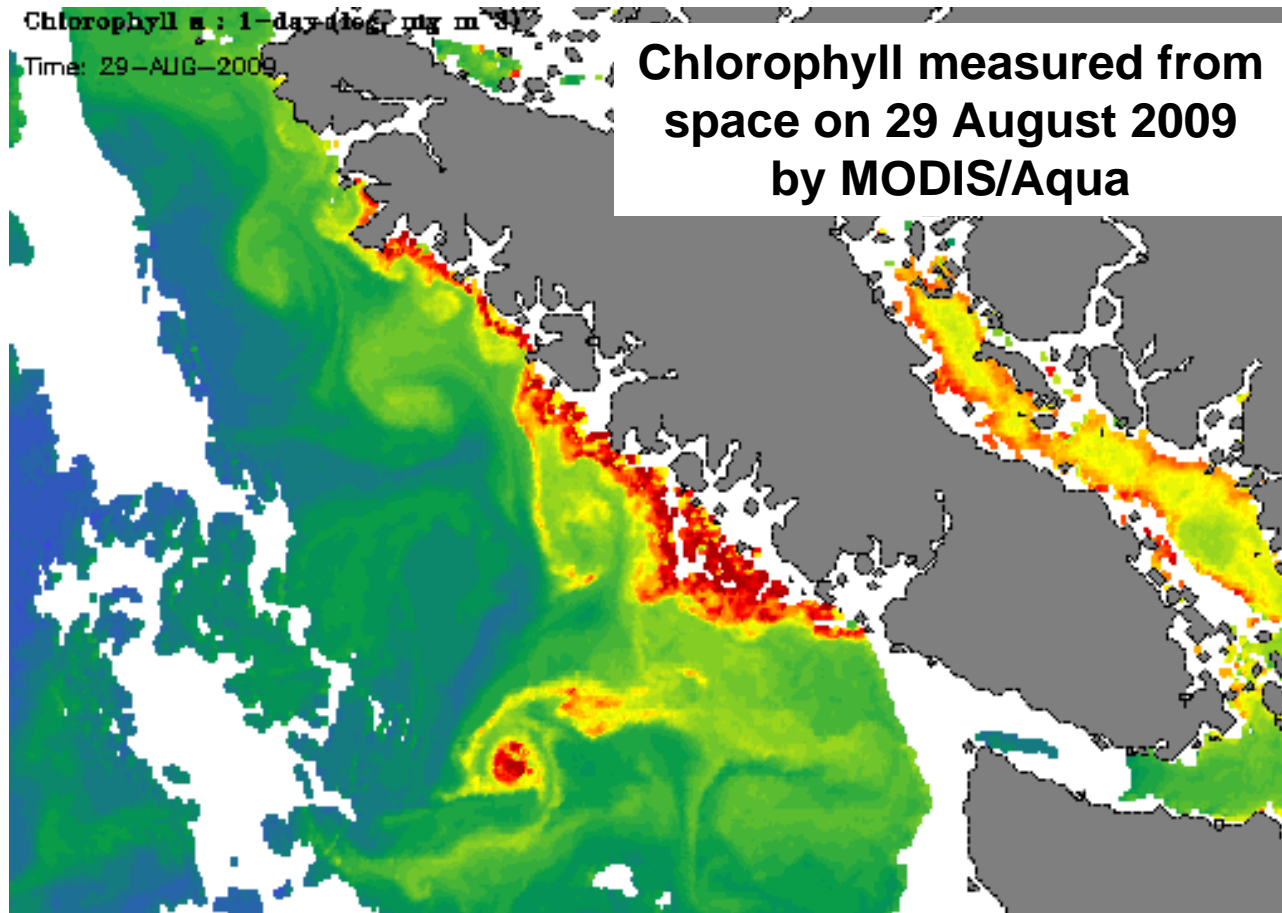




# Update on ocean conditions – 2009

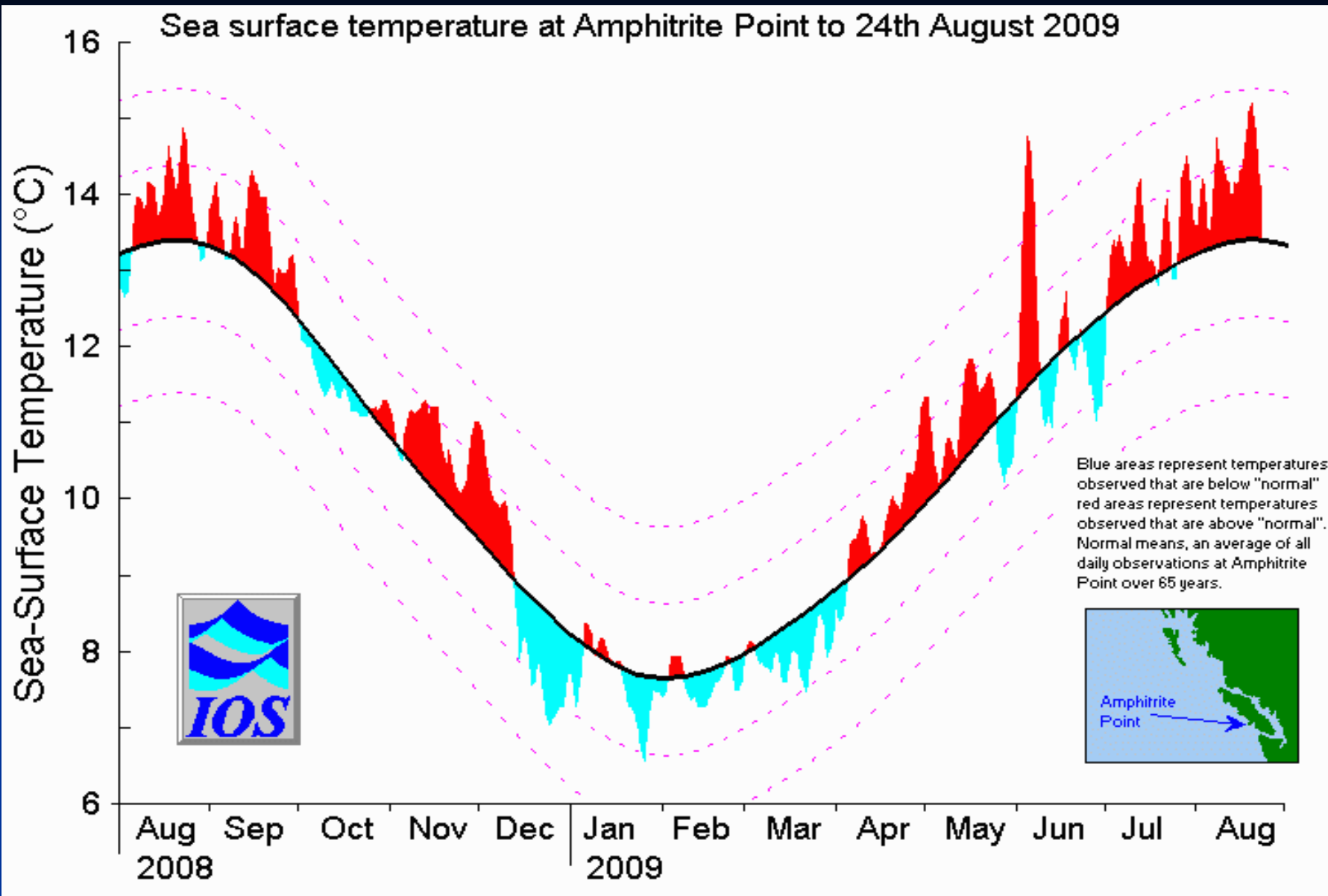
Laura Richards  
Regional Director  
Science  
Fisheries & Oceans

