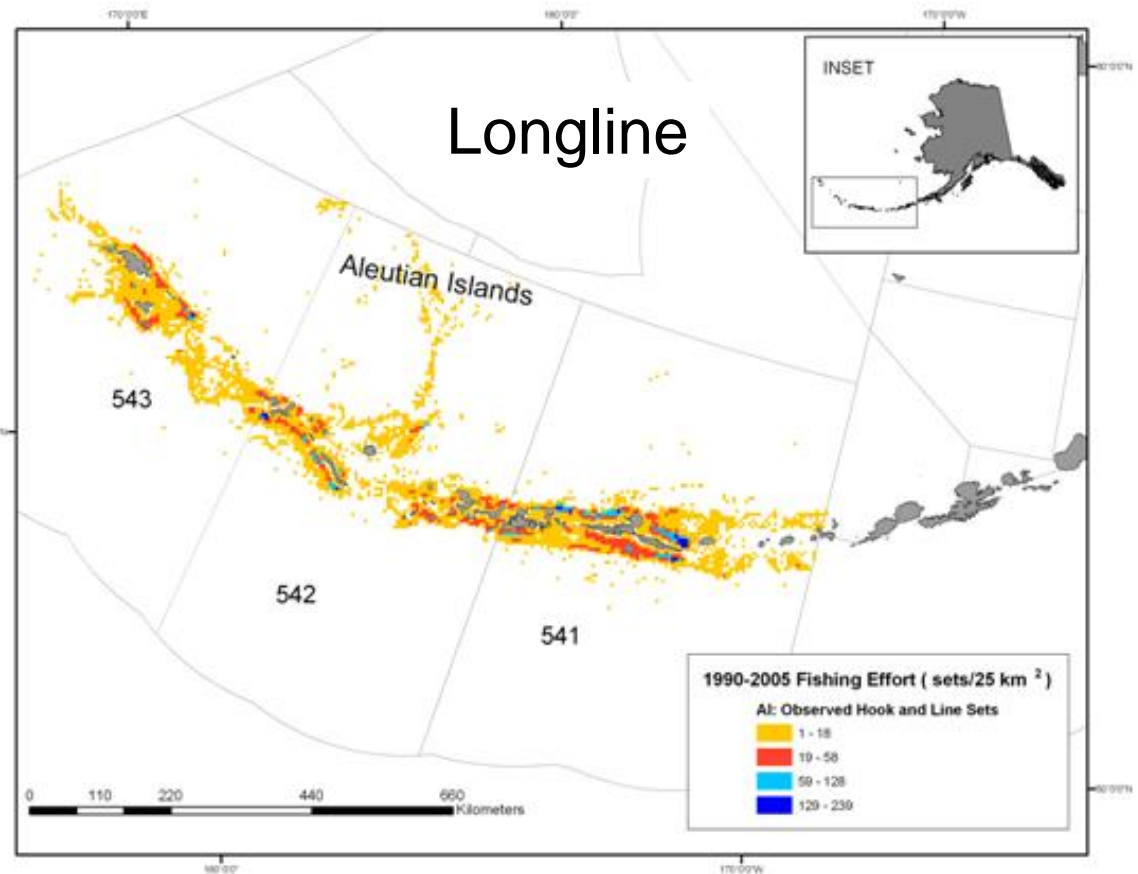


# AI Food webs: location, location, location



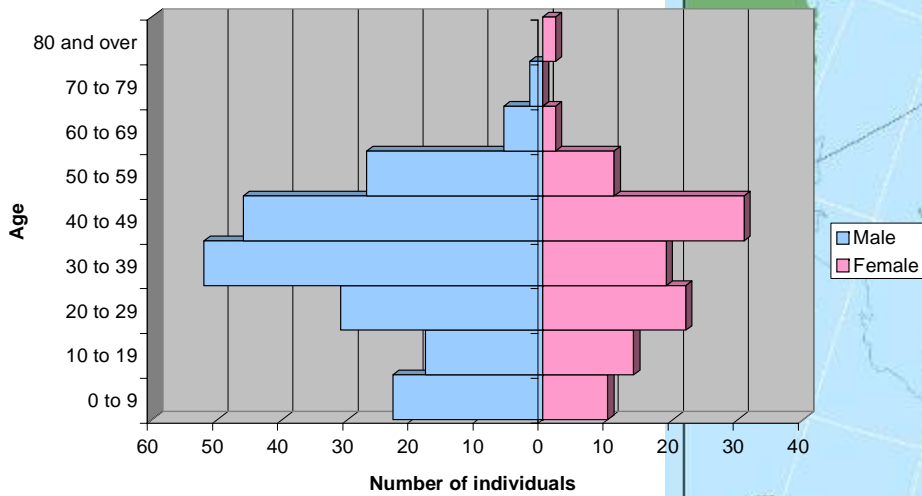


# Socioeconomic relationships: Fishing patterns 1990-2005



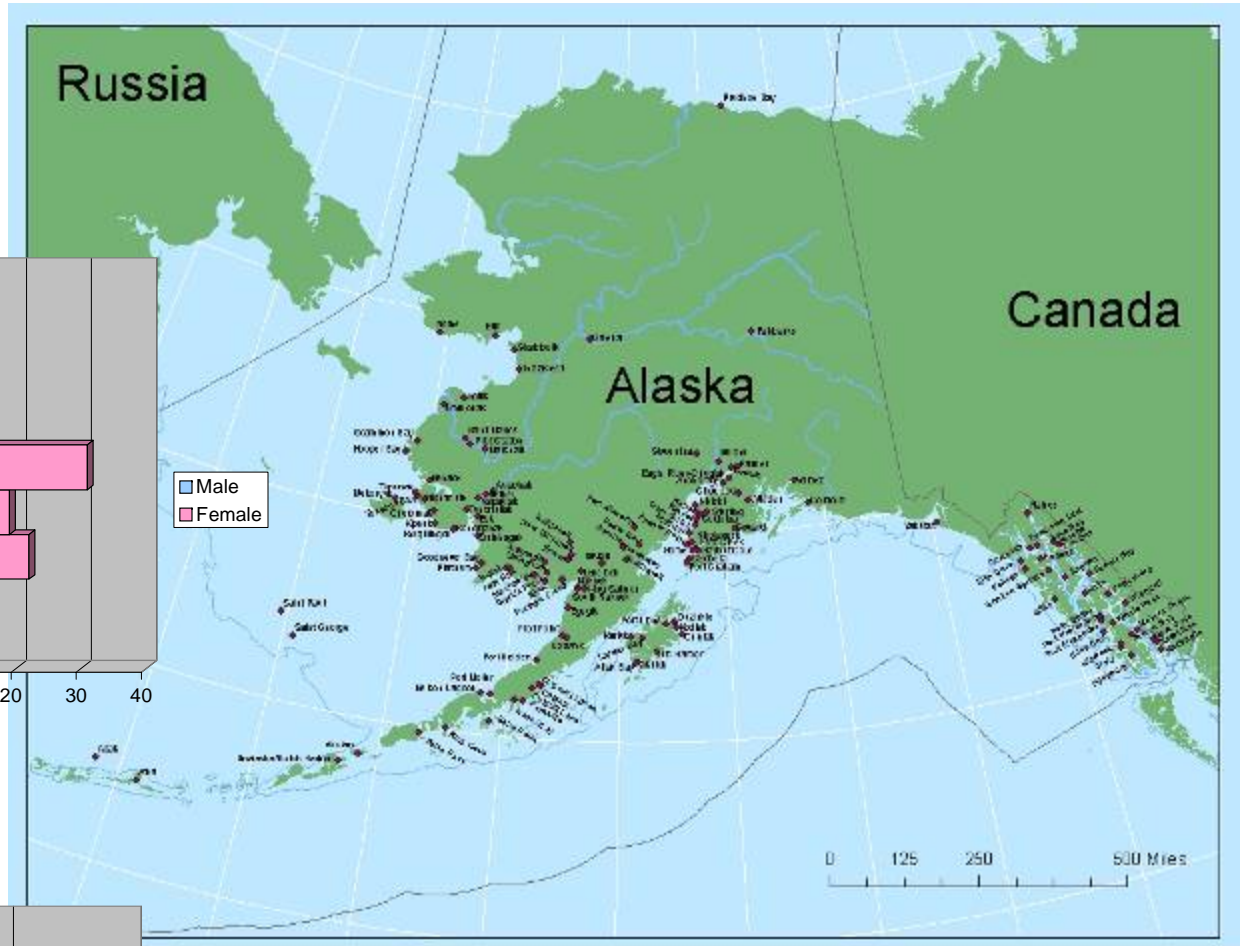
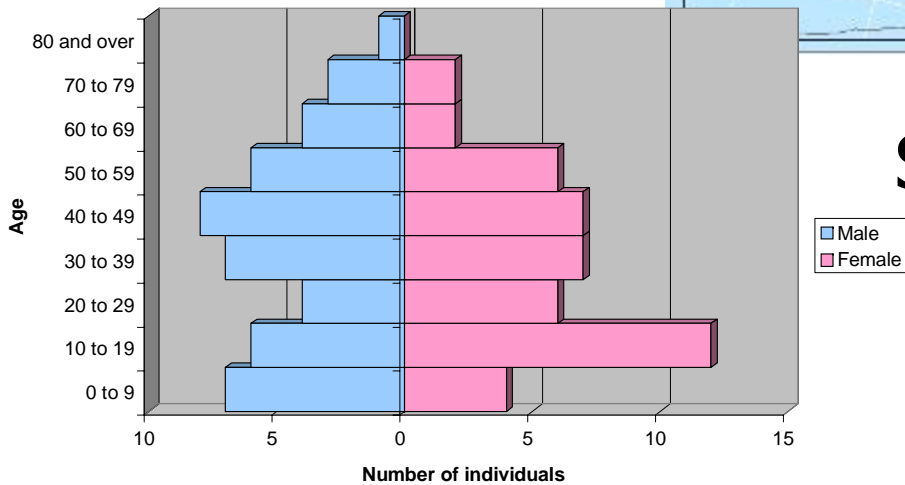
**2000 Population Structure  
Adak**

