



# Distribution and Abundance of Pelagic Fish Resources

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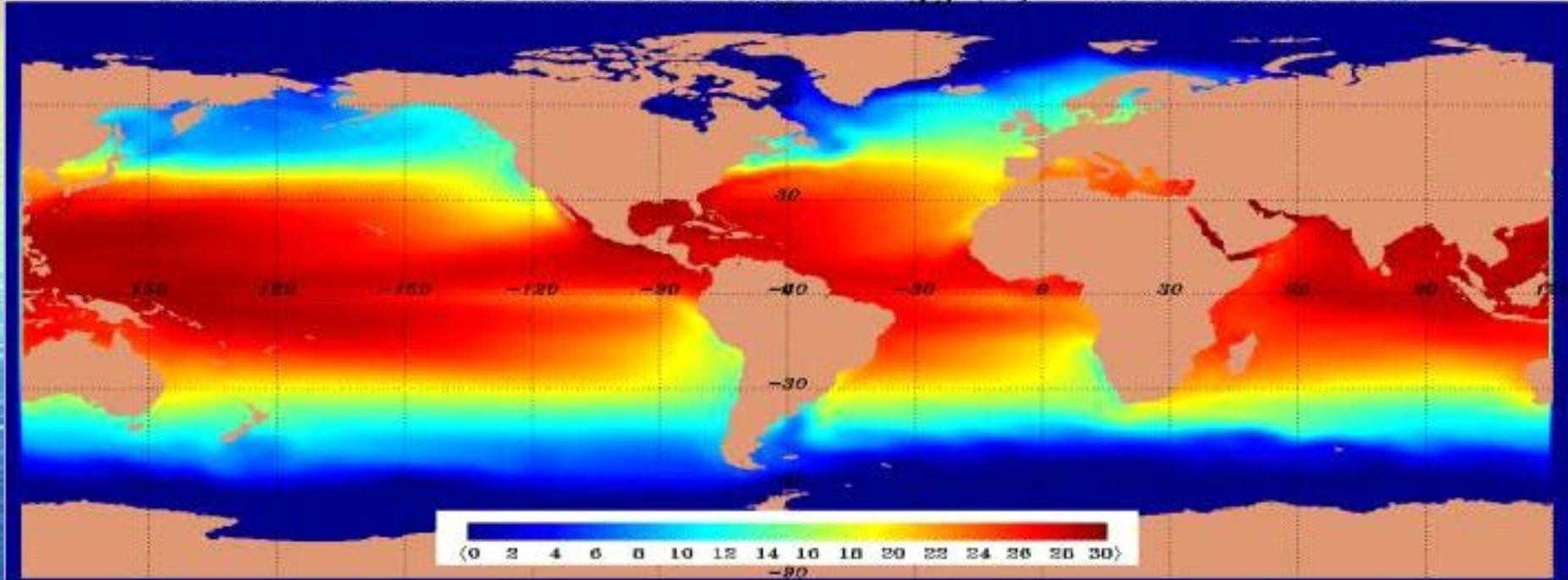


# Objectives

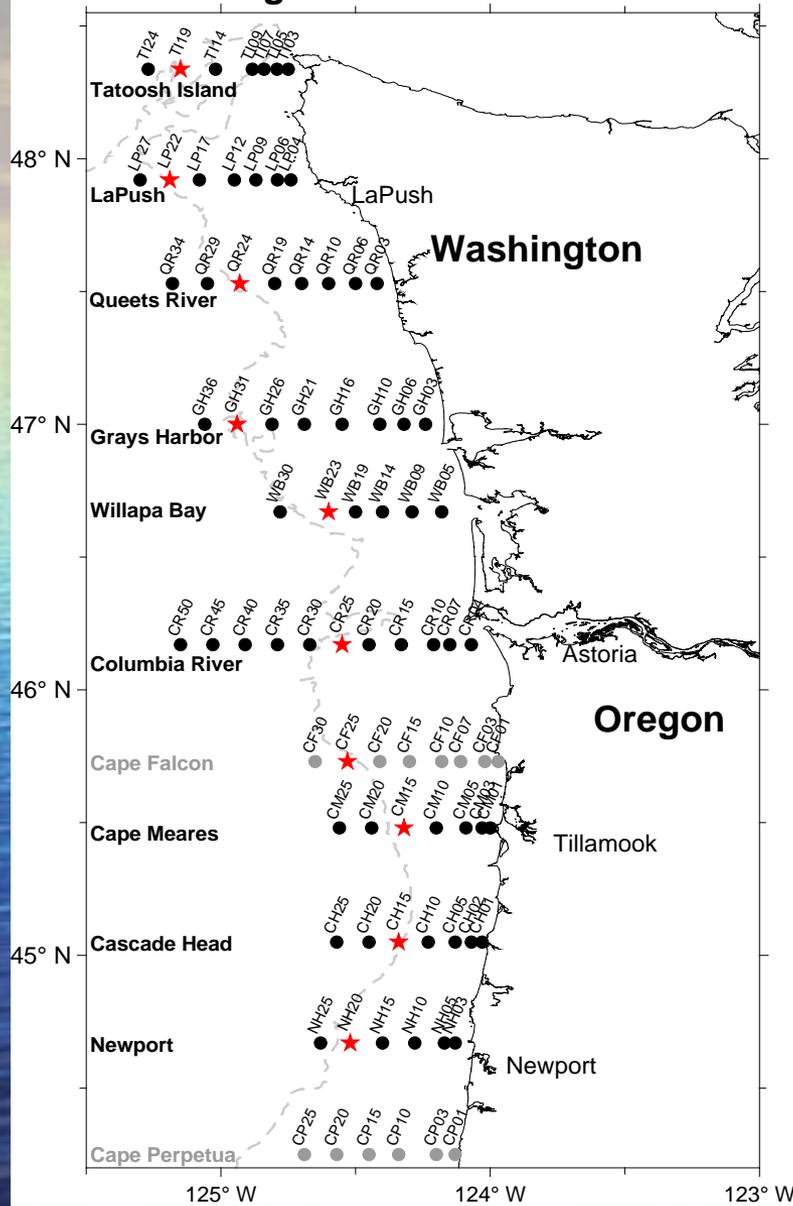
- Historic fish surveys
- What are the key species
- Distribution and abundance of key species
- Data gaps and issues