Presentation to  
PaCOOS  
Board of Governors  
September 10, 2009  
Seattle



## Summary of DFO Pacific Region State of the Ocean Report, published in June 2008, with updates as available.

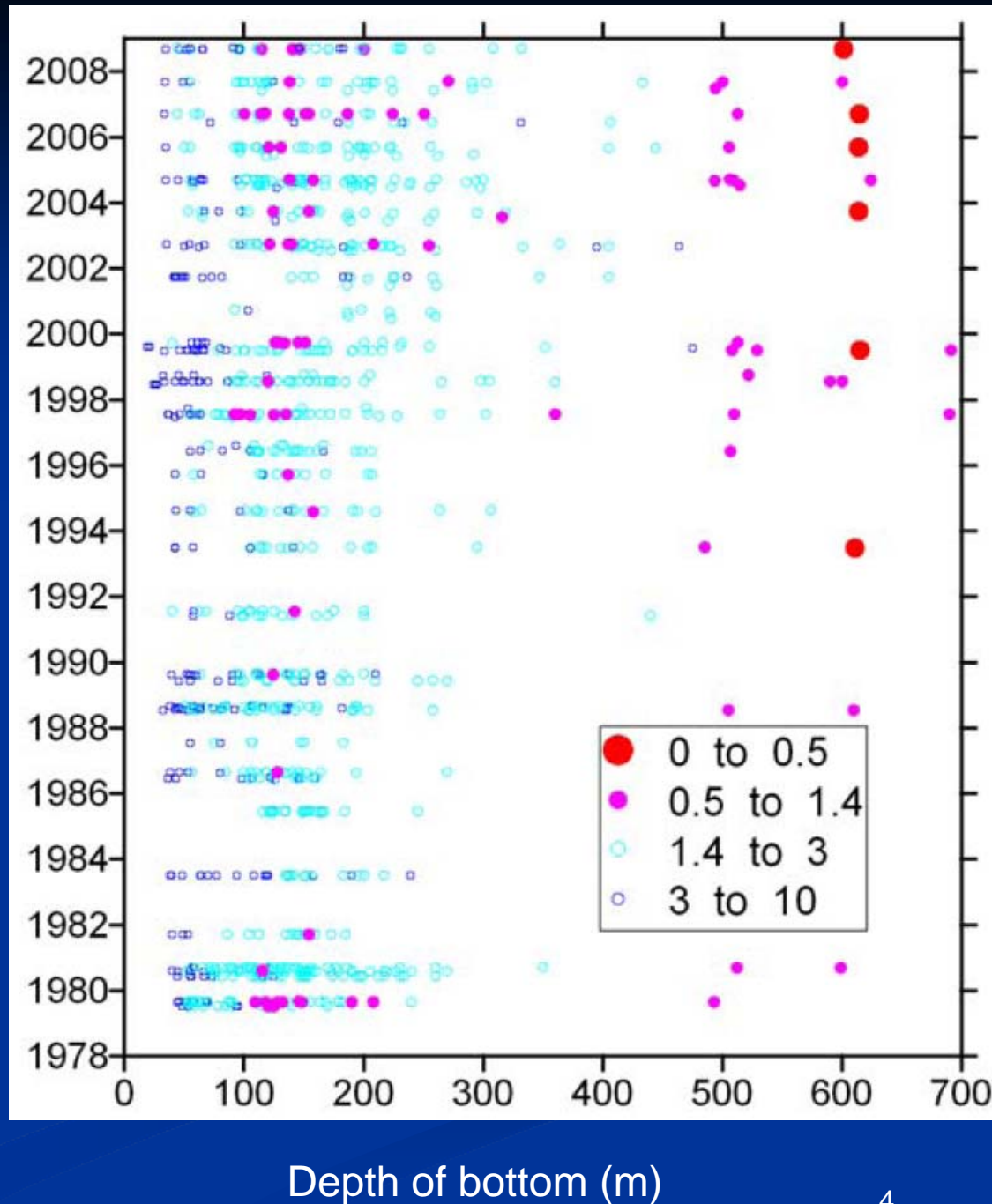
- Stronger-than-normal westerly winds the past 3 winters brought cooler waters to BC, along with a general dominance of boreal & subarctic zooplankton.
- Globally, 2007 and 2008 were among the warmest in recent history. However, the NE Pacific ocean surface temperatures were cool. Line P ocean surface temperatures in 2008 were the coldest measured in the 52-year time series. By mid-2009 these temperatures had increased.
- Near-shore temps were also low in 2008, (only surface temps in Strait of Georgia were warmer than normal). By mid-2009 near-shore temperatures were warmer.



Ocean temperature measured at Amphitrite Point on the southwest coast of Vancouver Island which have been sampled daily since 1934.

**Oxygen concentrations** (ml/litre) measured in the bottom 20 m off the west and north coasts of Vancouver Island. Each measurement is from a titrated sample collected by an oceanographic cruise.

Oxygen concentrations are low in bottom waters in summer, but in the top 100m, most observed concentrations are greater than 1.4 ml/litre.