Data source: US Census



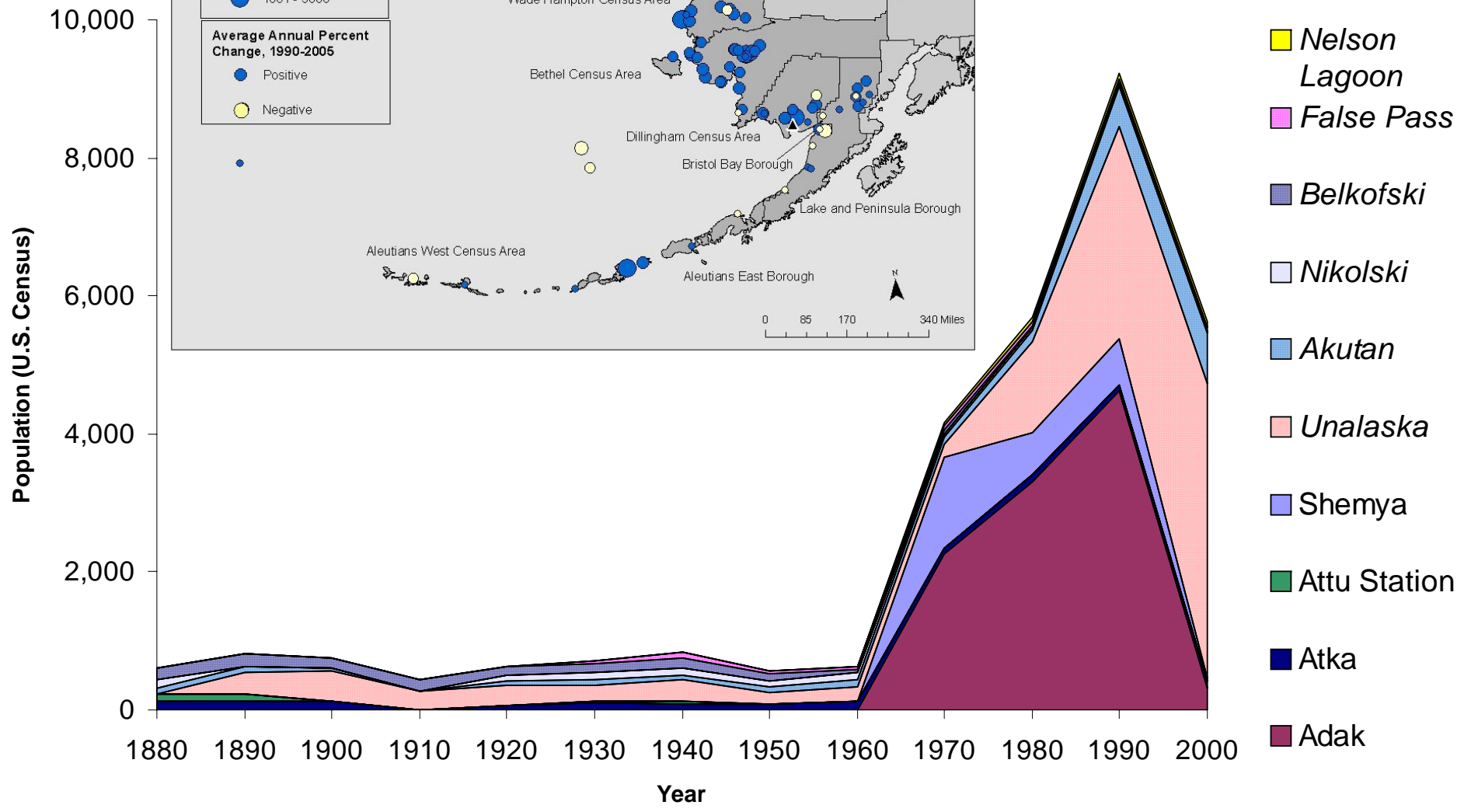
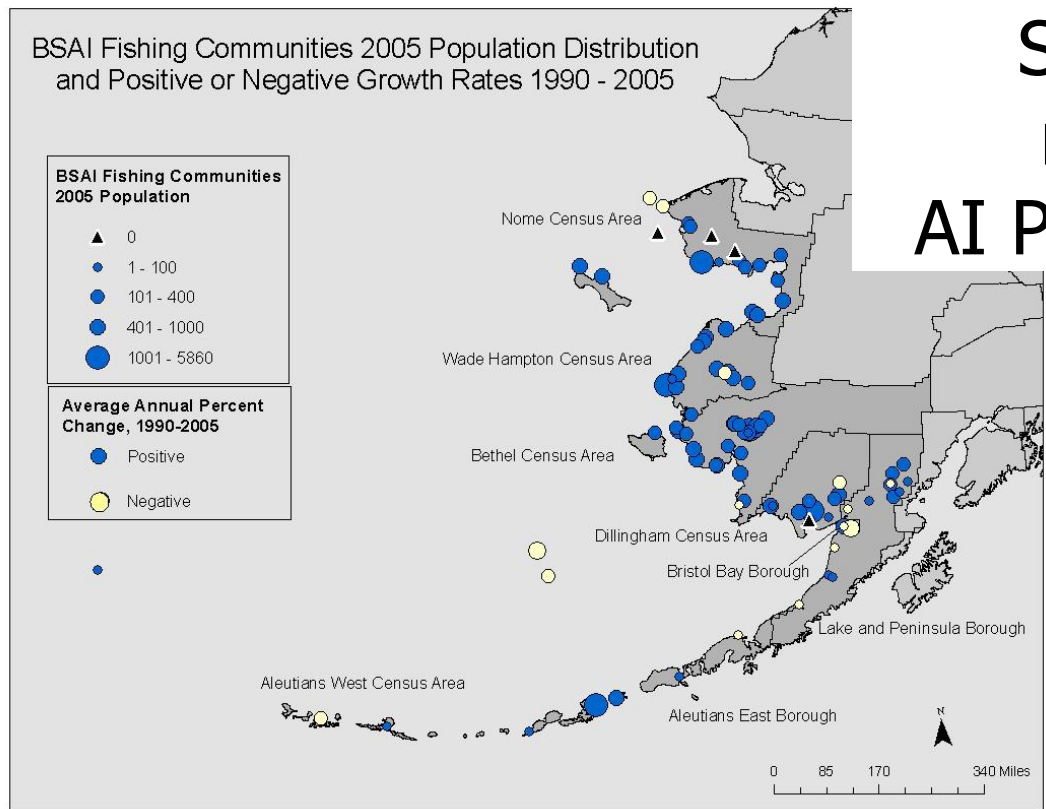
**2000 Population Structure  
Atka**