# World Ocean Sea Surface Temperatures

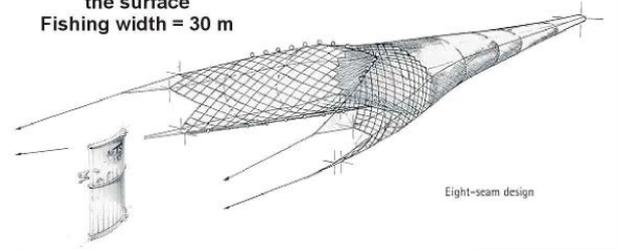
*FNMOC OTIS 4.0: NCEP SST Climatology (C) 12 Jul 2002 12Z*



# BPA Plume Study Target Station Locations



264 Rope Trawl fished at the surface  
Fishing width = 30 m



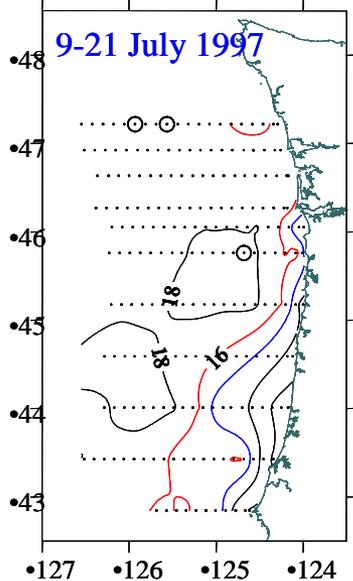
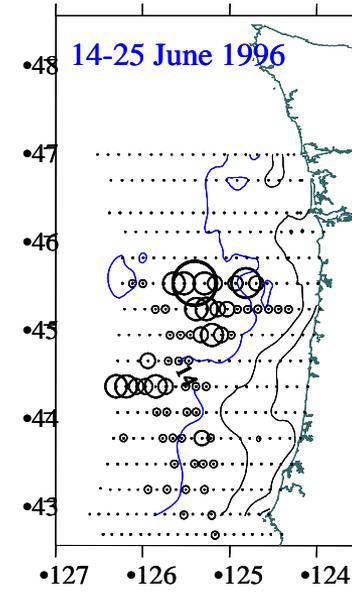
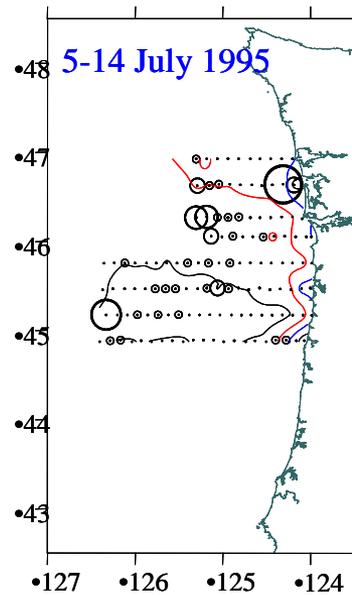
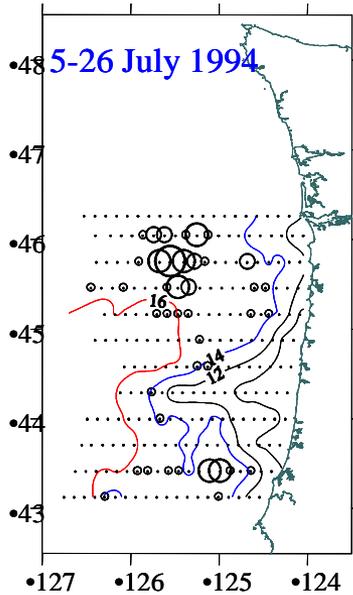
# Offshore Fish Surveys

- Brodeur and Ware 1995
  - Interdecadal variability in distribution and catch rates of epipelagic nekton in the Northeast Pacific Ocean.
- Matarese et al. 2003
  - Atlas of abundance and distribution patterns of ichthyoplankton from the Northeast Pacific Ocean and Bering Sea Ecosystems based on research conducted by the Alaska Fisheries Science Center (1972-1996).
- Pacific sardine and Northern anchovy spawning surveys
  - NWFSC 1994-1998
  - SWFSC ongoing
- At present there are no offshore pelagic fisheries research surveys being conducted in offshore waters (from shelf to 200 nm)

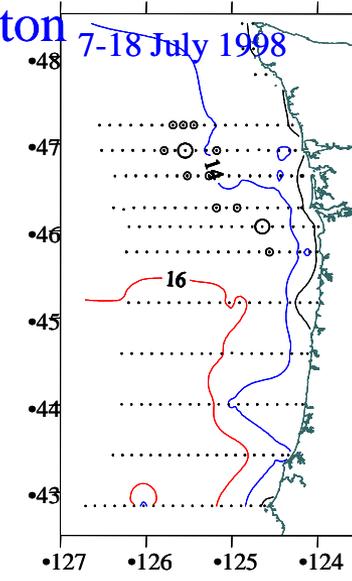
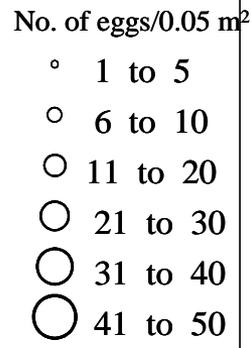
# Key Species

- Small migratory fishes
  - Anchovy, sardines
- Small non-migratory fishes
  - Pacific saury, pomfret, myctophids
- Large migratory fishes
  - Tuna, mackerel, sharks
- Squid
- Mammals

