

THE *NORTH COAST PROGRAM:* BODEGA LINE AND SALMON MANAGEMENT

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Catching a haul of chinook, or king, salmon off Point Reyes, Calif.

The North Coast Program: Integrated Ocean Observing for Salmon Management

Strategy: *Coupled and integrated* physical and biological oceanographic monitoring is needed to move forward with salmon management in an ecosystem context during this period of substantial environmental change.

NCP PARTNERS

- Sonoma County Water Agency
- California Coastal Conservancy
- Central and Northern California Ocean Observing System
 - Humboldt State University
 - Monterey Bay Aquarium Research Institute
 - Bodega Marine Laboratory/UC Davis
- Farallon Institute for Advanced Ecosystem Research
 - NOAA-National Marine Fisheries Service
 - California Ocean Science Applications
- NOAA/Integrated Ocean Observing System

Research Team: Eric Bjorstedt, Francisco Chavez, John Field, Heather Kerkerling, John Largier, David Manning, Kyra Mills, Steven Morgan, Bill Peterson, Jonathon Phinney, Steve Ramp, Steve Ralston, Jarrod Santora, Paul Siri, Bill Sydeman, Sarah Ann Thompson et al.

Step (1) Salmonids and Their Food





Spray Glider

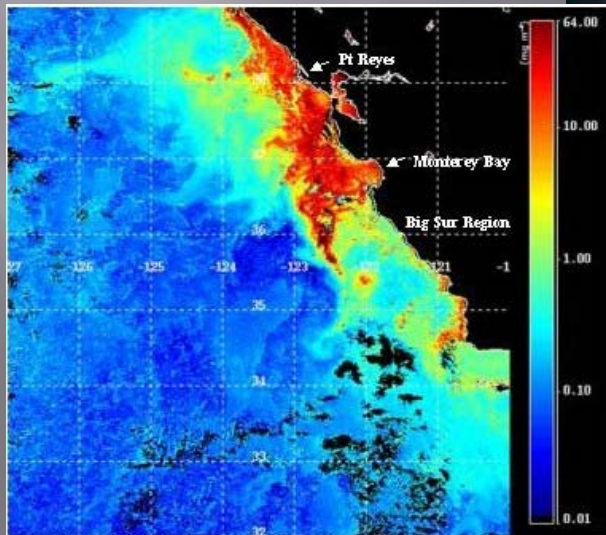


Moorings



Step (2) Prey Base and Oceanic Conditions

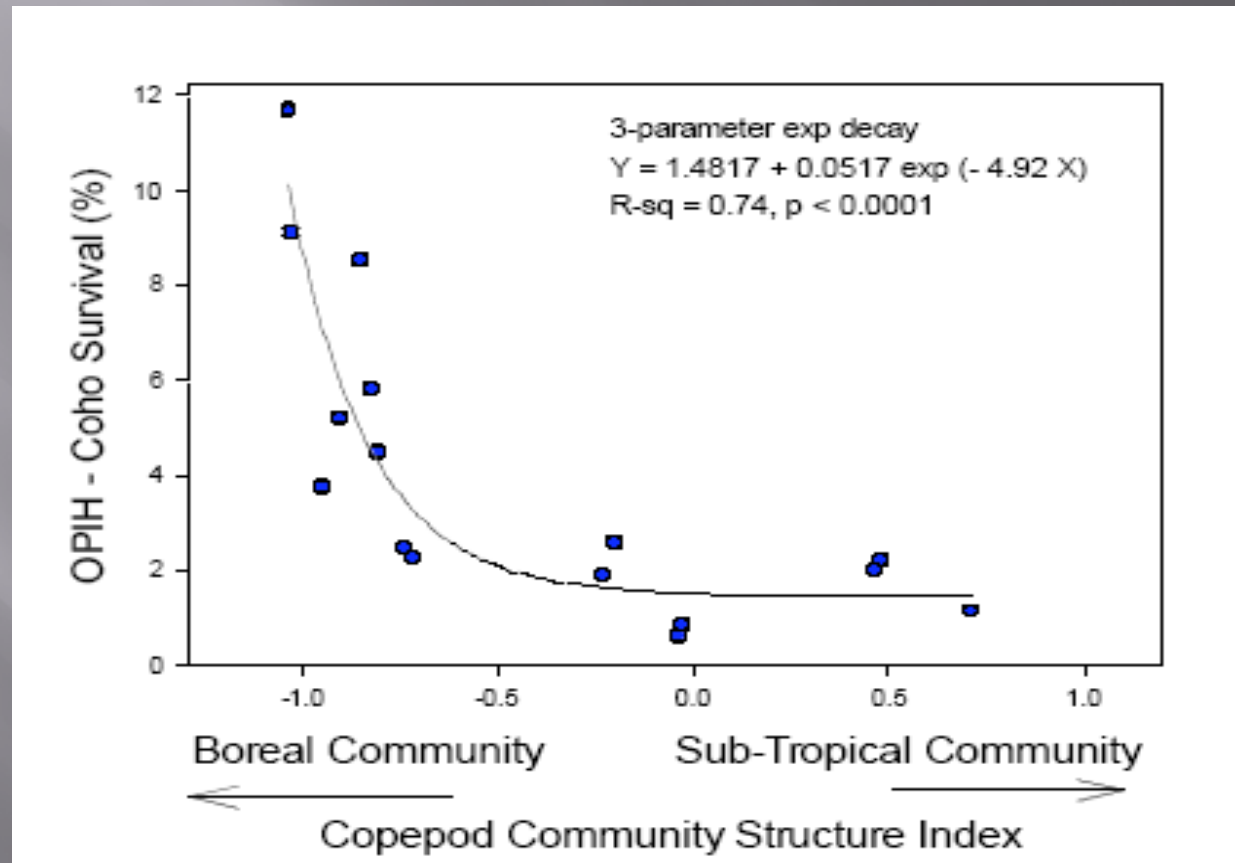
Satellite Oceanography



HF Radar



THE BASIS: PETERSON'S FORECASTING MODEL (OR COHO SURVIVAL & COPEPODS)



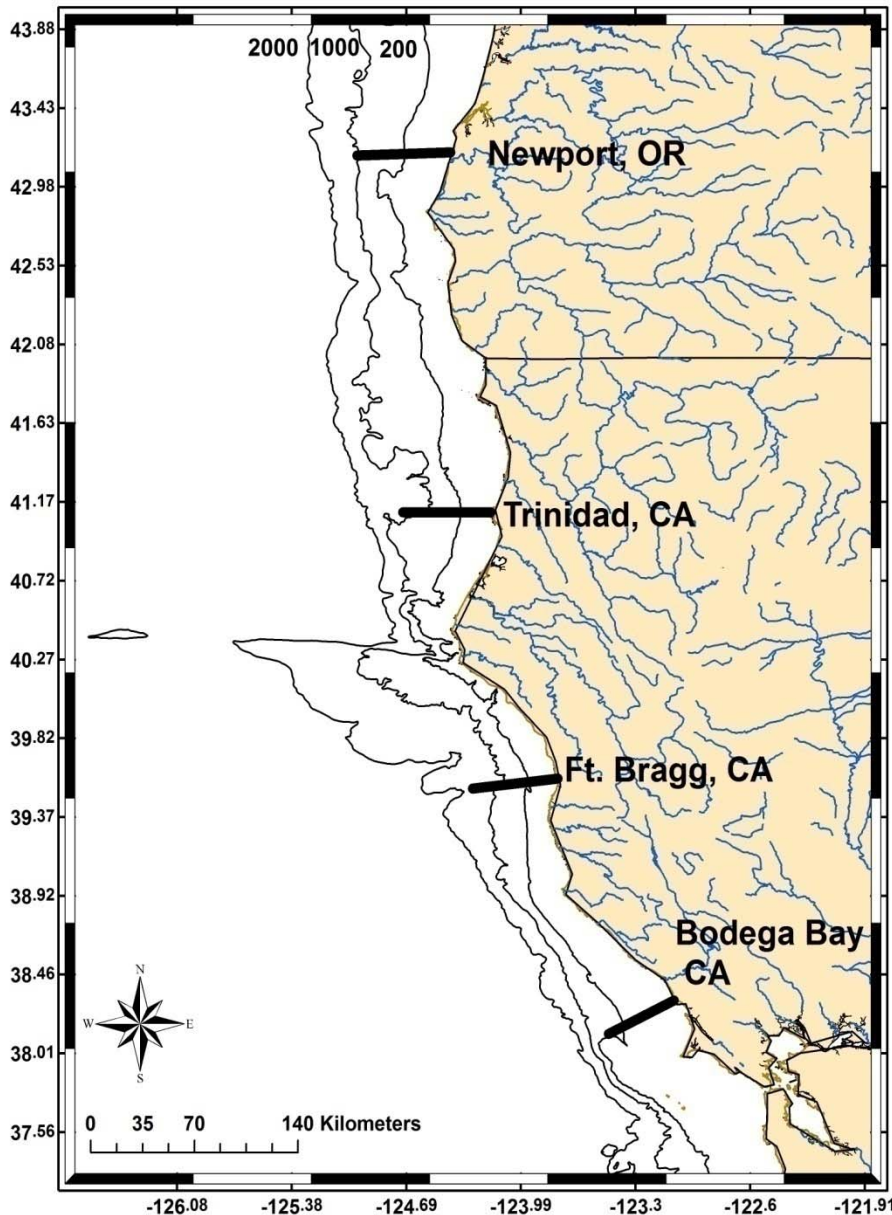
Q1: Will this work for northern CA?