Data Source: US Census

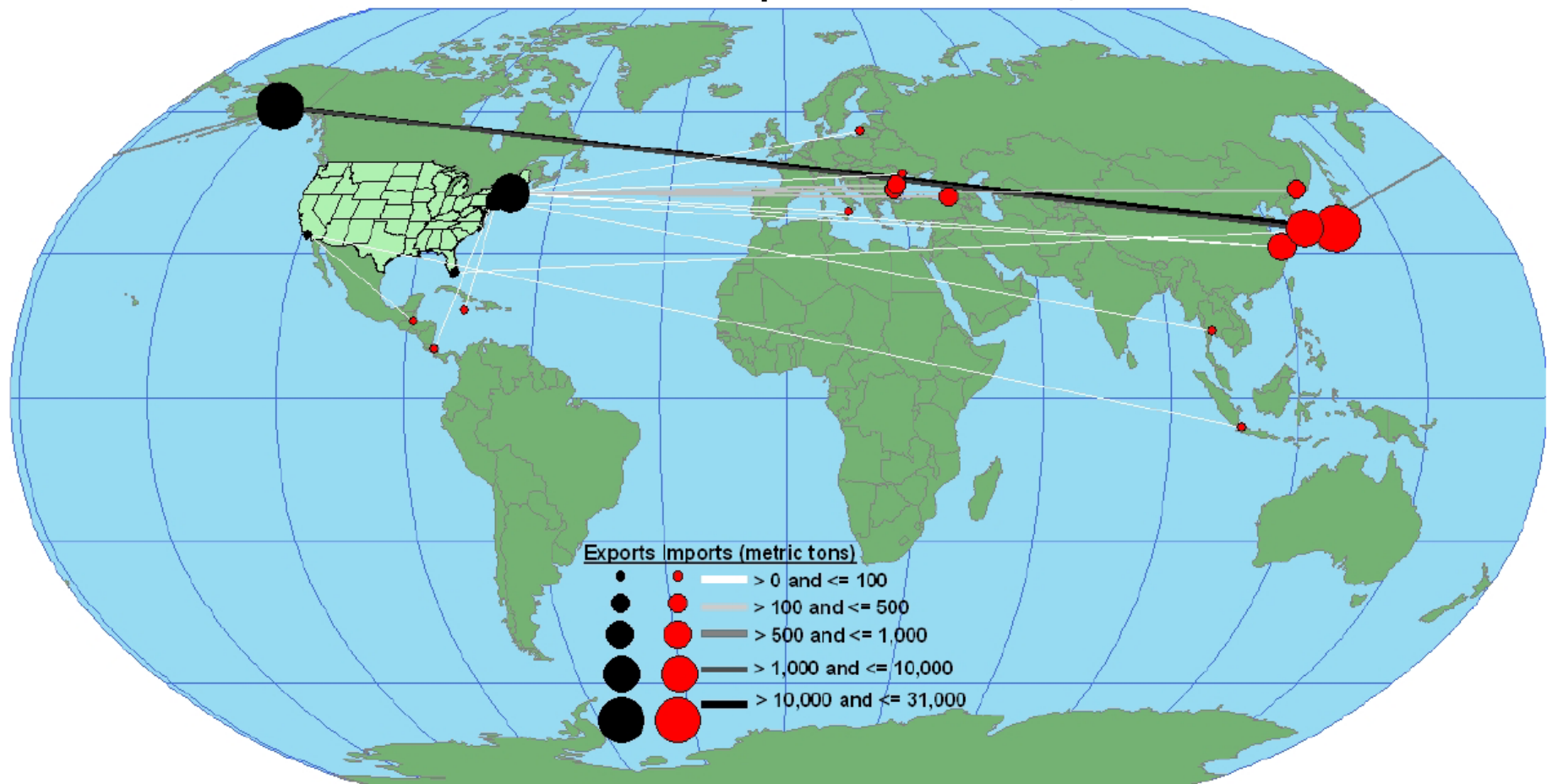


# Socioeconomic relationships: Aleutian Islands Communities

# Socioeconomic relationships: AI Population Trends



# Atka mackerel: Local fish, global market



Source: U.S. Merchandise Trade Statistics, GIS: Alaska Fisheries Science Center (michael.dalton@noaa.gov)

Figure 3-23 US Atka Mackerel Exports to the World, 2005.

# International shipping: global markets, local impacts



Source: The Economist, January 18, 2007

Estimated 3000-3500 vessel transits annually through Unimak pass  
1600 container ships, 30-40 tankers, and increasing with global trade  
Risk concentrated near Dutch Harbor, Unimak Pass, Akun Is., Near Is.

# Social and management boundaries

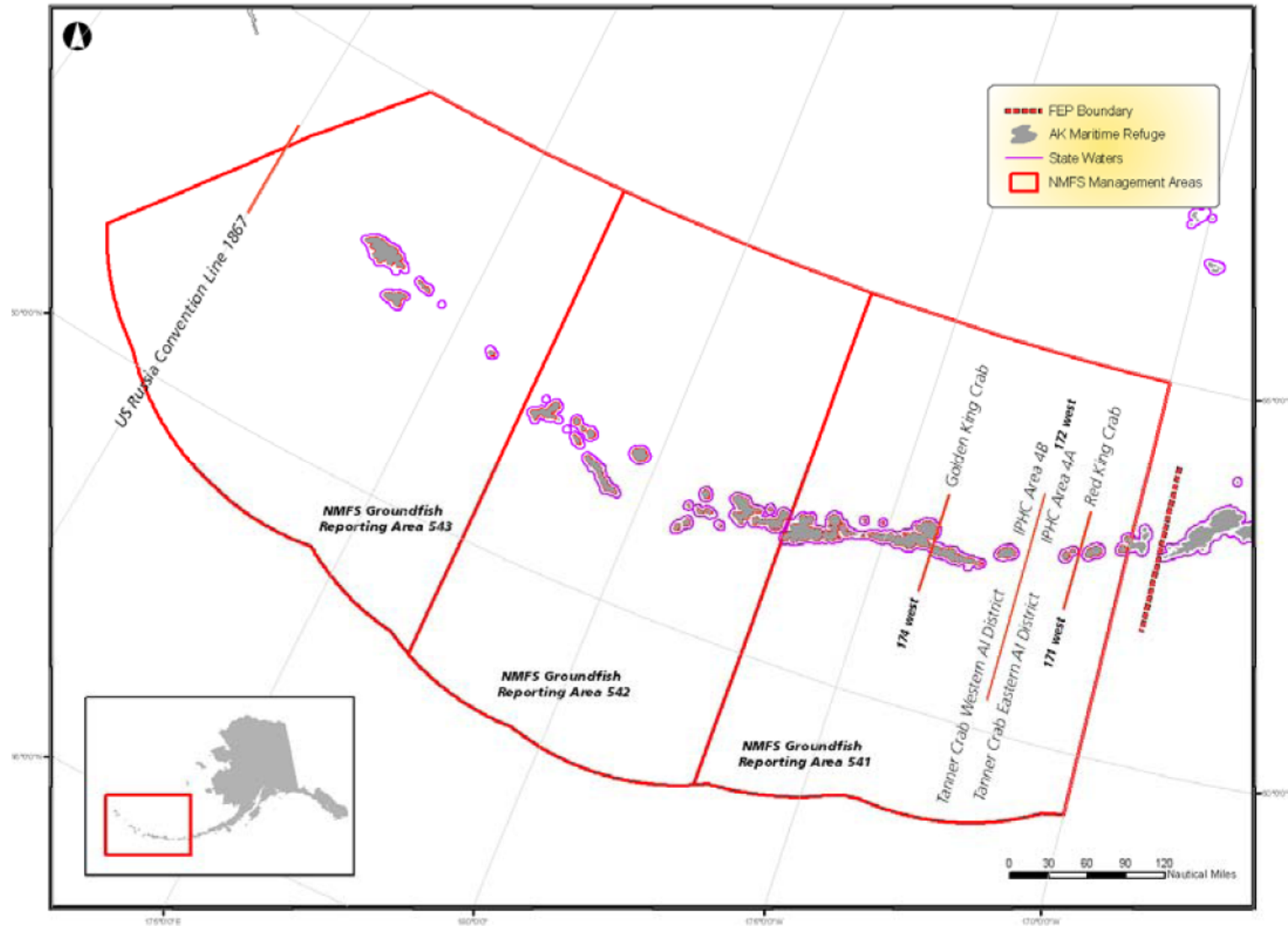


Figure 3-25 Management boundaries in the Aleutian Islands for groundfish, halibut, and crab fisheries.