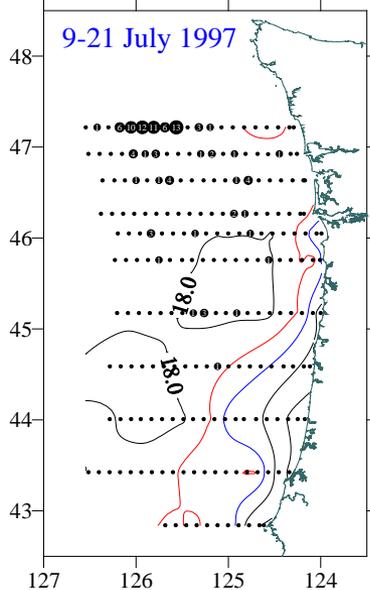
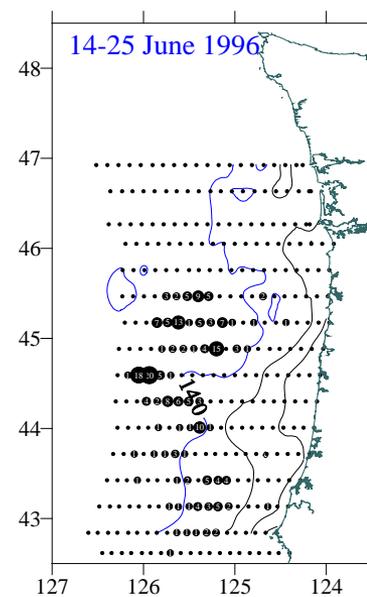
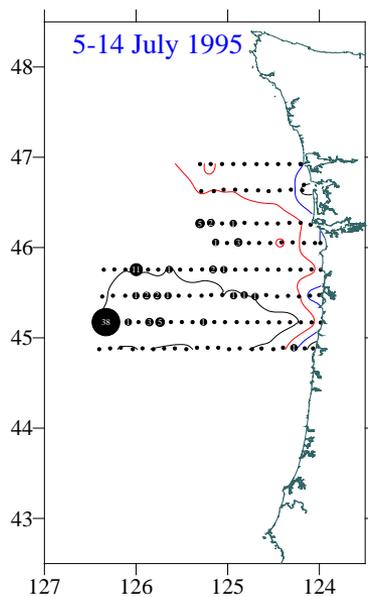
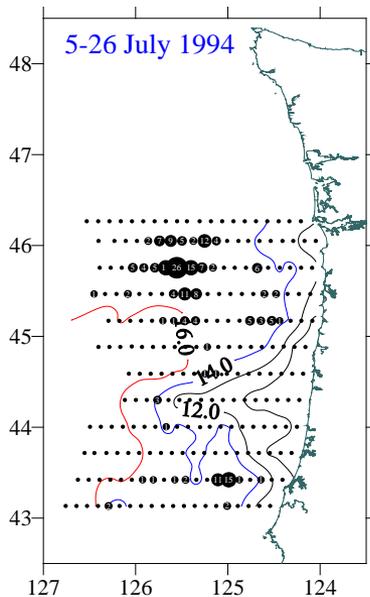
# Northern anchovy (*Engraulis mordax*) spawning



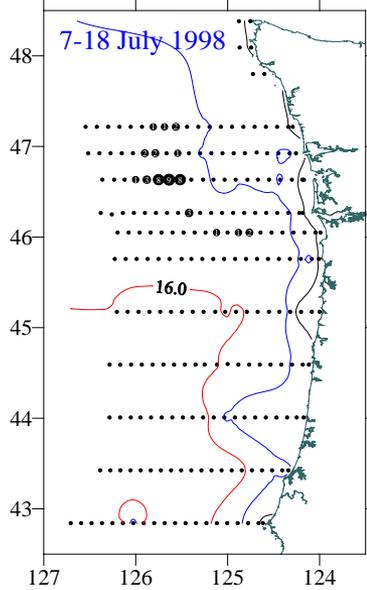
NMFS Ichthyoplankton  
Sampling 1994-1998  
Temperature at 3 m



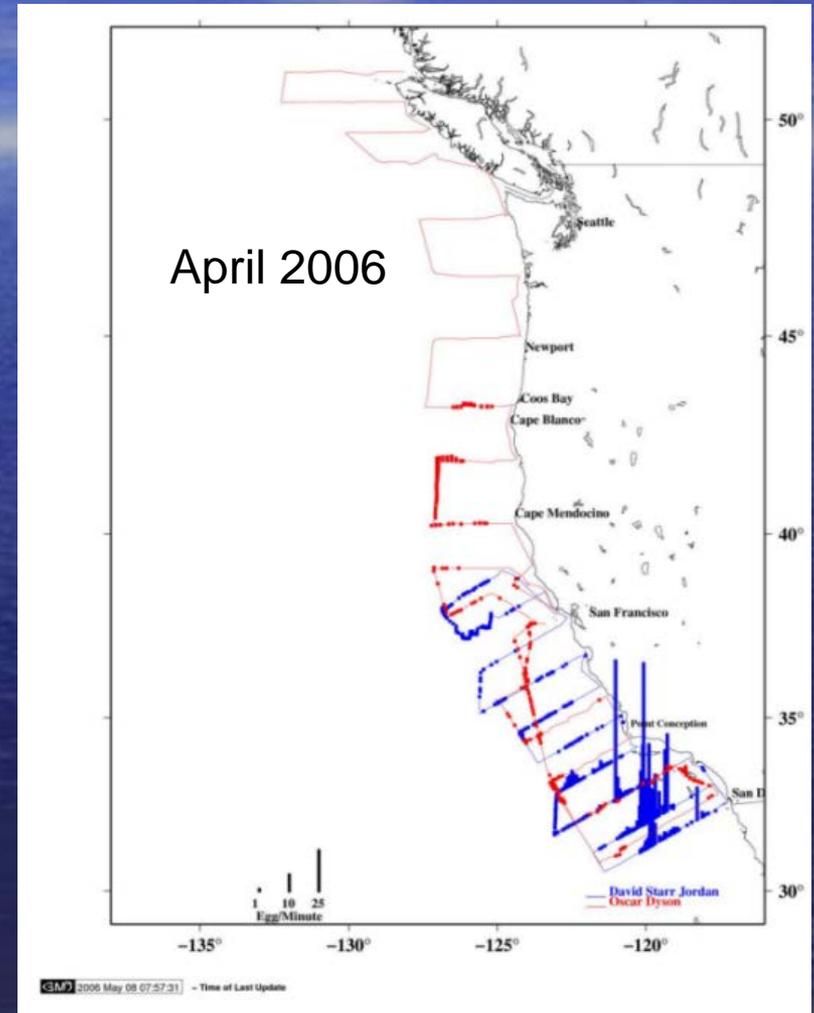
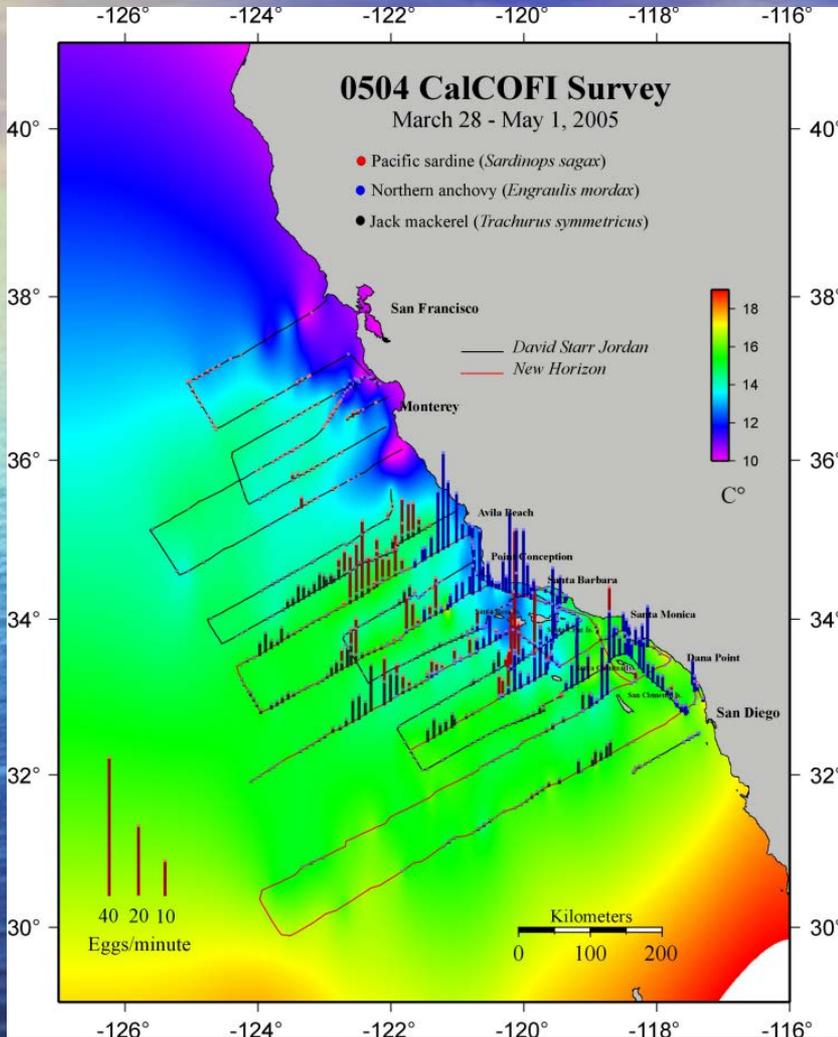
# Pacific sardine (*Sardinops sagax*)