The North Coast Program

Replicate the Newport Line

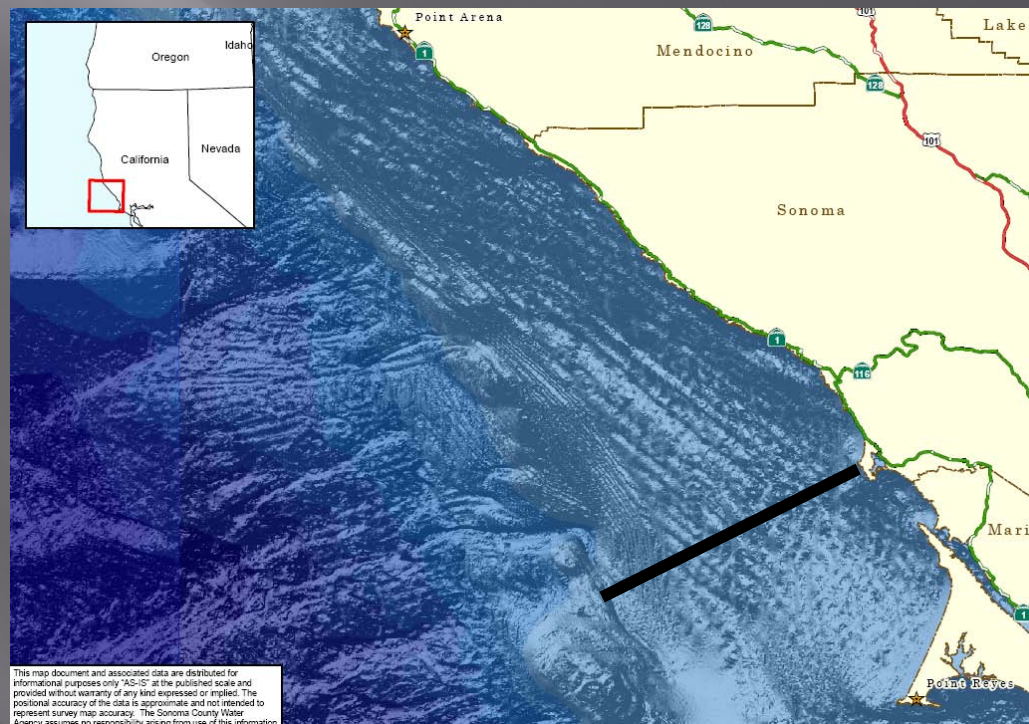
- 4 coastal lines (3 active)
- Near active fishing ports, for Collaborative Fisheries Research (CFR) programs
- Academic, NGO, and Government, Industry partnership
- Cover shelf habitat where juvenile chinook and coho reside

All sampling: vertical haul of 0.5m, 202 micron net! All researchers on board with methods...