# Agencies in the AI

**Table 3-3 Regulatory responsibility in Aleutian Islands**

| Resource, Population                      | Agency                              | Responsibility   |
|---|-------------------------------------|--|
| groundfish                                | NPFMC/NMFS<br>ADFG                  | 3-200nm; population abundance; setting harvest levels, fishery management, monitoring, and enforcement<br>0-3nm  |
| halibut                                   | IPHC<br>NPFMC/NMFS                  | population abundance, setting harvest levels<br>management of fishery  |
| crab                                      | NPFMC/NMFS<br>ADFG                  | monitor overfishing levels, allocations<br>harvest levels; fishery management, monitoring, enforcement   |
| scallop                                   | NPFMC/NMFS<br>ADFG                  | monitor overfishing levels<br>harvest levels, fishery management, monitoring, enforcement  |
| salmon                                    | ADFG<br>NPFMC/NMFS                  | population abundance, harvest levels, fishery management<br>retention prohibited 3-200nm   |
| herring                                   | ADFG                                | population abundance, harvest levels, fishery management   |
| other fish                                | NMFS                                | advisory authority for habitat for all fish including fish in nearshore watersheds   |
| marine mammals (except walrus and otters) | NMFS                                | population abundance, advisory authority, protection under the MMPA and ESA  |
| walrus and otters                         | USFWS                               | population abundance, advisory authority, protection under the MMPA and ESA  |
| birds                                     | USFWS                               | population abundance, advisory authority, protection under the MBTA  |
| citizens of Adak                          | City of Adak                        | municipal responsibility   |
| citizens of Atka                          | City of Atka                        | municipal responsibility   |
| land                                      | USFWS<br>BLM<br>DNR<br>DOD          | protection of Alaska Maritime National Wildlife Refuge, including marine responsibility extending offshore<br>(own some small parcels)<br>(own some land parcels)<br>Shemya, others? |
| shipping                                  | DEC<br>USCG                         | oversight of spill response<br>ensure safety of vessels in US ports and waterways  |
| oil and gas development                   | MMS<br>DNR or DEC                   | 3-200nm<br>0-3nm   |
| military activity                         | Alaskan Command,<br>Pacific Command | Shemya, floating barge   |
| formerly used defense sites               | AFCEE                               | cleanup  |
| Amchitka                                  | DOE                                 | cleanup  |

**KEY:** ADFG – Alaska Department of Fish and Game; AFCEE – US Air Force Corps of Engineers; DEC – Alaska Department of Environmental Conservation; DNR – Alaska Department of Natural Resources; DOD – Department of Defense, DOE – Department of Energy, EPA – Environmental Protection Agency, MMS – Minerals Management Service, NMFS – National Marine Fisheries Service, NPFMC – North Pacific Fishery Management Council, USFWS – US Fish and Wildlife Service



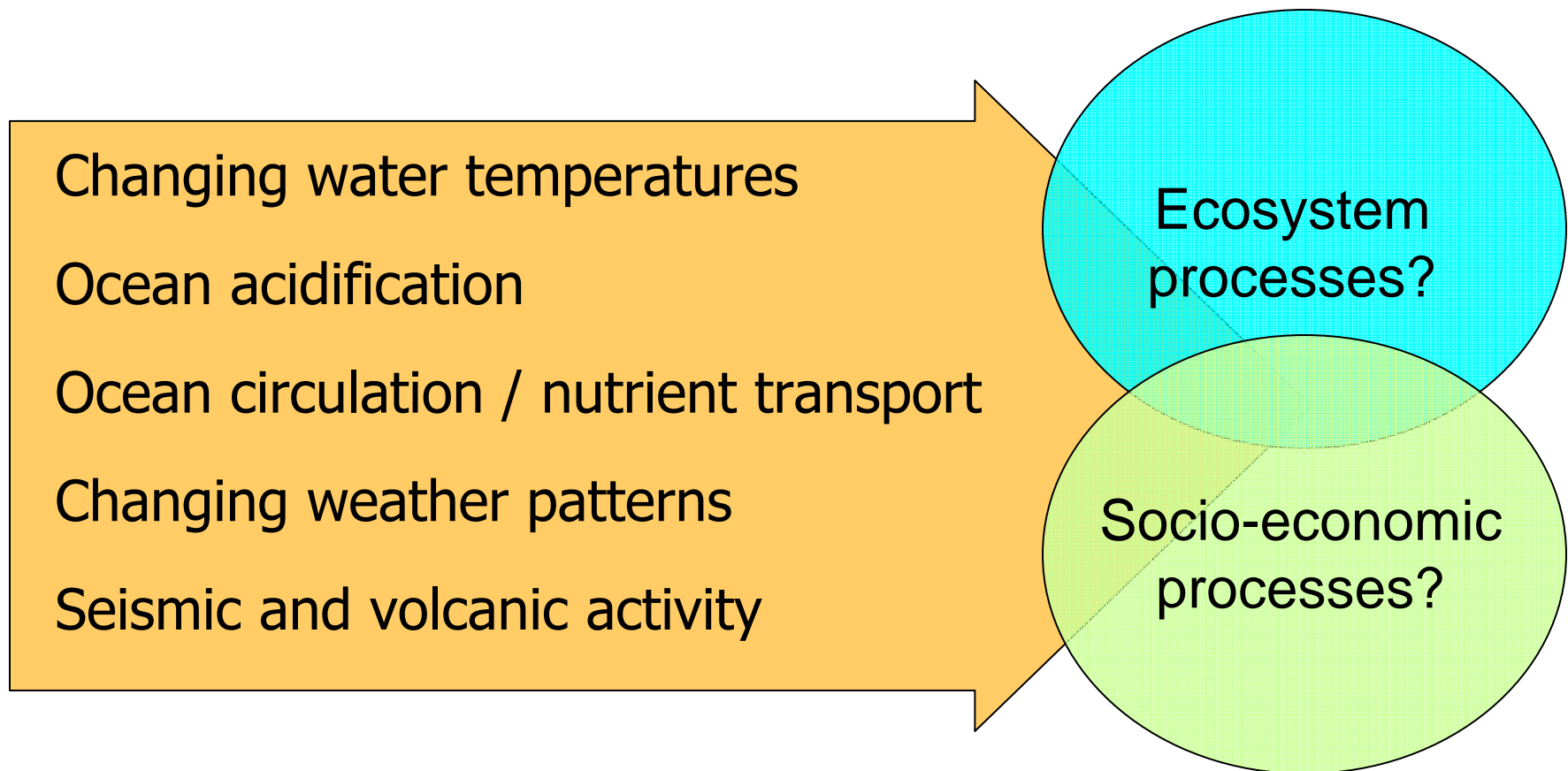
# Interactions

- Climate and or physically mediated interactions
- Predator-prey (food web mediated) interactions
- Endangered Species Act (regulatory) interactions
- Fishing effects interactions
- Other socioeconomic activities interactions