NMFS Ichthyoplankton  
Sampling 1994-1998  
Sardine Larvae per 0.05m<sup>2</sup>  
Temperature at 3 m



# Sardine spawning surveys

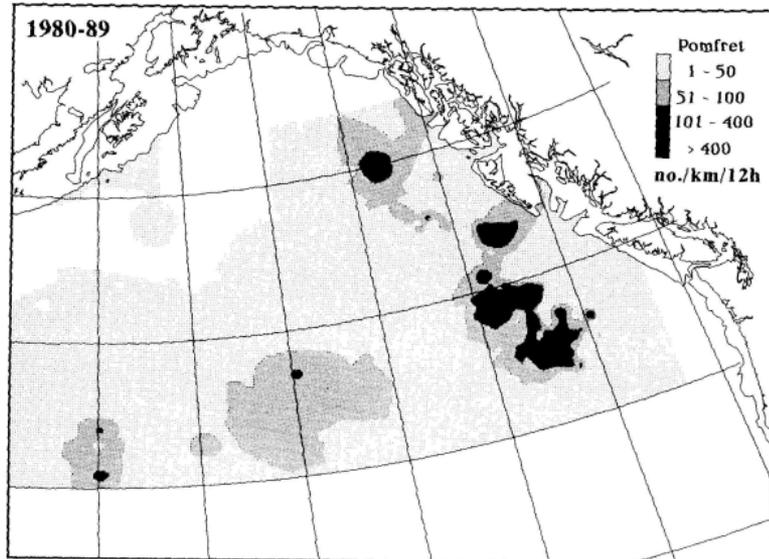
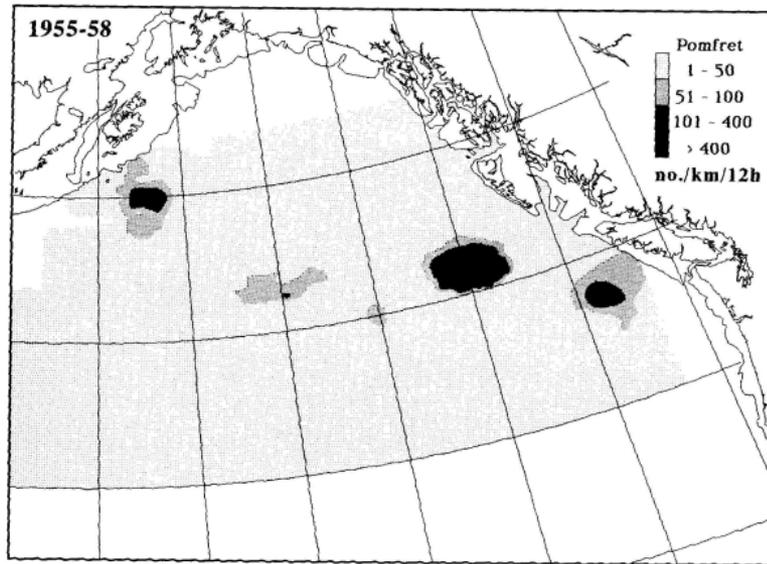


Pacific saury (*Cololabis saira*)