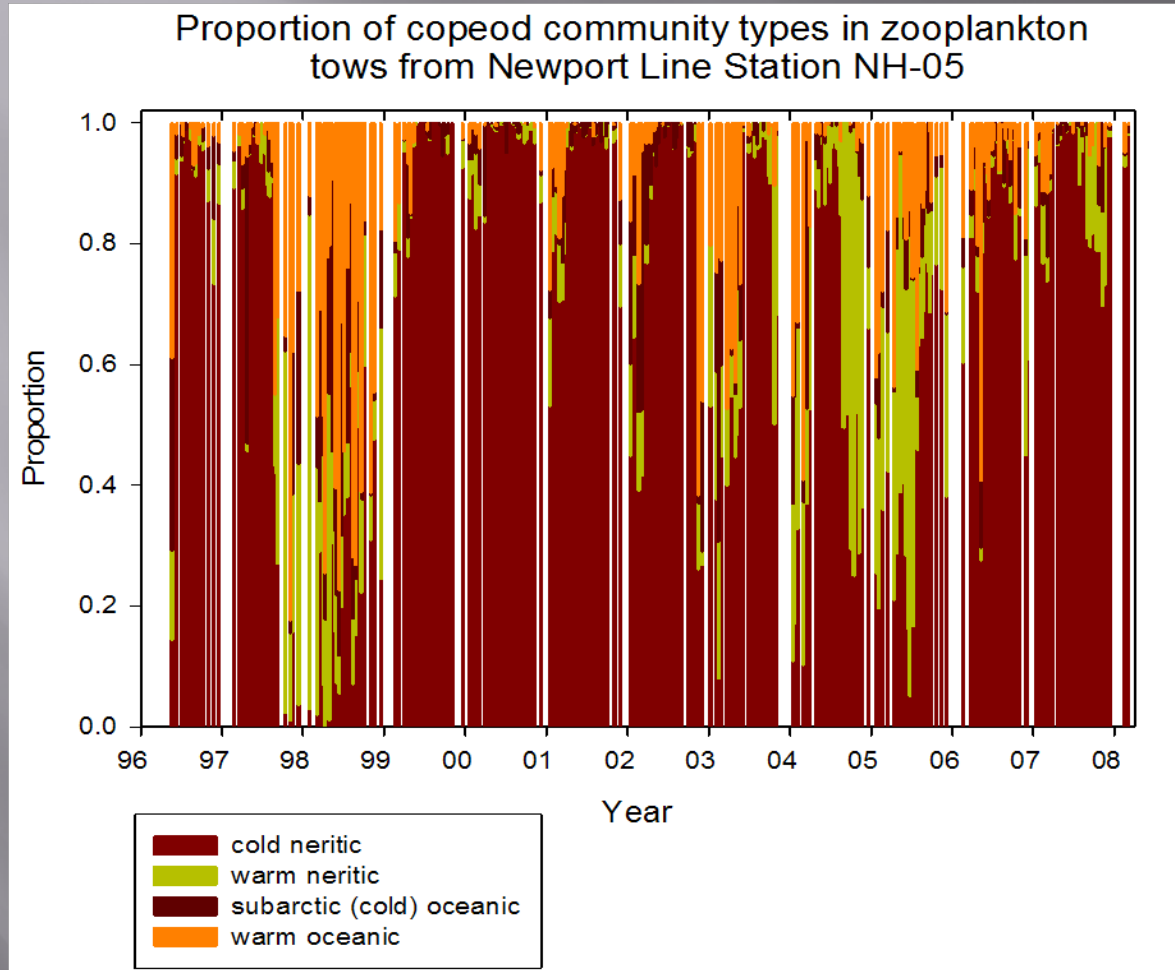


The Bodega Line

- 11 surveys to date (Sept. 2008 – Aug. 2009)
- Zooplankton and CTD sampling @ 5 stations (1-30km from shore)
- Continuous observations (between stations) of temperature, salinity, florescence, birds and mammals
- Large-scale hydrographic measurements (e.g. surface currents from CODAR array)
- Initial support (SCWA) for research plan, pilot surveys, coordination with Newport and Humboldt lines.
 - Builds on NOAA-WEST:
 - Upwelling-relaxation,
 - Plankton dispersal,
 - Long-term variability, ...by
 - staff and students @BML