# Recent observations from DFO Line P science cruise, 19 Aug - 3 Sept 2009

Images provided by Marie Robert IOS/DFO

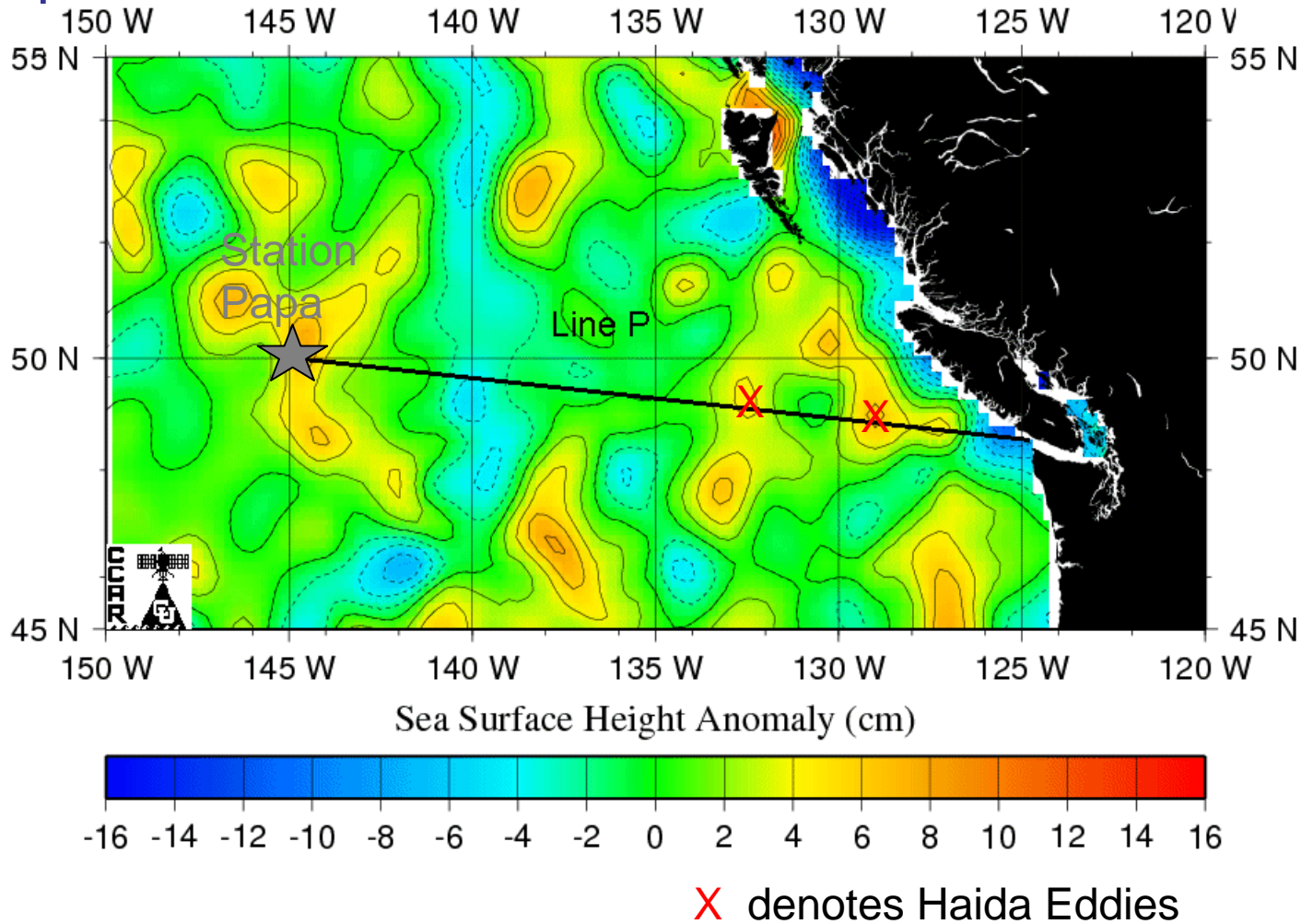
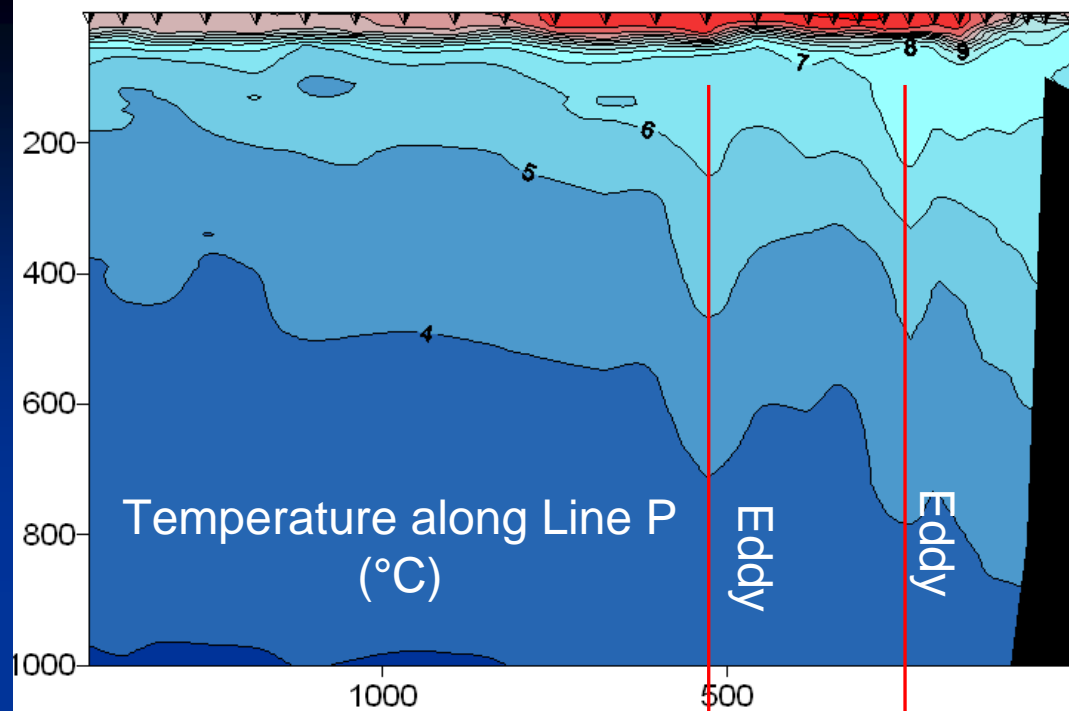


Image of sea surface height anomaly derived from on-line software of Colorado Center for Astrodynamics Research, University of Colorado.