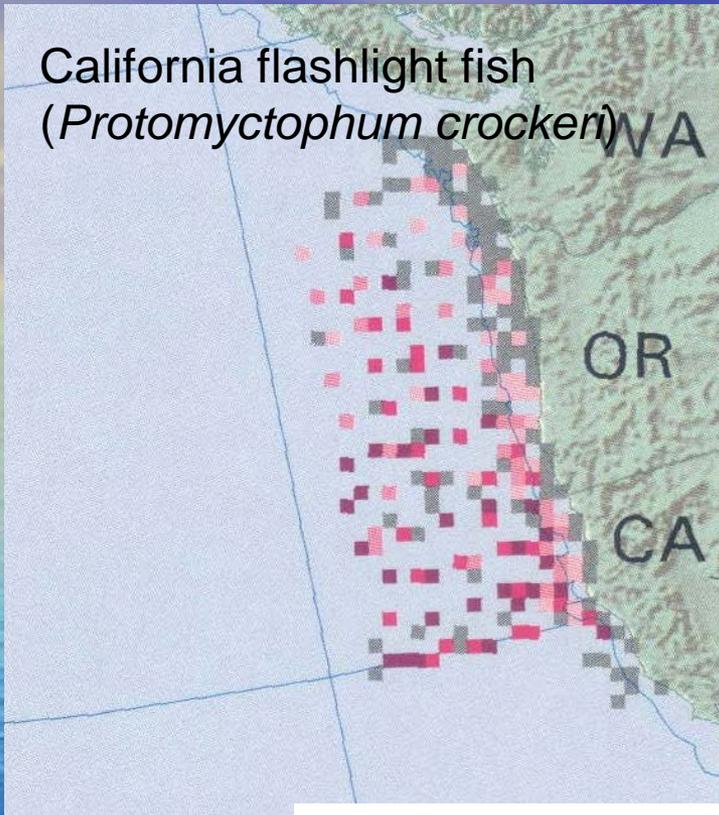




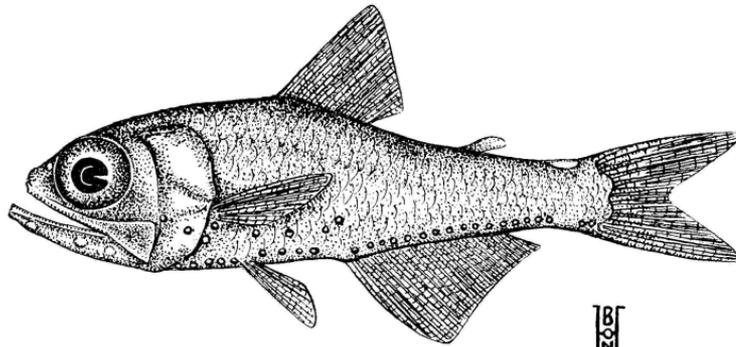
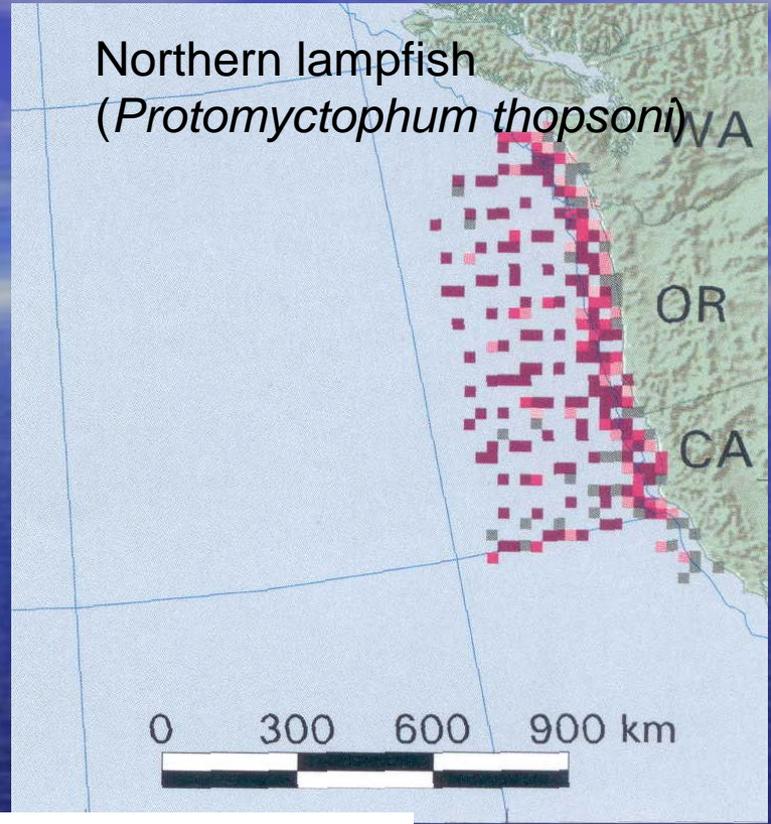
# Pacific pomfret



California flashlight fish  
(*Protomyctophum crockeri*)

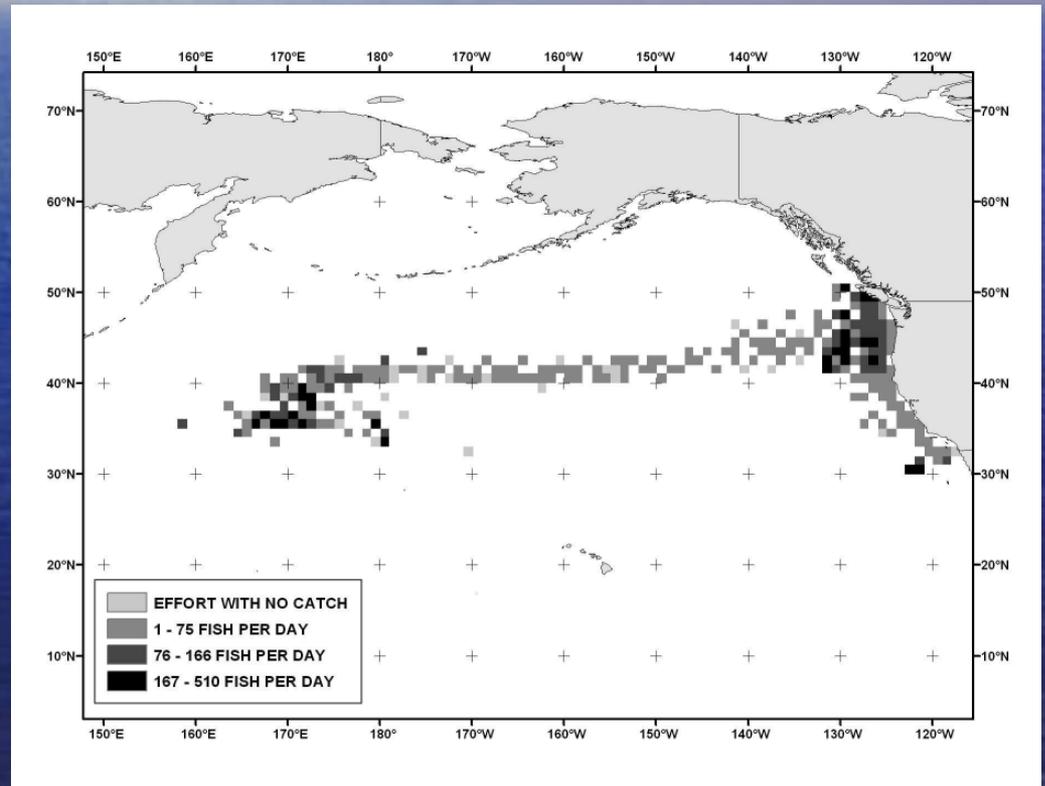
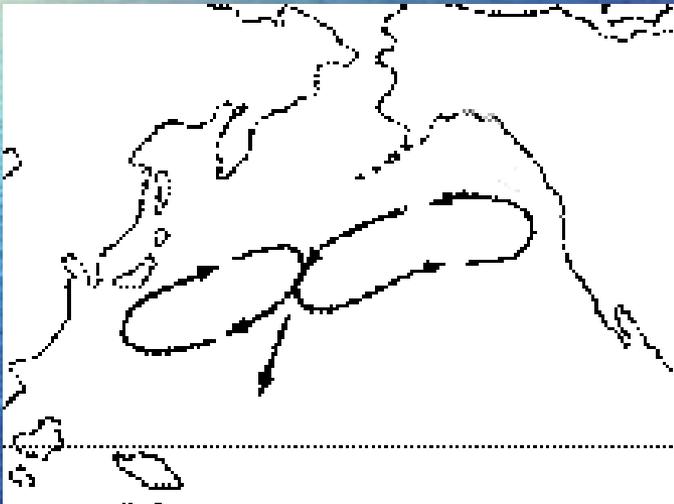