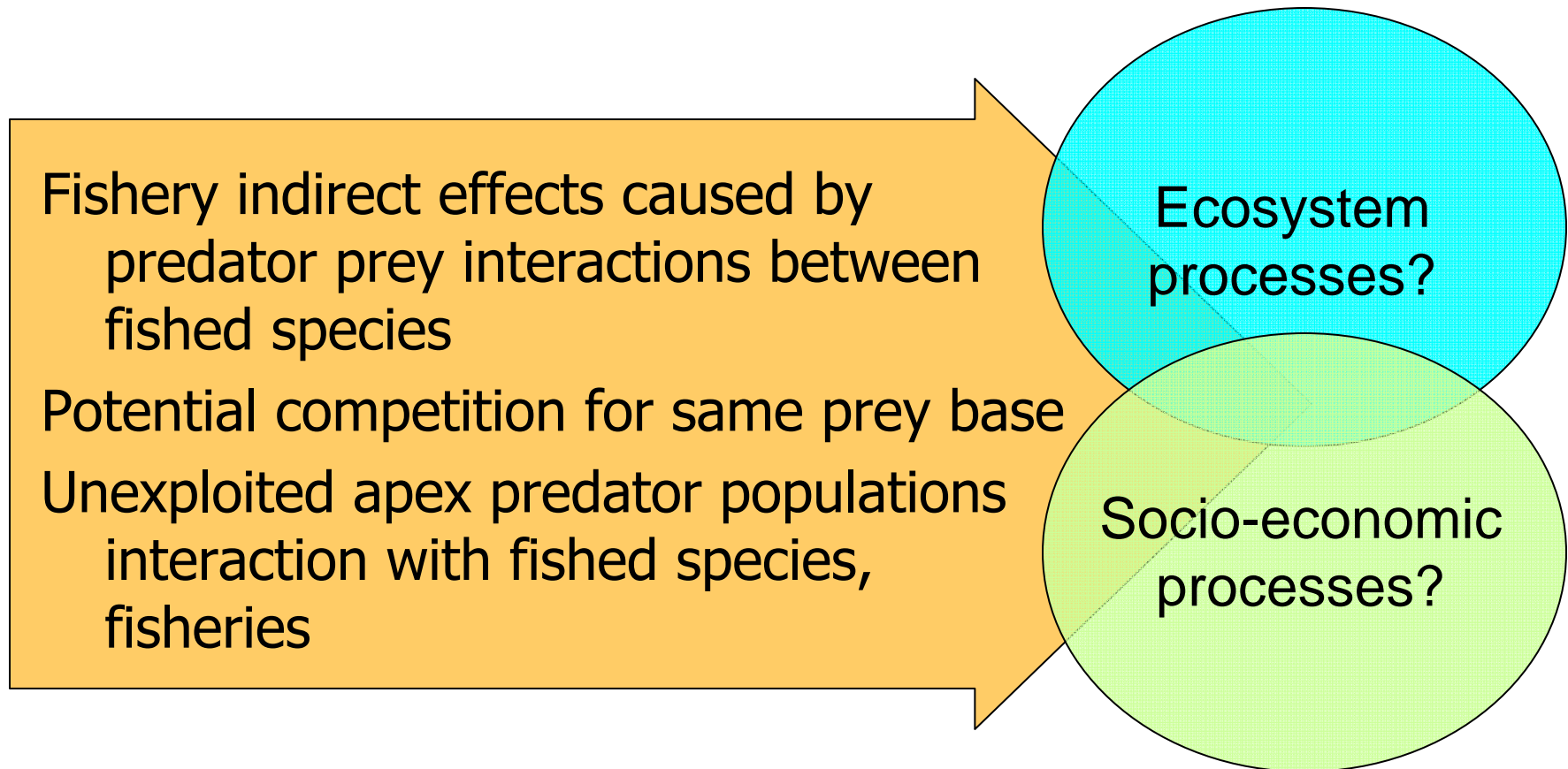
Interactions between interactions are discussed within each category to the extent possible

Are the interactions clear and are we missing any?

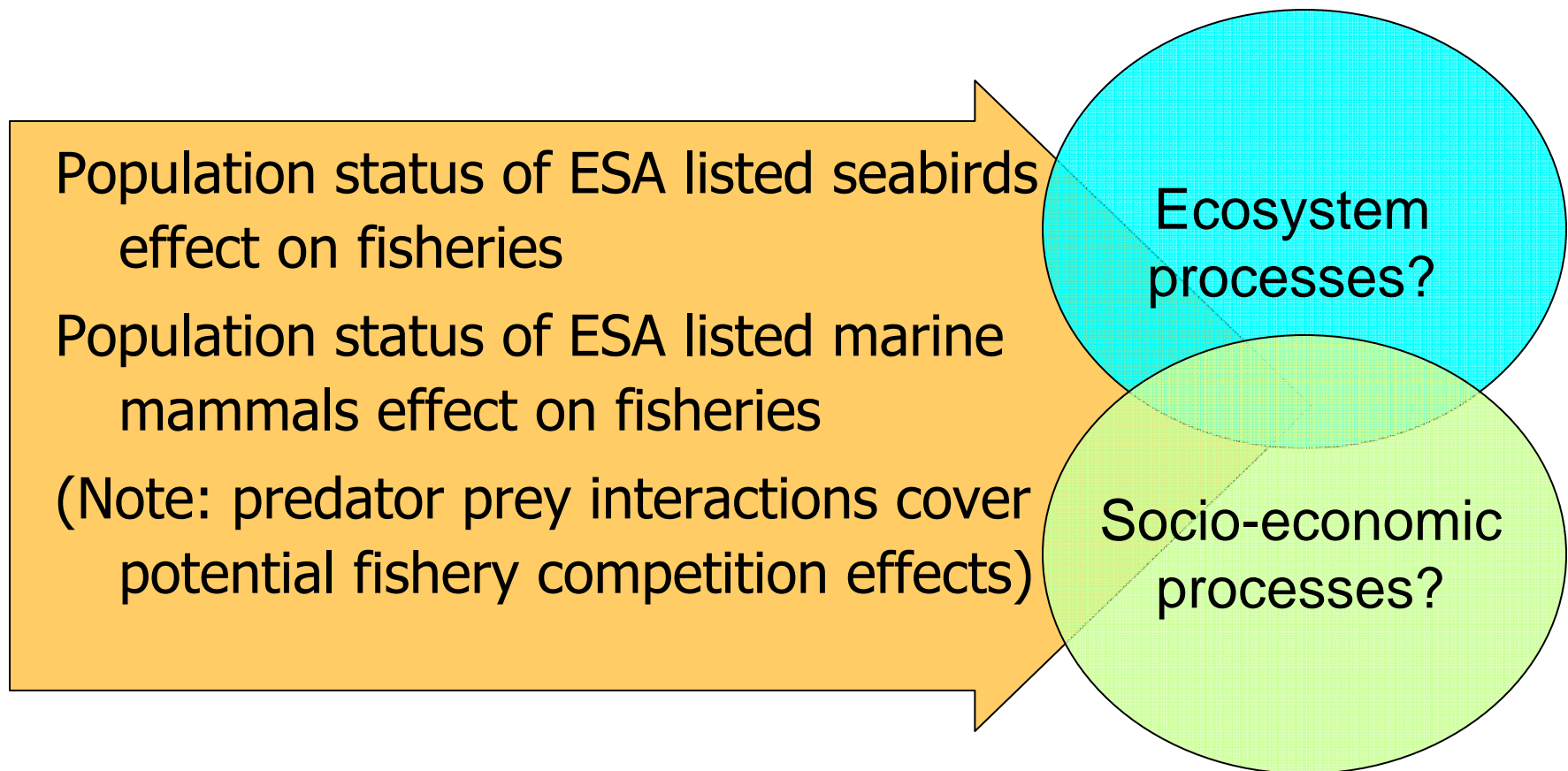
# Climate and physically mediated interactions