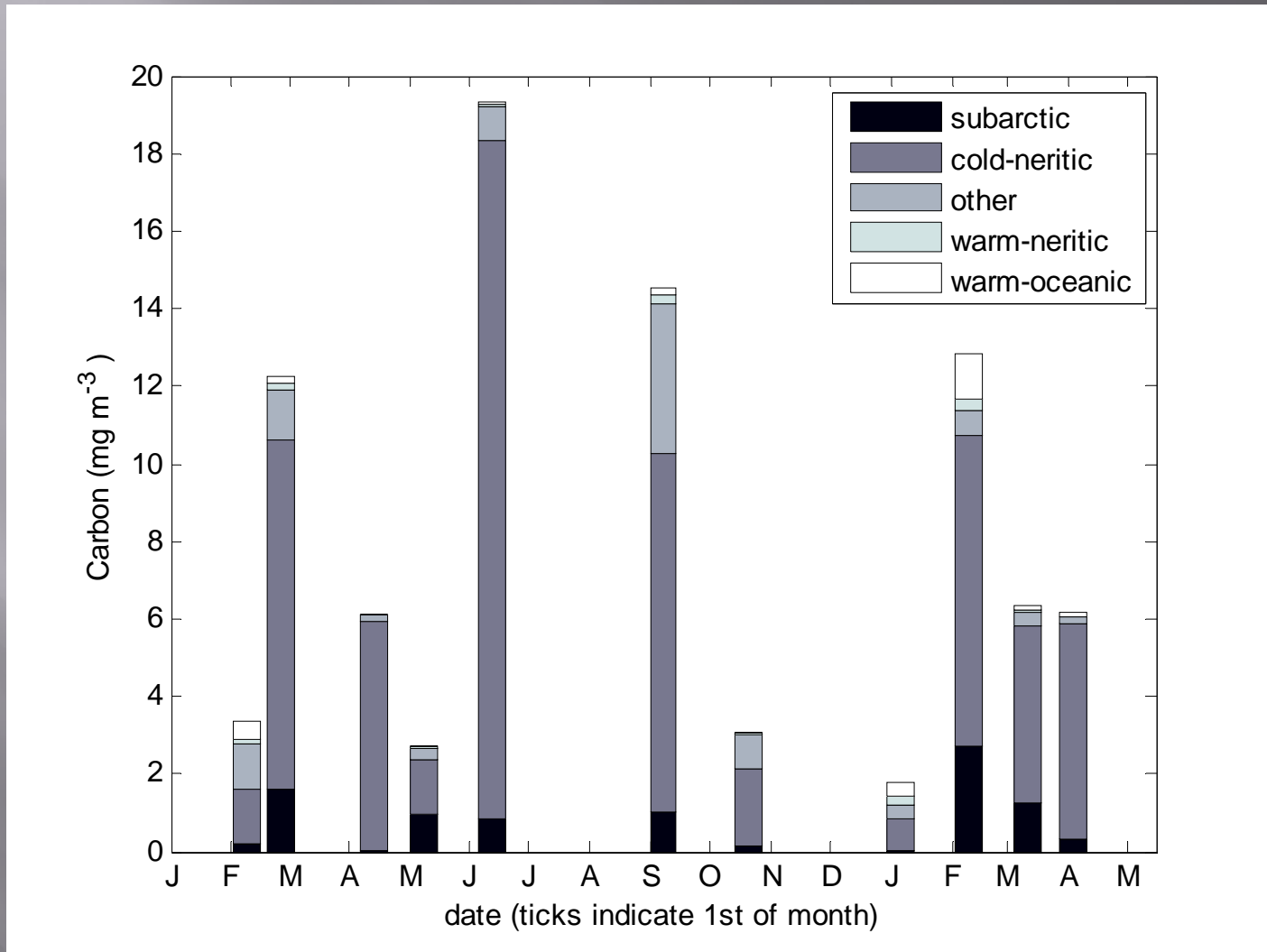
Copepod Community Structure, Newport, OR



Advection from offshore (oceanic waters) and coastal (sub-tropical waters) responsible for variation in community structure.

Peterson et al., unpubl.