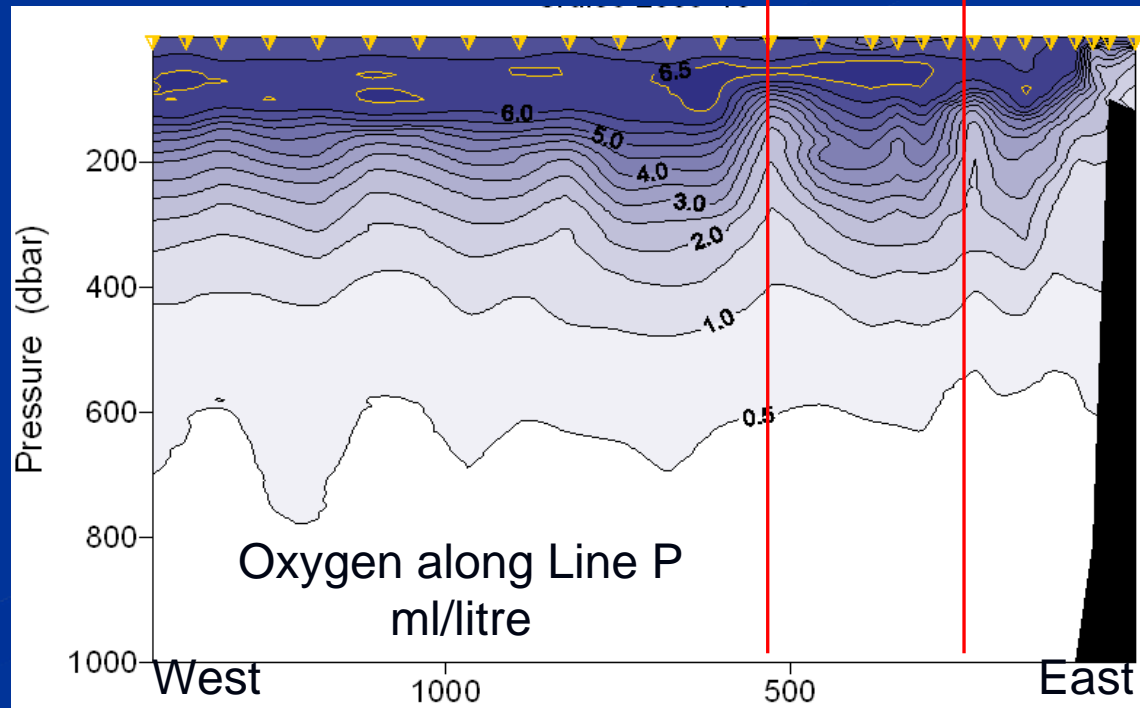
Contours are at 2 cm intervals, relative to a long-term average sea level.

Subsurface temperatures generally cool toward the west, due to general upwelling in the centre of the Gulf of Alaska.

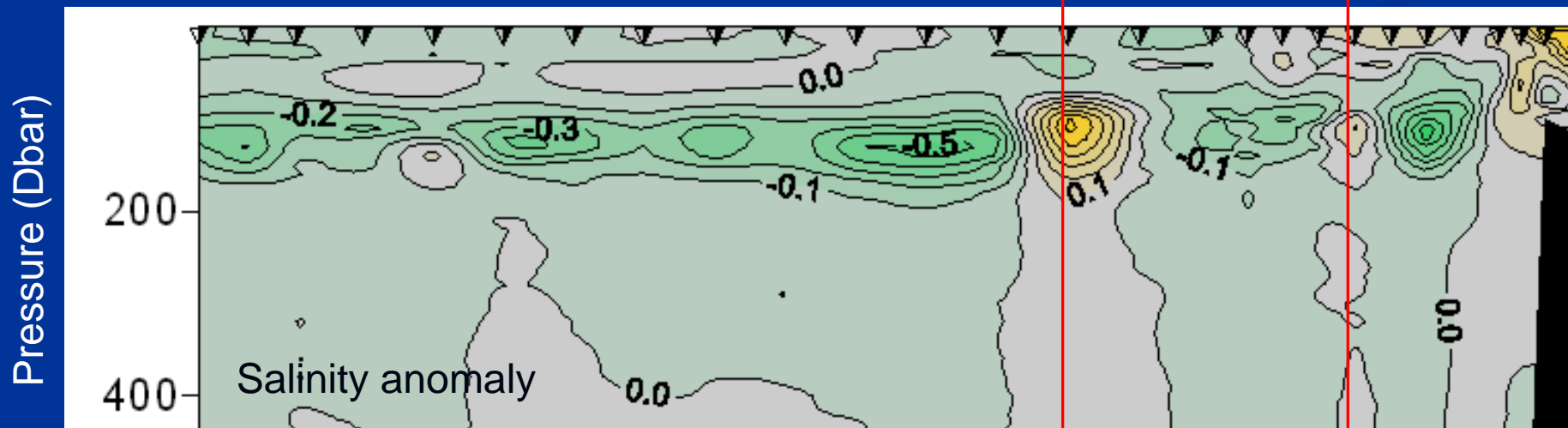
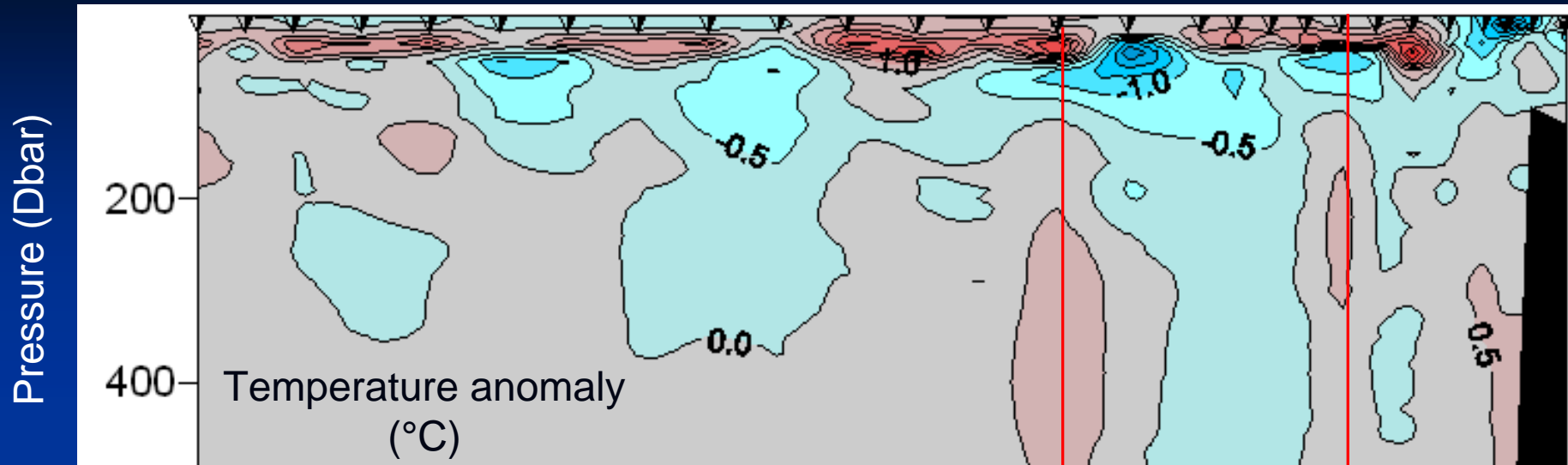


Low oxygen on the continental shelf bottom in summer is normal, due to upwelling and local oxidation.

Haida eddies normally have low oxygen concentrations below 100 m depth, due to their high percentage of coastal water.