Northern lampfish  
(*Protomyctophum thopsoni*)



BT  
M

# Albacore tuna (*Thunnus alalunga*)





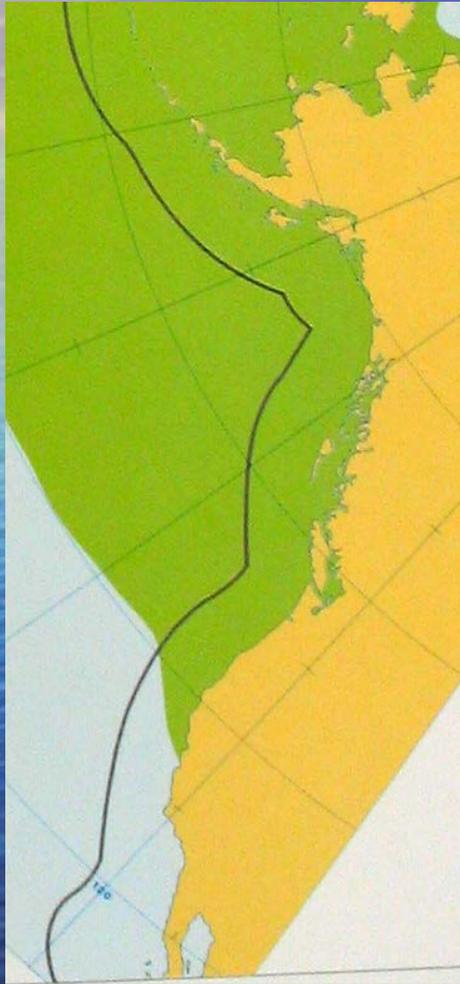
Jack mackerel  
(*Trachurus symmetricus*)



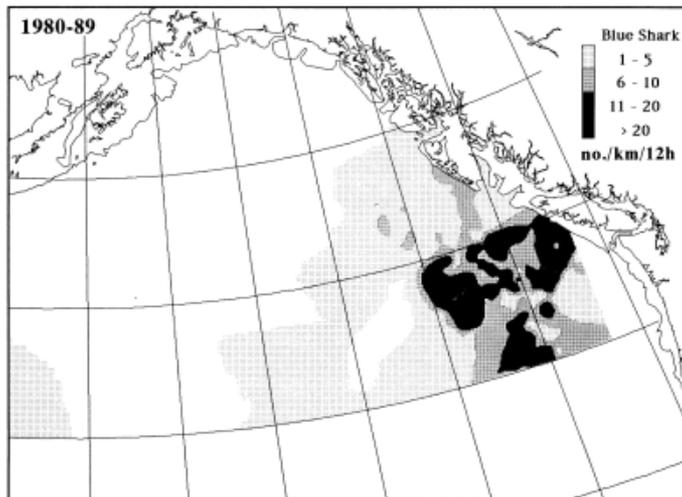
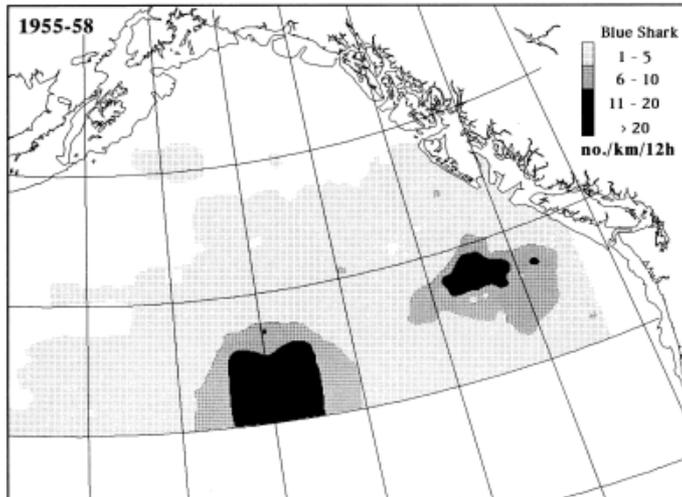
Pacific hake  
(*Merluccius productus*)



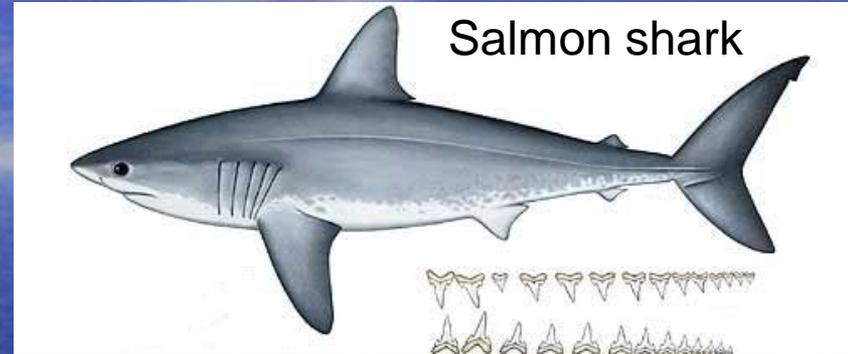
# Pacific salmon (*Oncorhynchus* spp.)