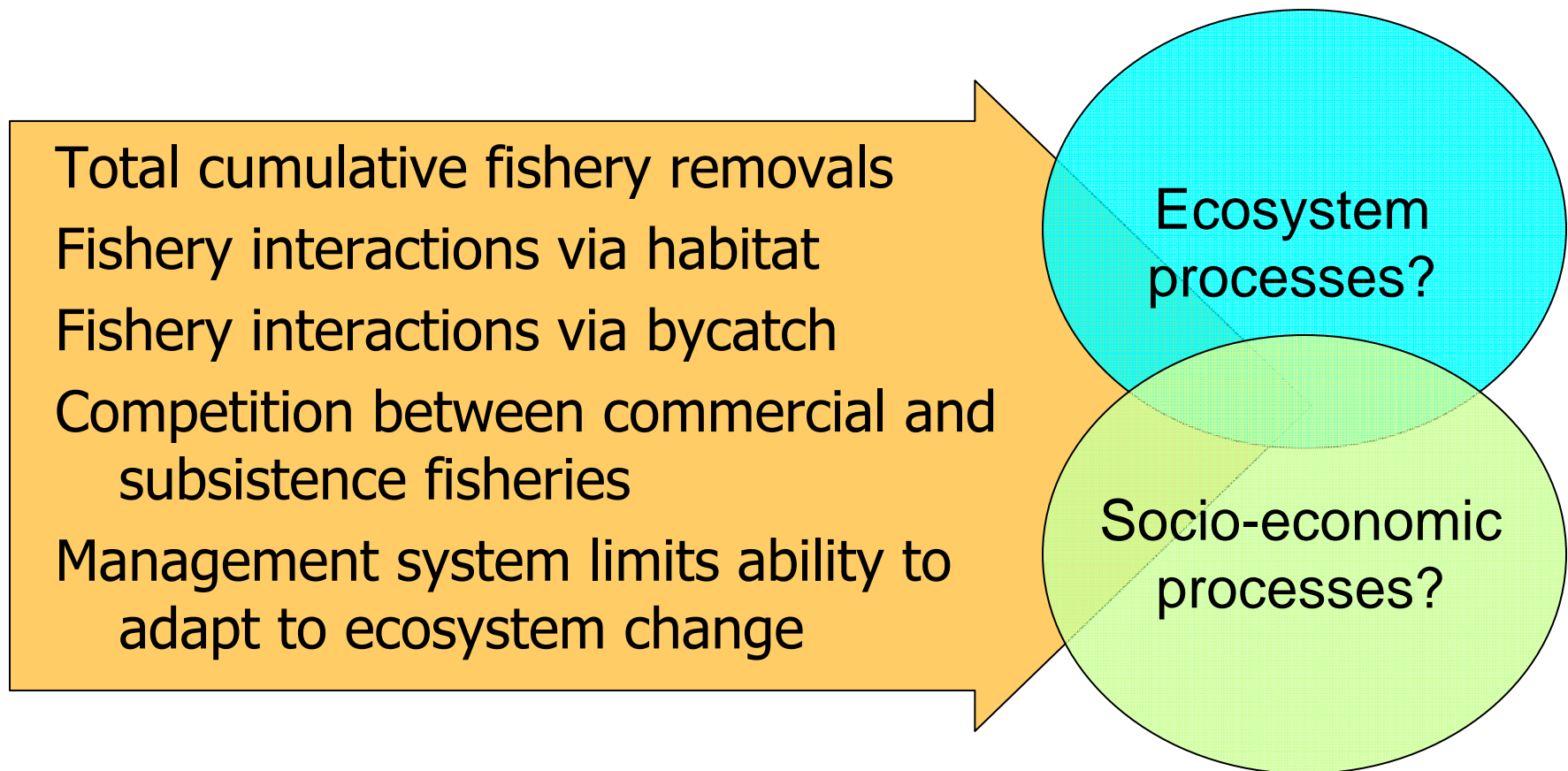
# Predator-prey / food web mediated interactions



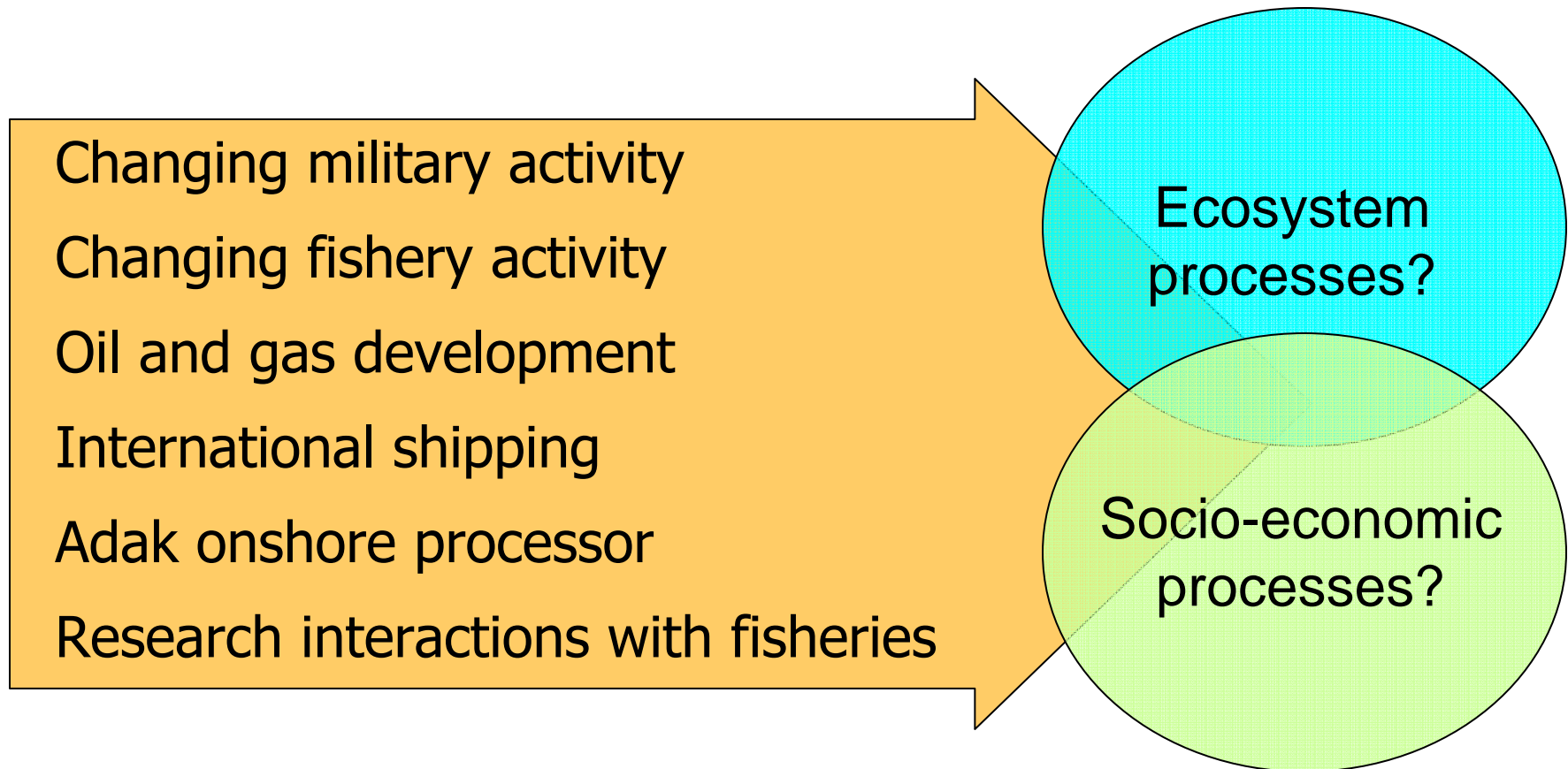
# Endangered species (regulatory) interactions