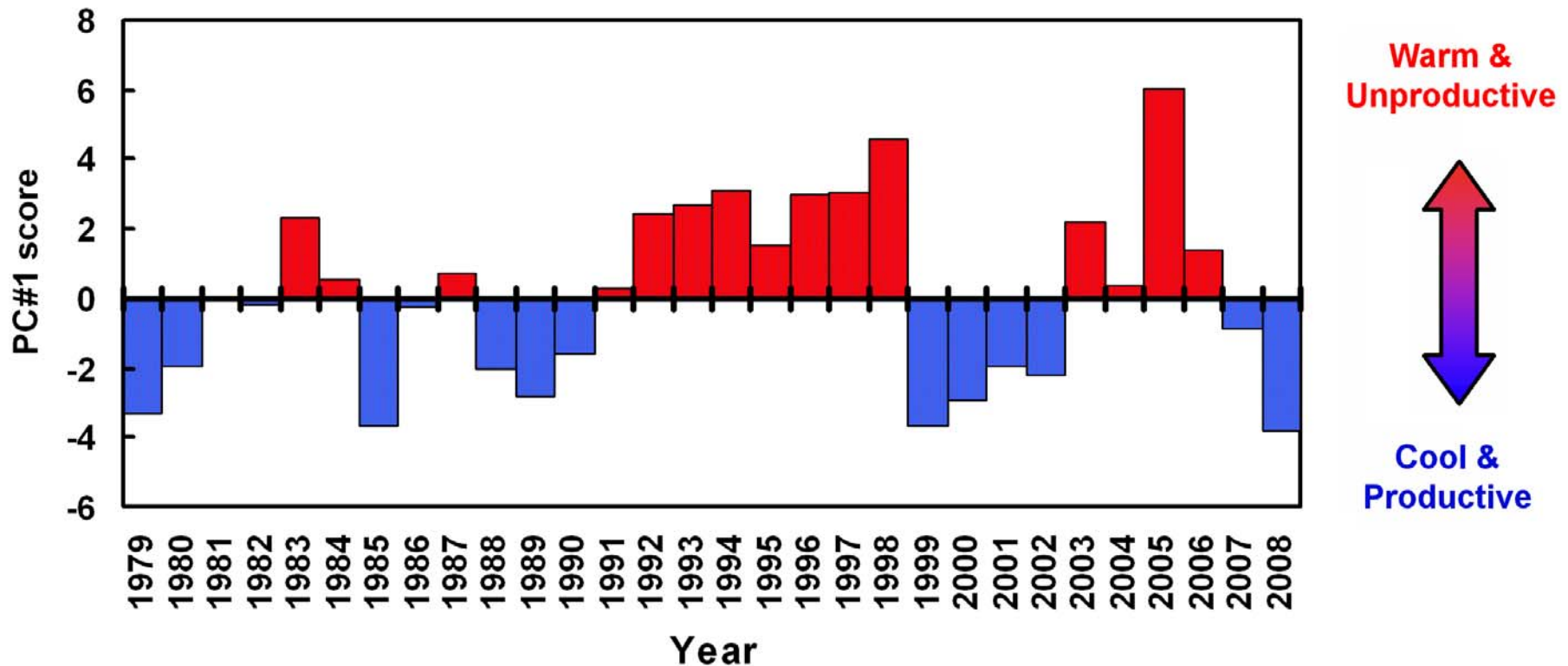
Note the positive temperature anomalies along Line P at about 50 m depth



Images provided by Marie Robert IOS/DFO

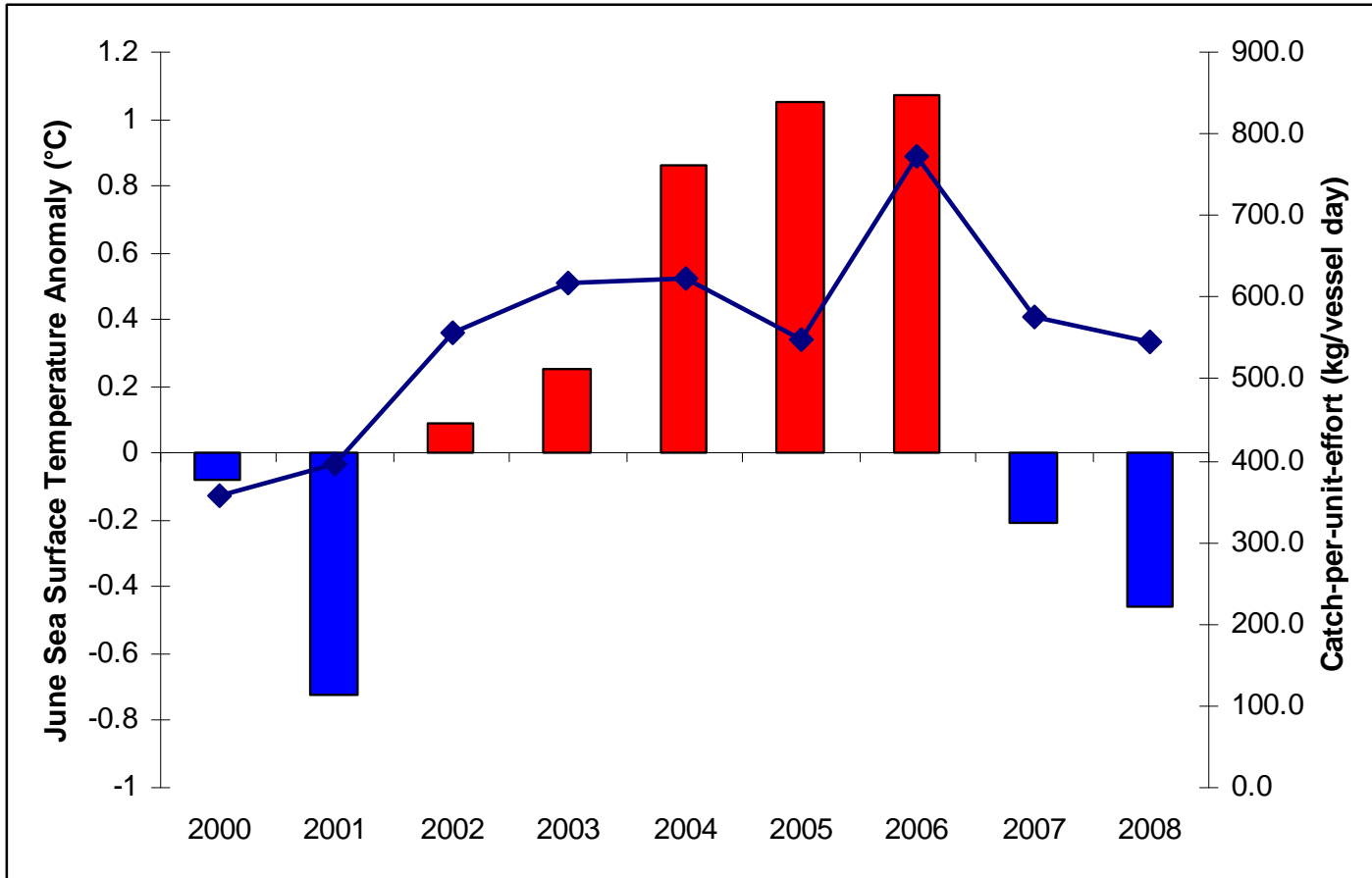
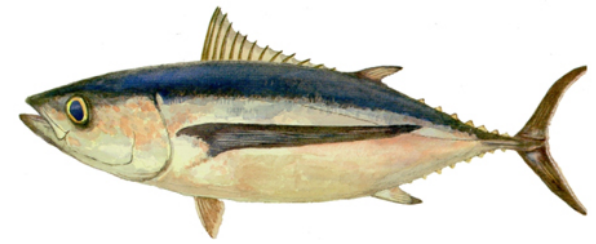
Annual scores for zooplankton-temperature-predator PC#1. Blue indicates cool temperature and favourable conditions for most of the endemic zooplankton and their predators.