Copepod Community Structure, Trinidad, 2008-2009

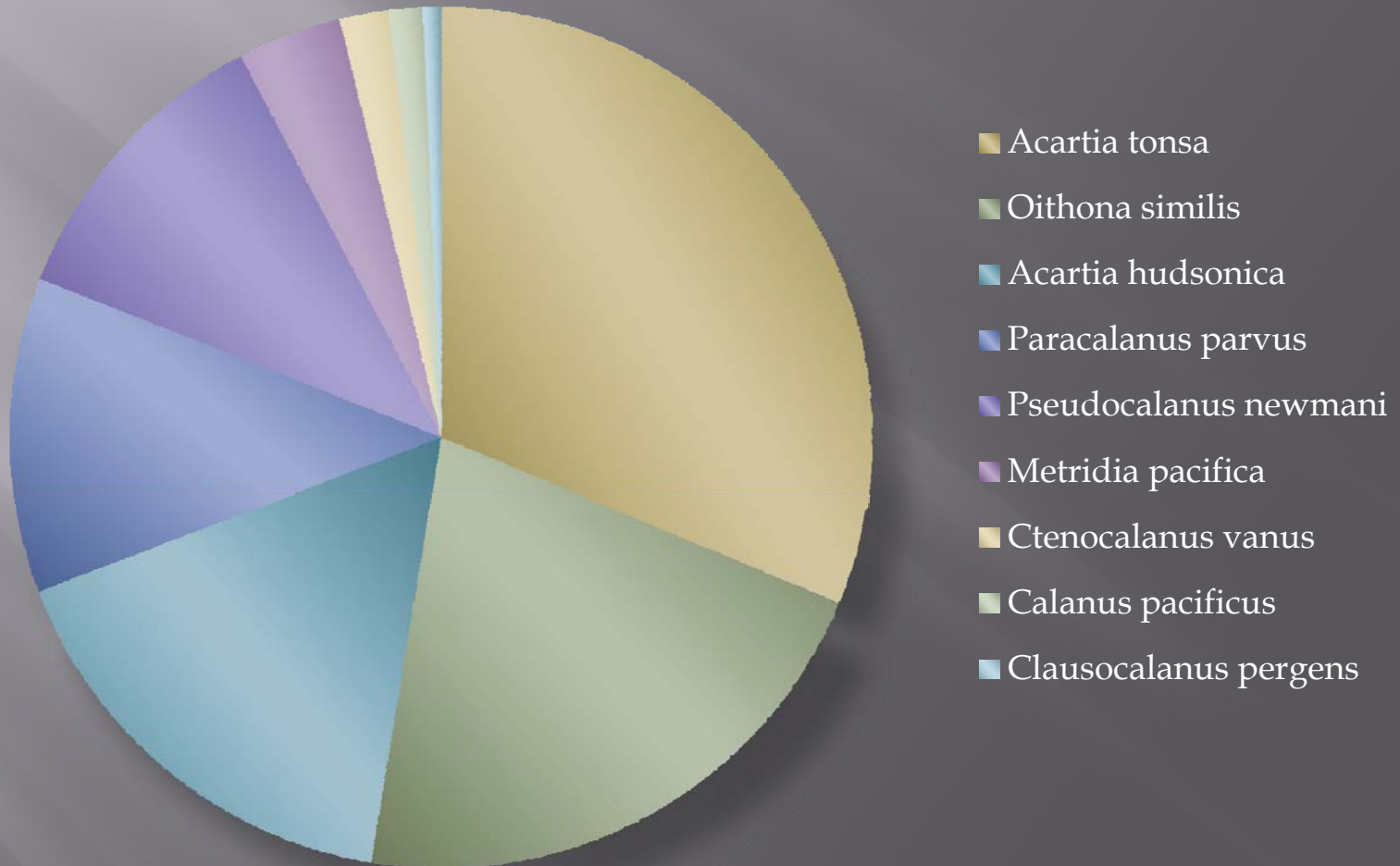


Copepod Community Structure, Bodega (Sept. – Dec. 2008)

<u>Species</u>	<u>Density (m³)</u>	<u>Assemblage</u>
Acartia tonsa	558.4	Warm neritic
Oithona similis	381.3	
Acartia hudsonica	296.1	Cold neritic
Paracalanus parvus	210.9	Warm neritic
Pseudocalanus newmani	20.9	
Metridia pacifica	69.7	Subarctic
Ctenocalanus vanus	32.3	Warm neritic
Calanus pacificus	23.0	Warm oceanic
Clausocalanus pergens	12.4	Warm oceanic
Heterorhabdus/Lucicutia	7.7	
Tortanus discaudatus	7.5	Cold neritic
unidentified calanoid	4.7	
Oithona spinirostris	3.8	
Corycaeus spp.	3.1	Warm neritic
Epilabidocera longipedata	2.6	
Oncaea spp.	1.3	
Acartia longiremis	1.1	Cold neritic
Eucalanus californicus	0,8	
Acartia danae	0.7	Warm oceanic
cyclopoid nauplii	0.4	
Microsetella spp.	0.3	
Euterpina acutifrons	0.1	
Scolecithricella	0.1	Subarctic
calanoid nauplii	0.1	

Bodega: 9 Of 28 species comprise 99% of assemblage

Density (m3)