# Fishing related interactions



# Other socioeconomic activity interactions



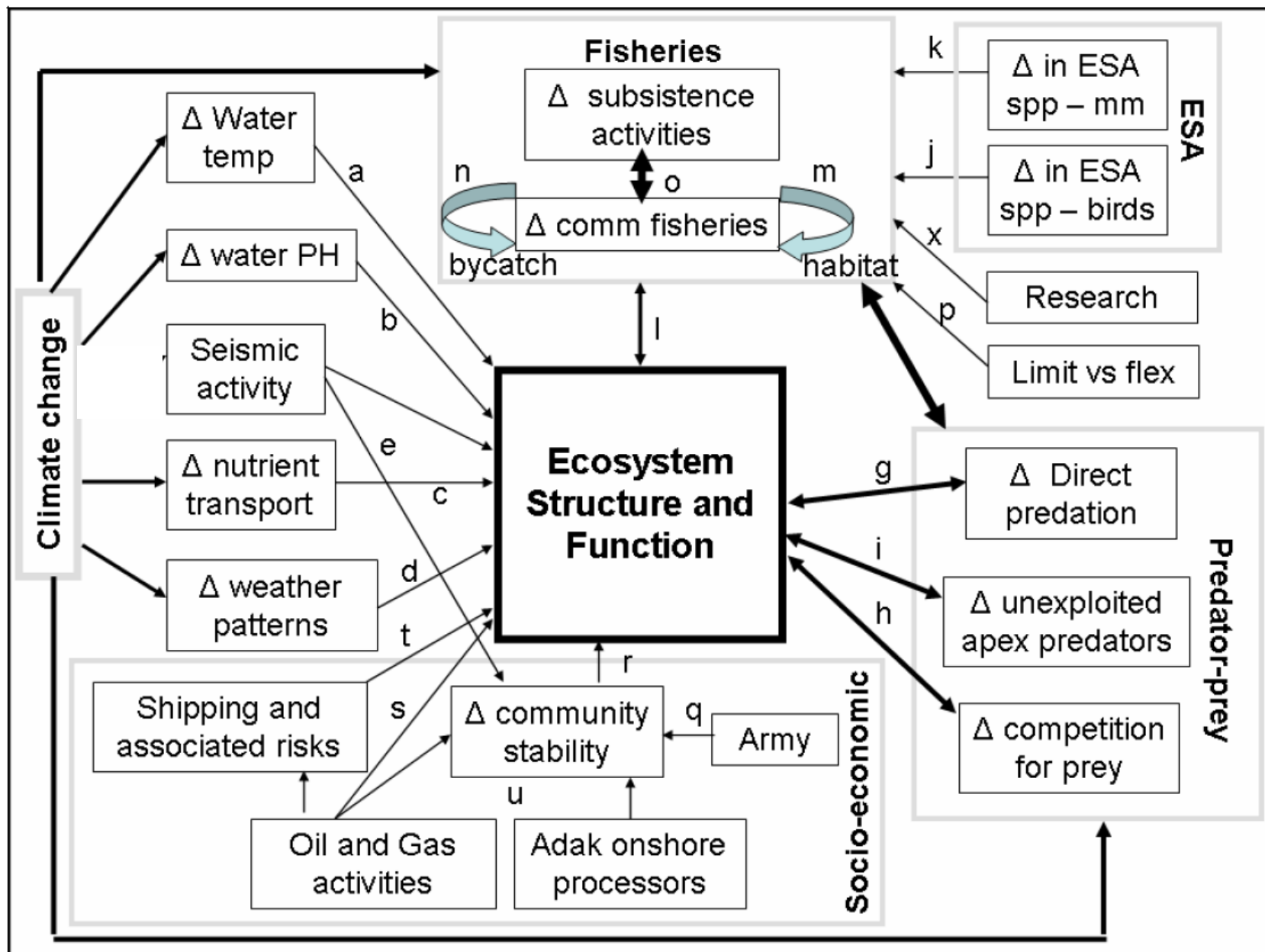
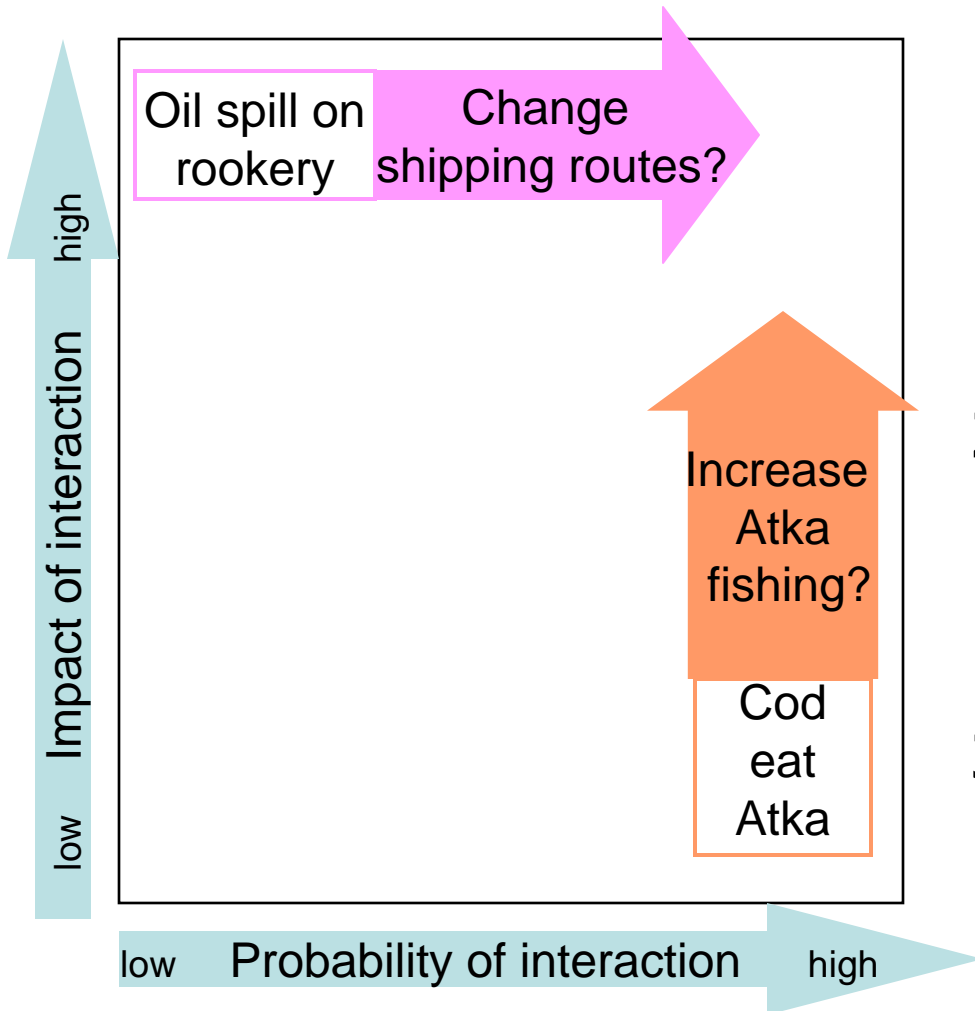


Figure 4-2 Map of ecosystem interactions



# Risk Assessment

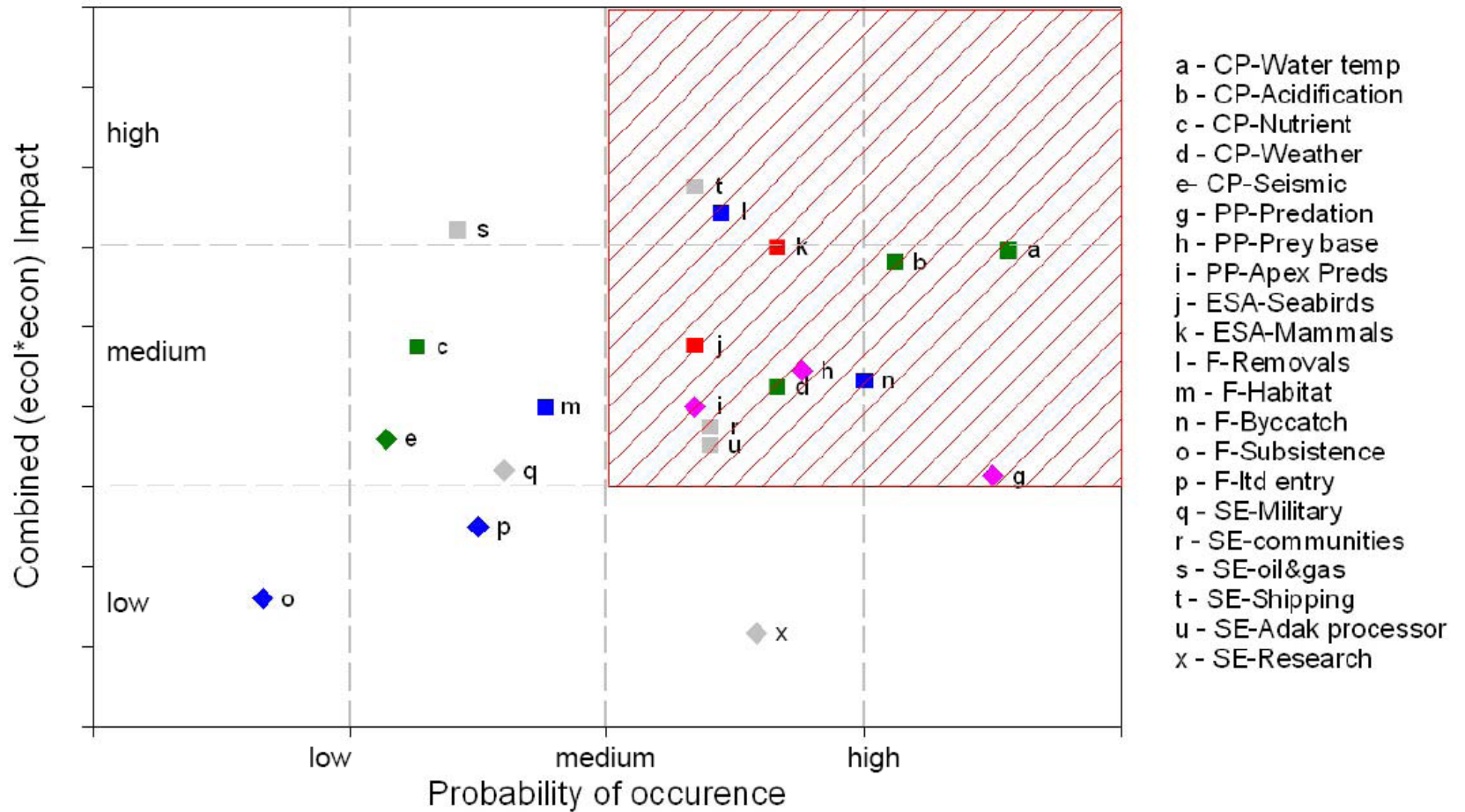
Interactions in context...