Red indicates warm and favourable for the southern zooplankton but unfavourable for endemic zooplankton and predators. Data for 2009 zooplankton not yet available.



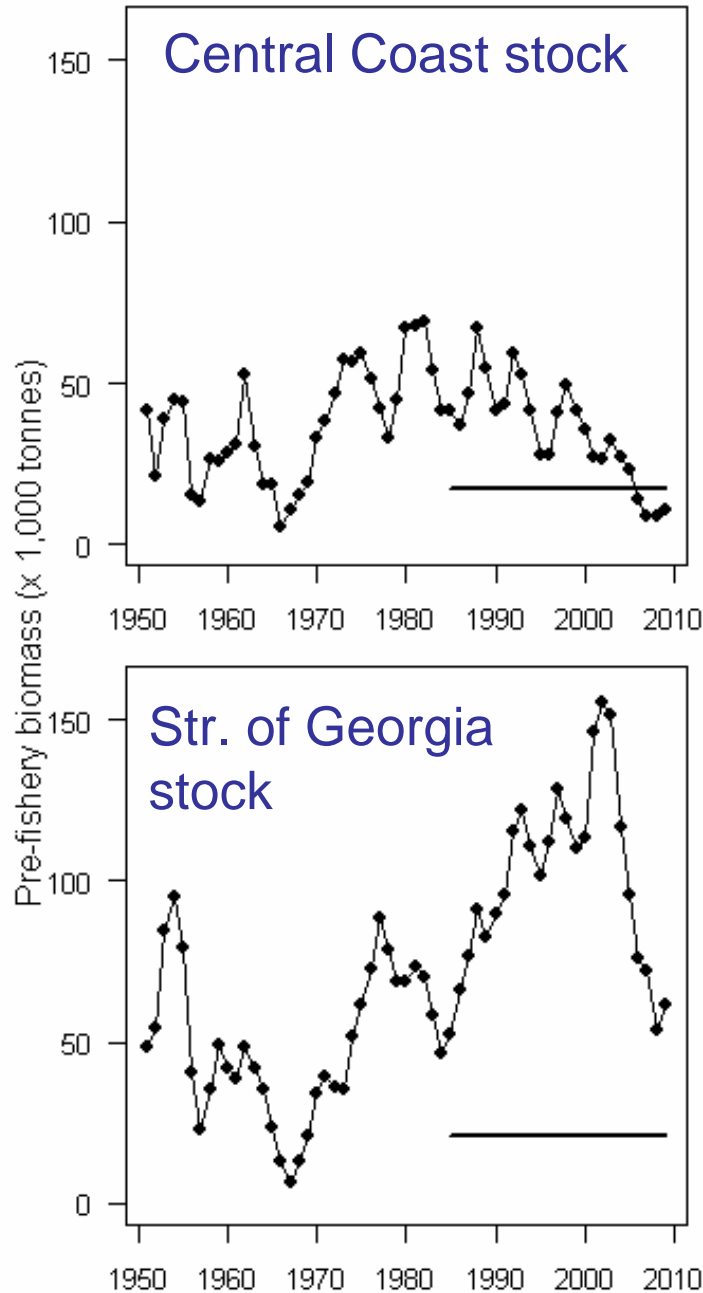
Courtesy of Dave Mackas IOS/DFO

# Albacore Tuna



Availability of albacore tuna in the coastal waters of British Columbia as measured by catch-per-unit-effort (blue line) in relation to June sea surface temperature.

# Herring in BC waters



## Herring biomass

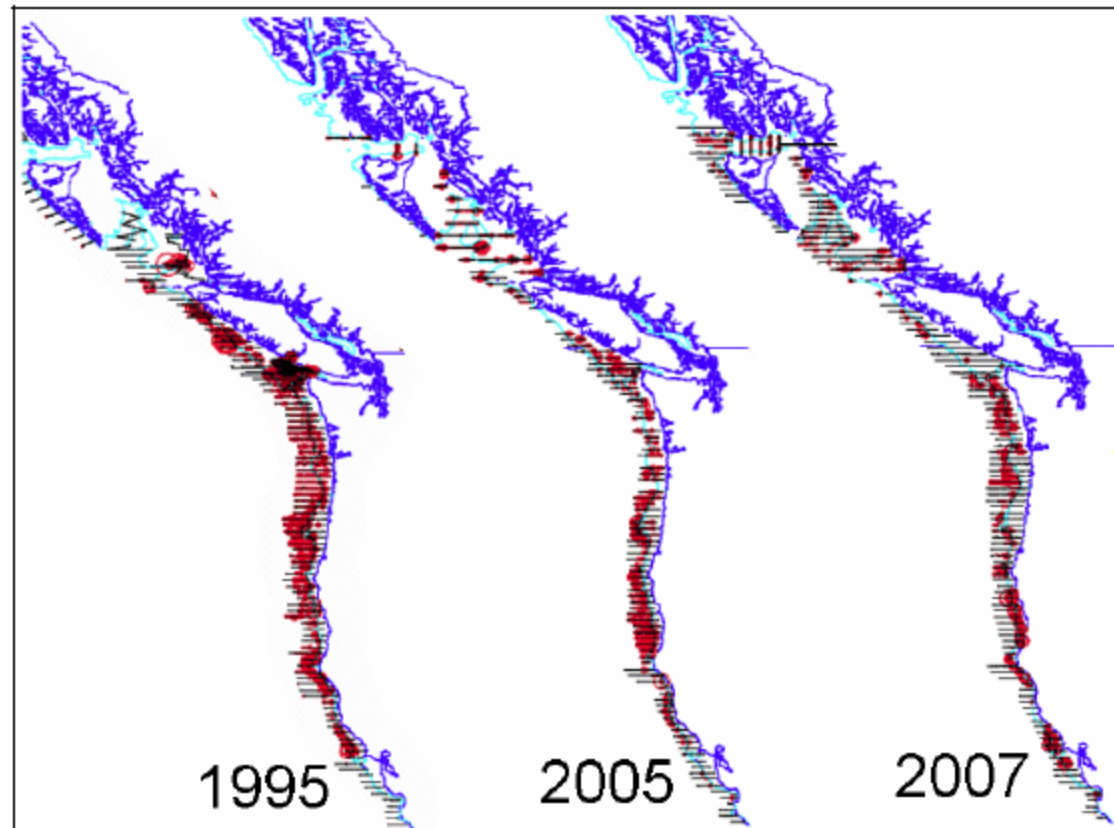
- 2009 assessment indicates increases in biomass in four of five areas (incl. SOG and CC)
- 08/09 and 09/10 fisheries are open for commercial harvest in SOG and PRD; below cutoff and closed in QCI, CC & WCVI