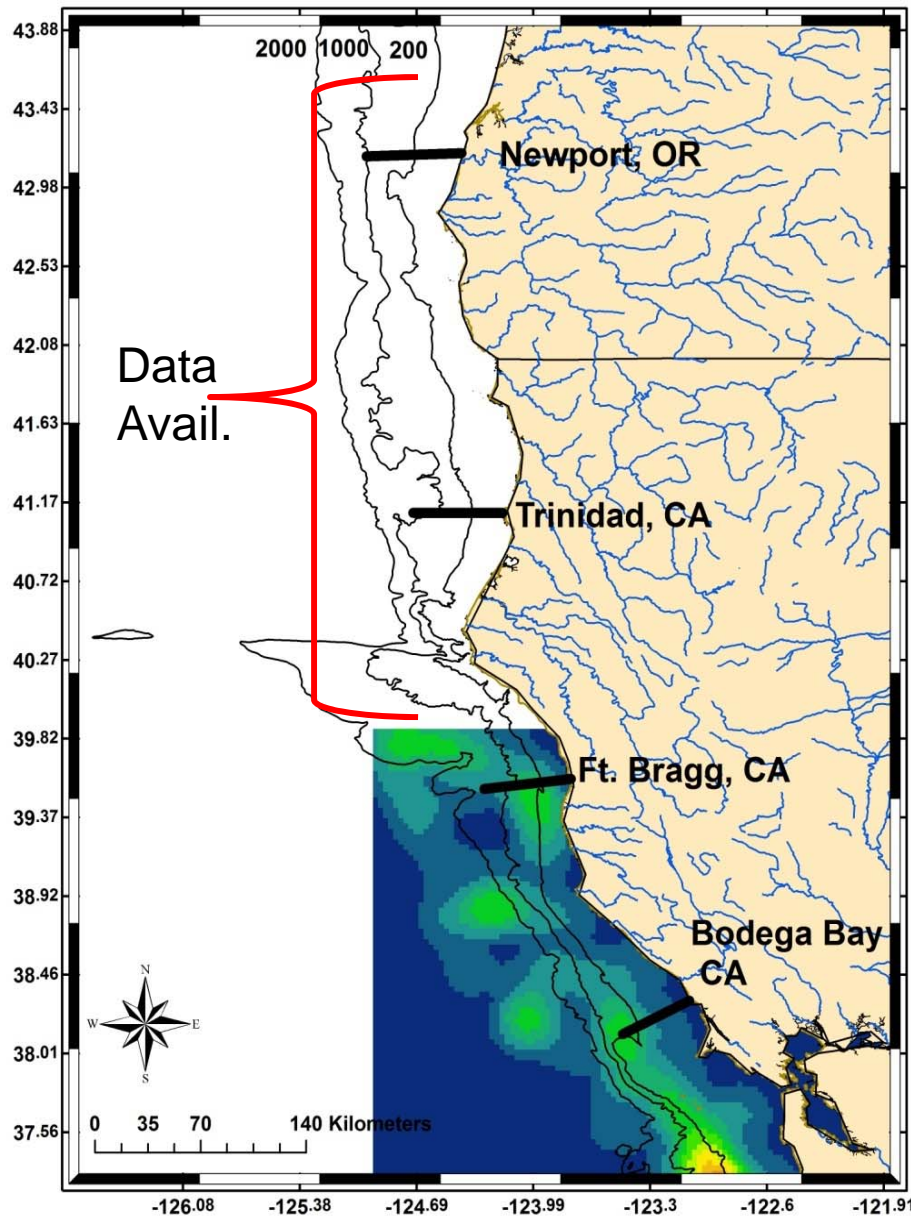


Juvenile Salmon Habitat?

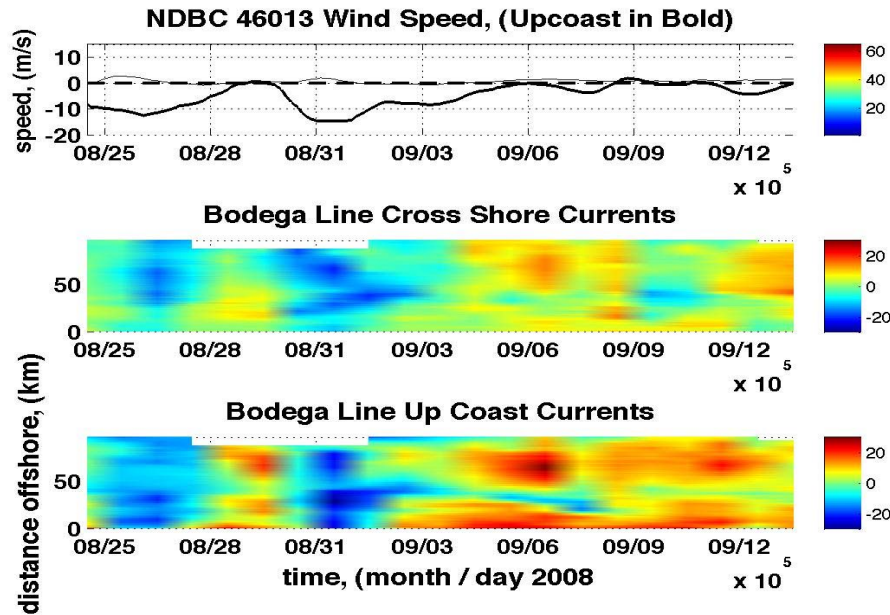
Krill Hotspots from Pt. Reyes to Fort Bragg (5 year composite of acoustic data)

Data from Northern CA to central OR available for analysis (GLOBEC LTOP and 2004-present PaCOOS cruises)