Each team member qualitatively estimated (low, medium, high)

1. The probability of each interaction happening
2. The extent of adverse impact of the interaction
  - Ecologically
  - Economically
3. And rated the length of impact (months-centuries)

# Risk Assessment



**Figure 4-4** Characterization of interactions in terms of probability of occurrence and a combined ecological multiplied by economic impact. Shaded area in upper right quadrant highlights those interactions with a medium to high probability of occurring and likely impact.

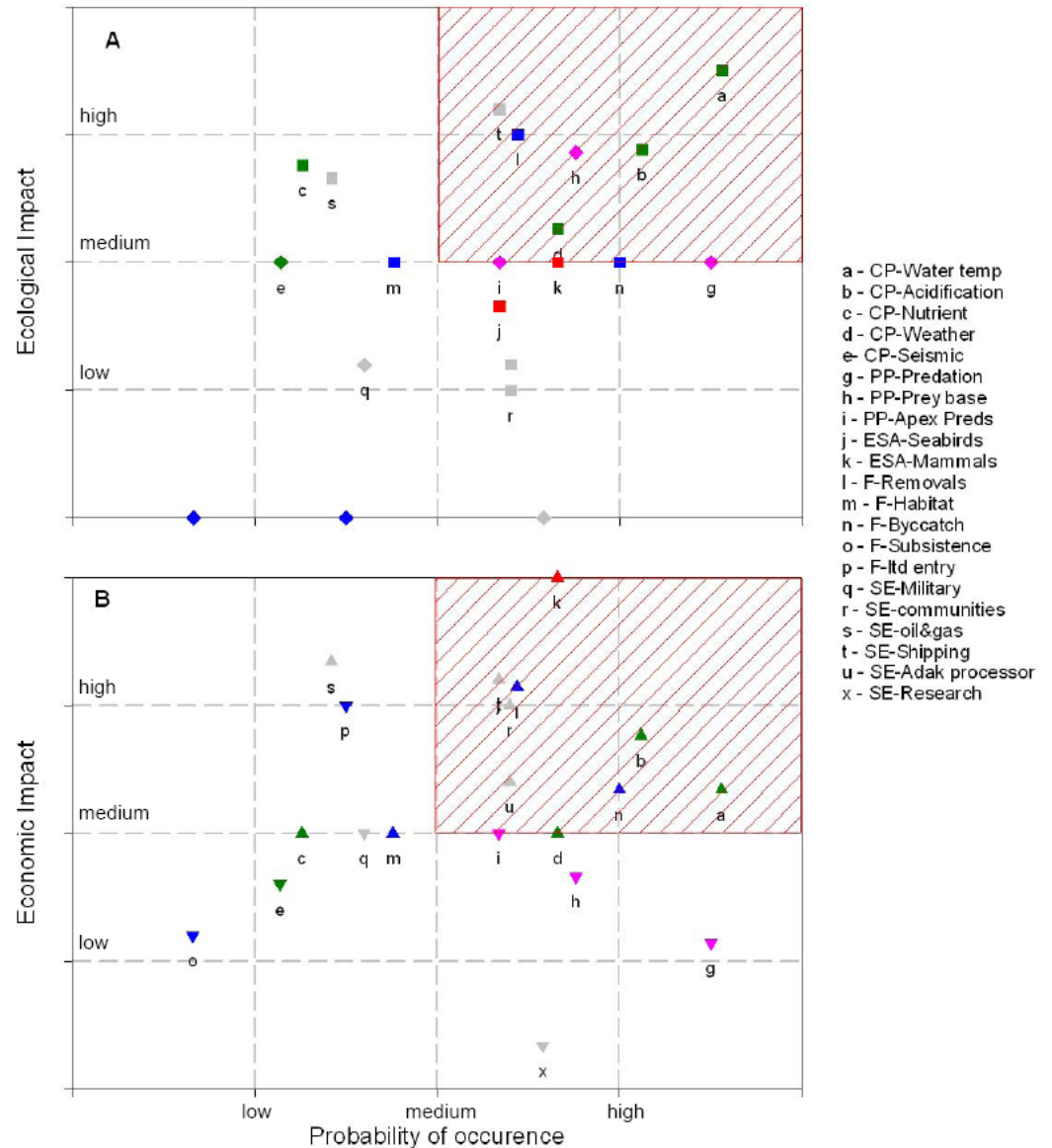
interpretation of scores begins on p.79

# Risk Assessment

Qualitative and preliminary

Intended to identify major interactions where the Council may direct further more in depth analysis

What are we missing?



# How will we come up with implications?

- First – identify/ prioritize data gaps and research needs
- Second – use risk assessment
  - look at high probability/high impact interactions
  - consider how the uncertainty associated with these interactions is currently considered by management
  - could more be done/ is further action warranted
  - prioritize these actions
    - use Council management objectives as filter (e.g. groundfish PSEIS objectives)

# We request specific feedback...

What are we missing?      More useful organization?

1. Introduction / purpose / need
2. Geographic description
3. Understanding the AI Ecosystem

Other information / sources?

Other interactions?

4. Ecosystem Assessment
- Add uncertainty (qualitative)?
- Alternative presentation?

5.-9. Sections to be completed pending comments



# Feedback

- Looking for feedback from communities, stakeholders, Council
- Community meetings
  - Unalaska: March 21
  - Adak: technical difficulties, will try to reschedule for April
  - Atka: late April

# Unalaska Community Meeting

- Discussion and clarifications on the **purpose/use** of the document, **risk assessment**
- Comments on missing elements, risk assessment methodology, reliance on models

# Ecosystem Committee report

# Next Steps for FEP

- AI Ecosystem Team workshop April 5-6, to discuss and develop remaining sections of FEP
  - reflect on feedback / reassess draft
  - develop implications and priorities for Council
  - AI FEP was pilot project; is this a useful exercise for other Alaska ecosystems?
- Final draft to be distributed to Council by May 18
- June Council meeting – Council adopts AI FEP
- by October – Team develops 'glossy' summary of FEP

# Future 'phases' of the FEP

- Coordination with the annual Ecosystem Considerations chapter
- Further work on the FEP
  - we discussed FEP being updated on 3 to 5 year cycle
  - FEP will identify some areas for future consideration

# Council's Action today

- Feedback on the document and its description of ecosystem processes
- Opportunity to provide direction to the Team on completing the remaining sections