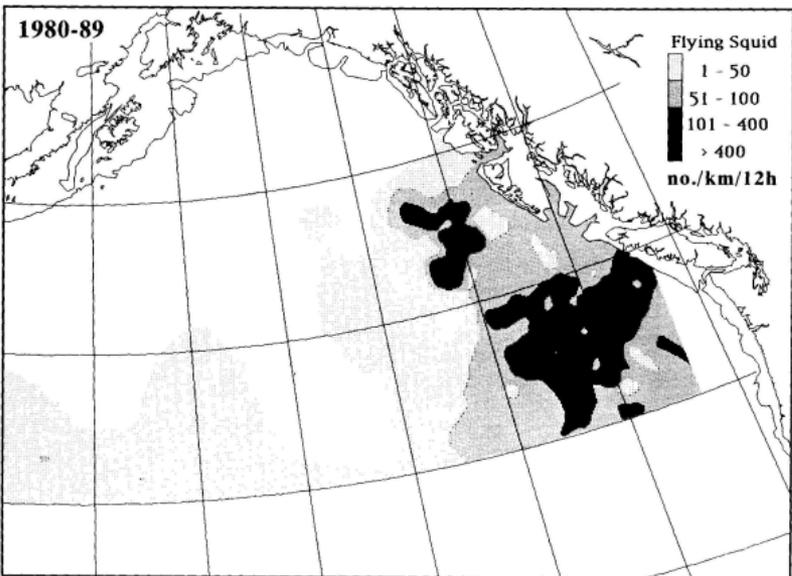
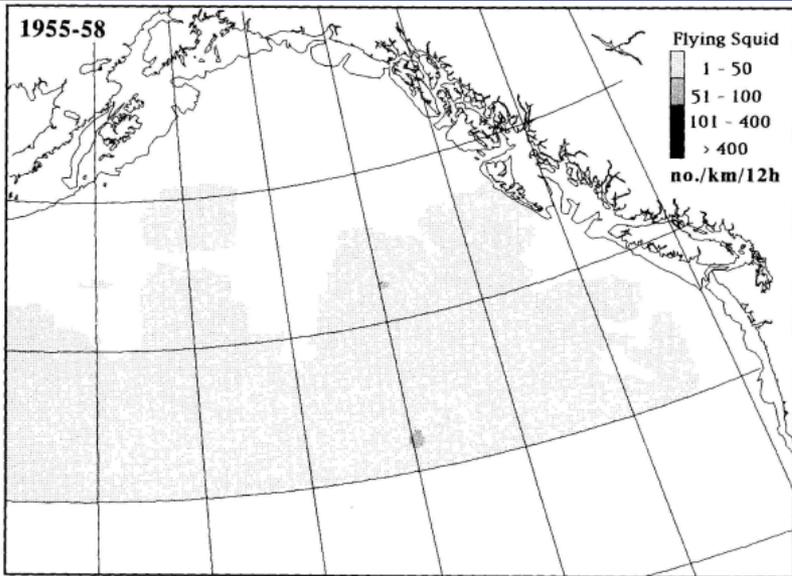


# Blue shark (*Prionace glauca*)

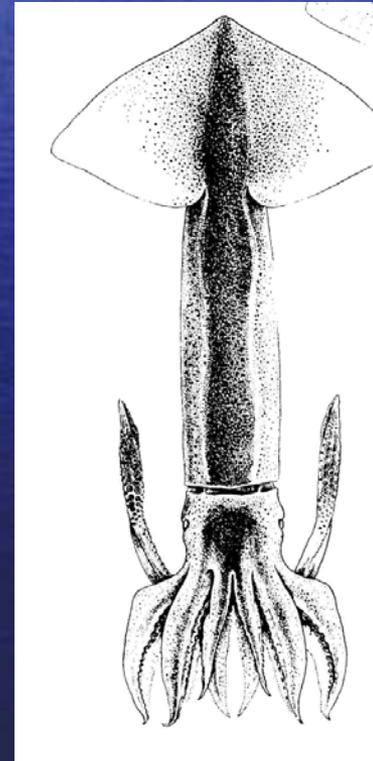


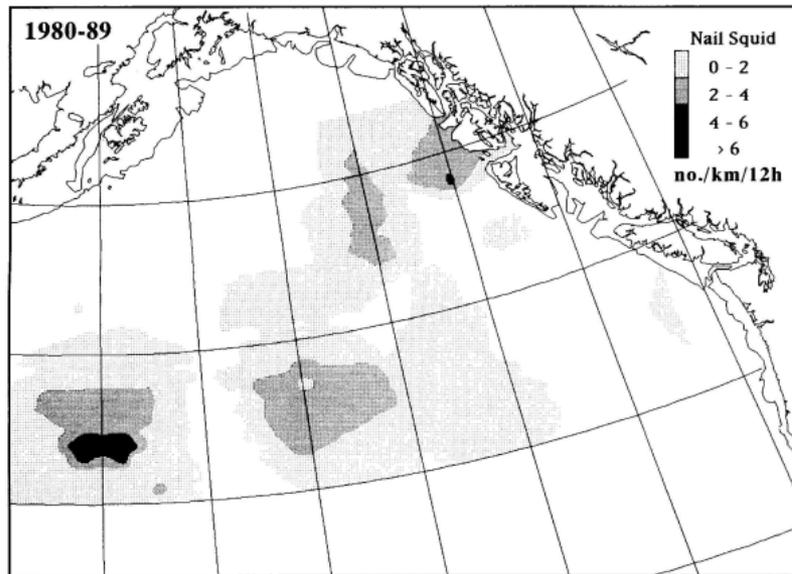
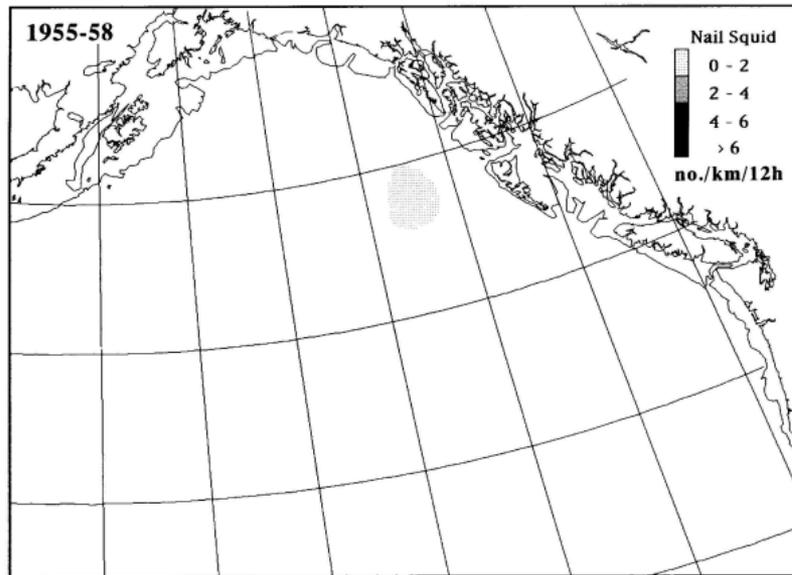
Soupin shark  
Thresher shark  
Salmon shark  
White shark





Neon flying squid  
 (*Ommastrephes bartrami*)