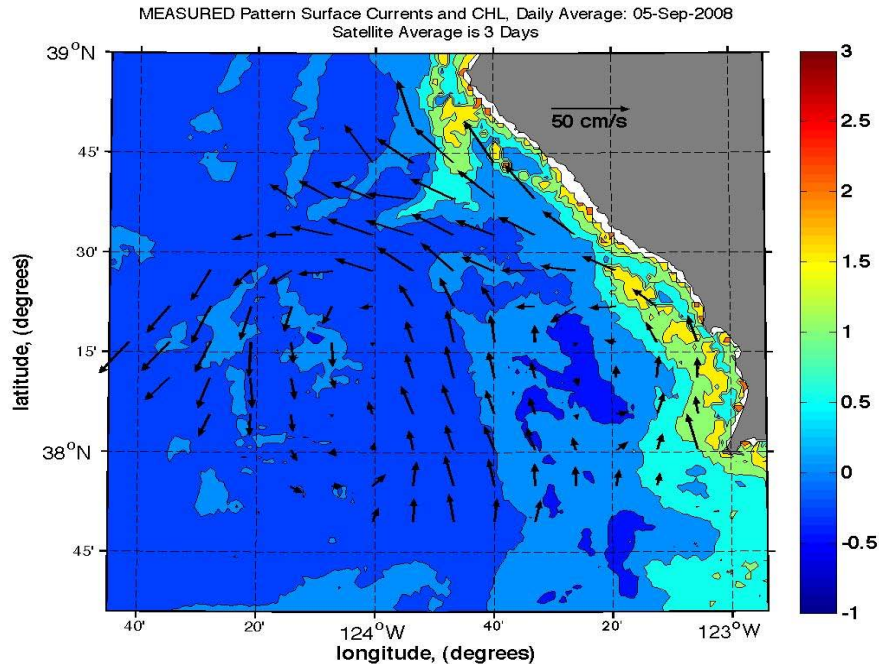
Bodega Line and Fort Bragg (...phantom line at the moment) and Newport and Trinidad appear to couple sample key salmon-krill habitats (to be determined)



Oceanographic Tools



- time-series data: wind, SST, F, ADCP, here showing wind and currents 2 weeks before and after cruise to put snapshot in upwelling-relaxation context.

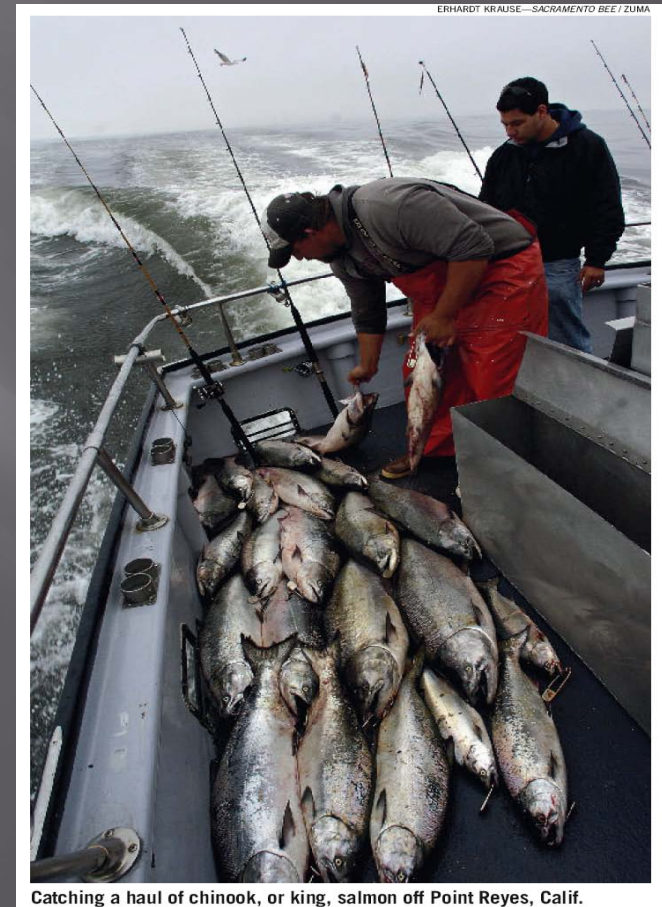


- spatial map data, HF radar and satellite (SST, Chl), here showing HF radar surface currents on Chl-a on the day of the survey

- shipboard data, which include continuous underway data on TSFX as well as vertical profiles of TSFX and ADCP

Collaborative Fisheries Research

- ▣ Work with fishing industry to collect data on salmon diet
- ▣ Fishers sample
- ▣ Provide stomachs for analysis
- ▣ Perfect for involving public
- ▣ State funding available
- ▣ Bodega, Trinidad, excellent Locations for CFR program



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