## Coast wide decline in size at age for past 20 yrs

- Occurs from California to Alaska
- Resulting from changes in ocean productivity

# 2009 Can-US hake survey in progress

- Few hake on WCVI, but abundant Humboldt squid
- Some hake in QC Sound and Dixon Entrance



Based on a figure provided by  
Rebecca Thomas, NMFS/NWFC

# Preliminary salmon returns - 2009

## **Chinook salmon**

2009 returns generally below average, except Fraser summer (age4), which are near expectations and above average

## **Coho salmon**

2009 returns above the 10-year average

## **Sockeye salmon**

2009 returns poor in north & central coast; very poor in Fraser; above forecast Barkley Sound

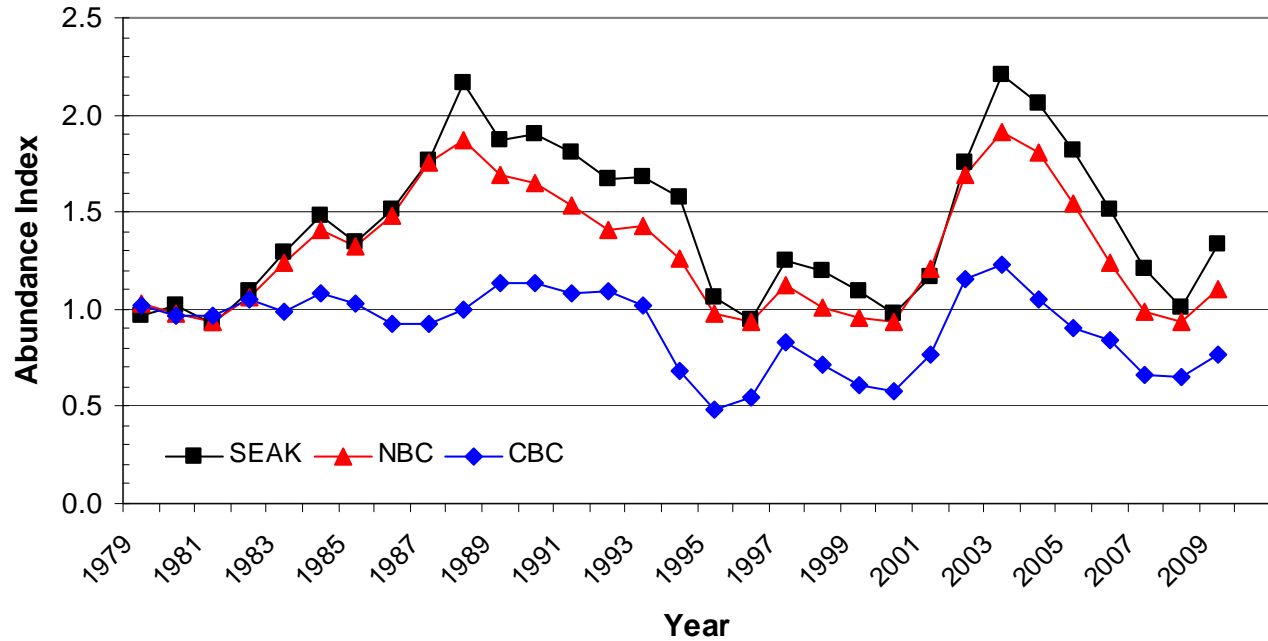
## **Pink salmon**

2009 returns above expectations; records in some areas

# Chinook Salmon Abundance

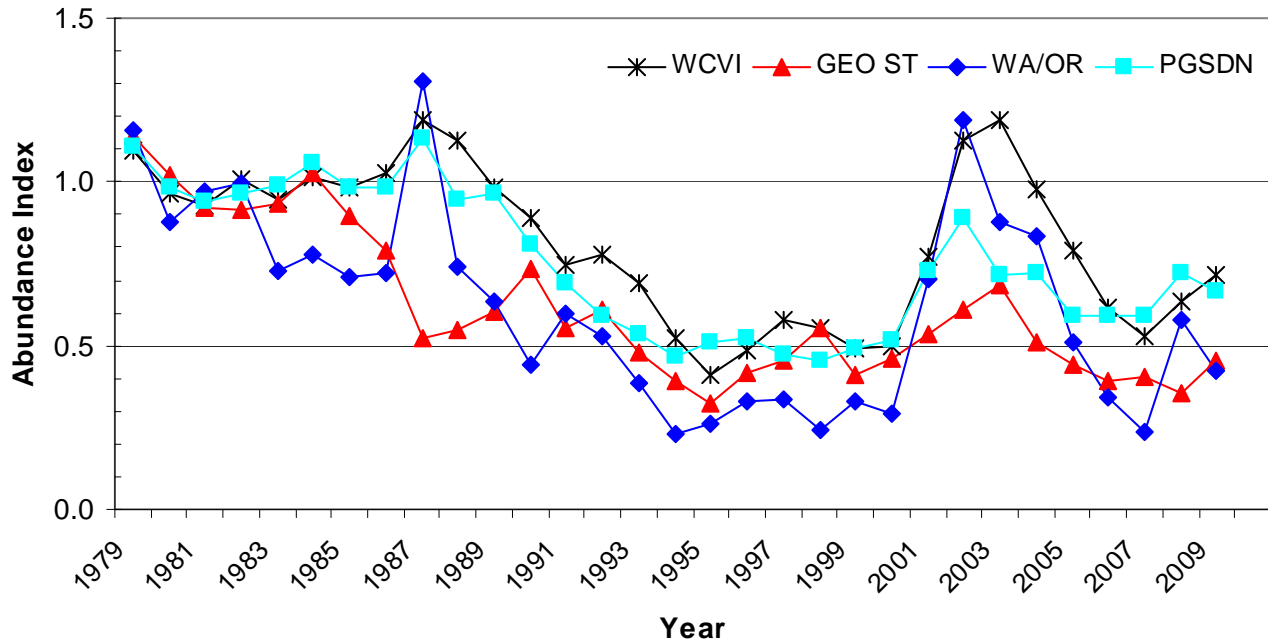
Abundance indices declining in northern fisheries

- Near 1979-1982 levels
- Abundances least variable in Central Coast of BC.