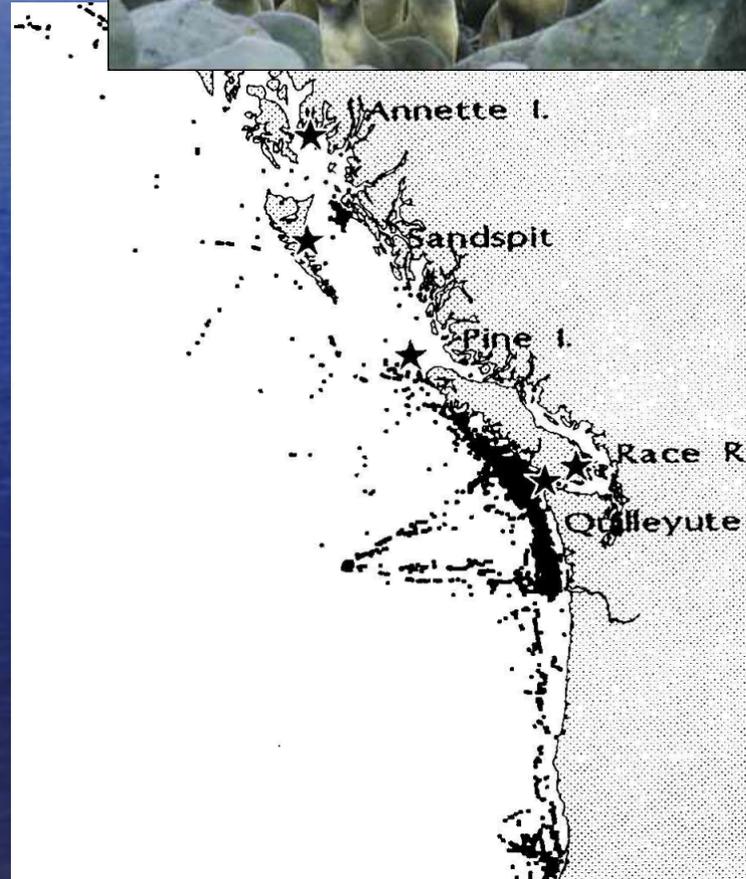
Nail squid  
(*Onchotheuthis borealijaponica*)



Sperm whale  
(*Physeter macrocephalus*)

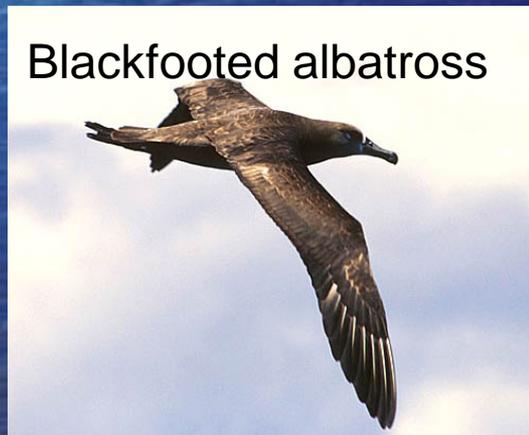


Fur seal  
(*Callorhinus ursinus*)



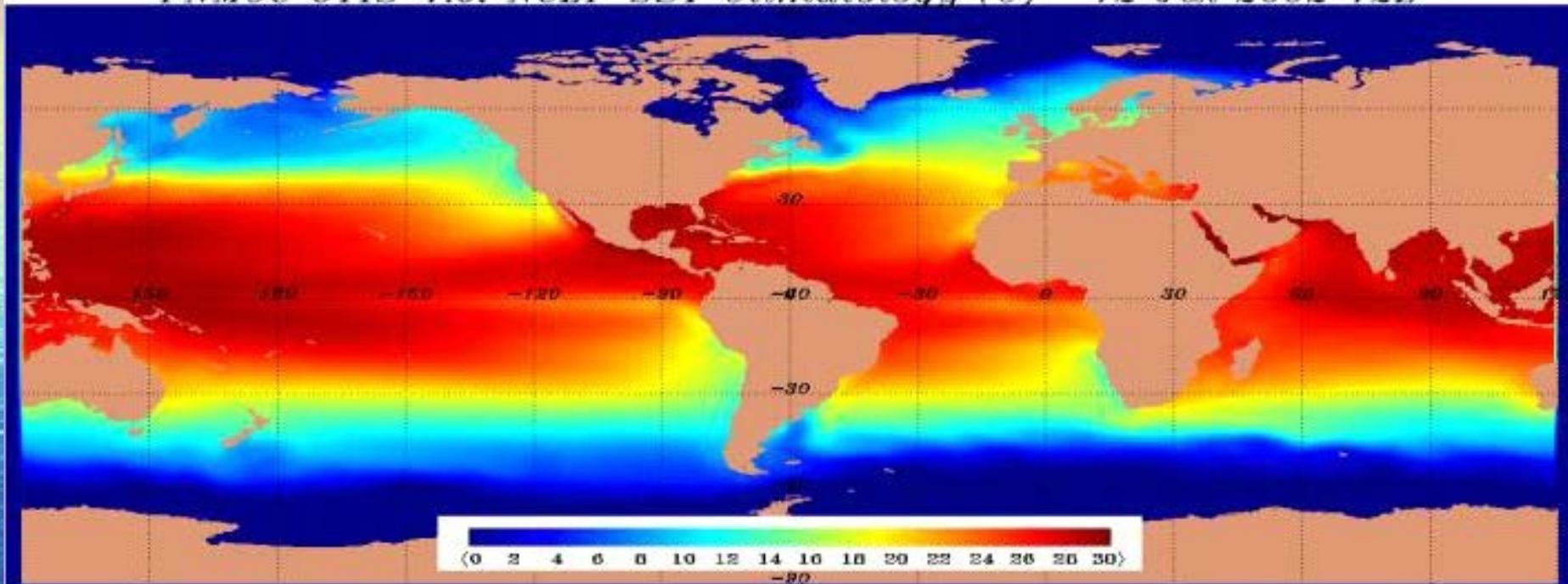


White sided dolphin



Blackfooted albatross

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# Conclusions

- Offshore pelagic nekton resources are many.
- Some of these resources are abundant and support commercial exploitation.
- We know relatively little about this offshore pelagic ecosystem:
  - Status of these stocks?
  - Food web?
  - What is the effect of climate change?

# What will be the effect of ballast water discharge?

- Diseases and parasites on eggs, larvae and adult nekton?
- Introduction of other plankton (phytoplankton and zooplankton) species on food web?
- Columbia River plume?



Thank You!