Some improvements in southern fisheries  
- 60% to 80% of 1979-1982 levels.

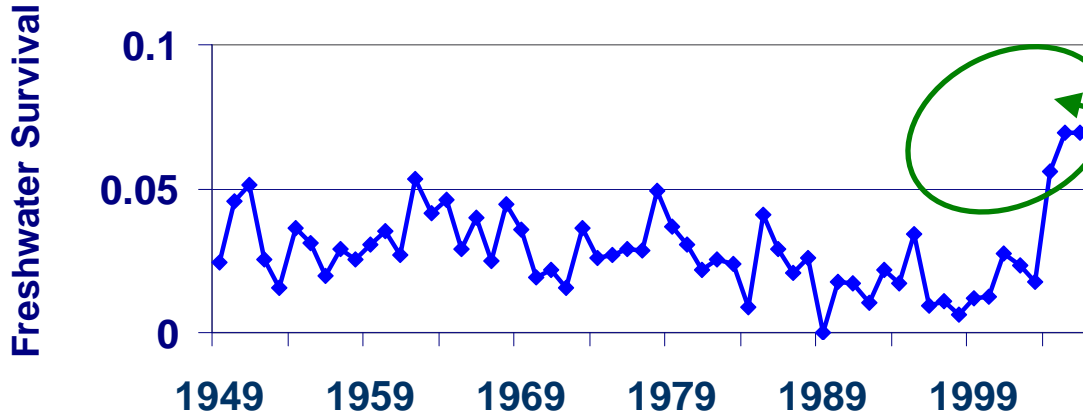
Courtesy of Gayle Brown & Chuck Parken PBS/DFO



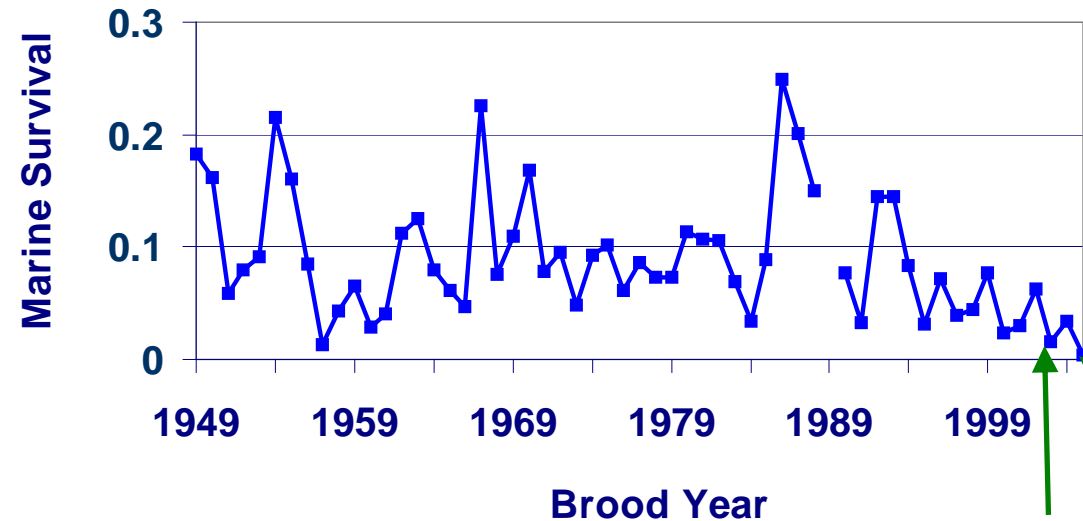
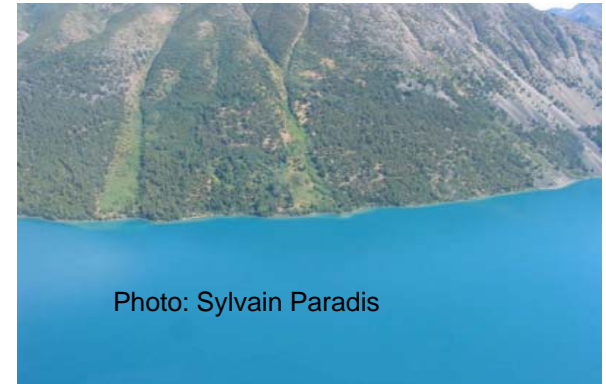
# Indicators of ocean conditions (1998 to 2007)

	(BROOD YEAR) OCEAN ENTRY YEAR (RETURN YEAR)	(1996) <b>1998</b> (2000)	(1997) <b>1999</b> (2001)	(1998) <b>2000</b> (2002)	(1999) <b>2001</b> (2003)	(2000) <b>2002</b> (2004)	(2001) <b>2003</b> (2005)	(2002) <b>2004</b> (2006)	(2003) <b>2005</b> (2007)	(2004) <b>2006</b> (2008)	(2005) <b>2007</b> (2009)
<b>Chilko Marine Survival</b>		G	Y	G	G	R	Y	G	R	Y	R
<b>Ocean Indices</b>											
1 PDO (Jan-March average)		R	G	G	R	G	R	R	R	Y	Y
2 ALPI		R	G	Y	R	R	R	R	Y	G	G
<b>Physical Conditions</b>											
3 SST (Entrance Island)		R	G	G	G	G	R	R	R	Y	Y
4 SST (Pine Island)		R	G	G	G	Y	R	R	R	Y	G
5 Upwelling index (48°N)		G	G	R	Y	G	R	Y	R	Y	G
6 Spring transition timing (48°N)		G	G	Y	Y	G	Y	Y	R	Y	Y
<b>Biological Conditions</b>											
7 Southern Copepods (SVI)		R	G	Y	G	G	R	Y	R	R	G
8 Boreal Shelf Copepods (SVI)		R	G	G	Y	G	Y	R	R	R	G
9 Southern Copepods (NVI)		R	G	G	G	Y	R	Y	R	R	G
10 Boreal Shelf Copepods (NVI)		Y	G	G	R	G	R	R	R	Y	G

# Chilko Lake sockeye survival



Record numbers of smolts for 2008 - 2010 returns



Preliminary 2009 return suggests lowest marine survival on record

Poor marine survival for 2007 return (2005 sea entry)