

# The North Pacific CPR Survey

*History, evolution and lessons learned*

Sonia Batten



# Pacific CPR Survey history

Pilot transect sampled in 1997, California to Alaska, undertaken by SAHFOS

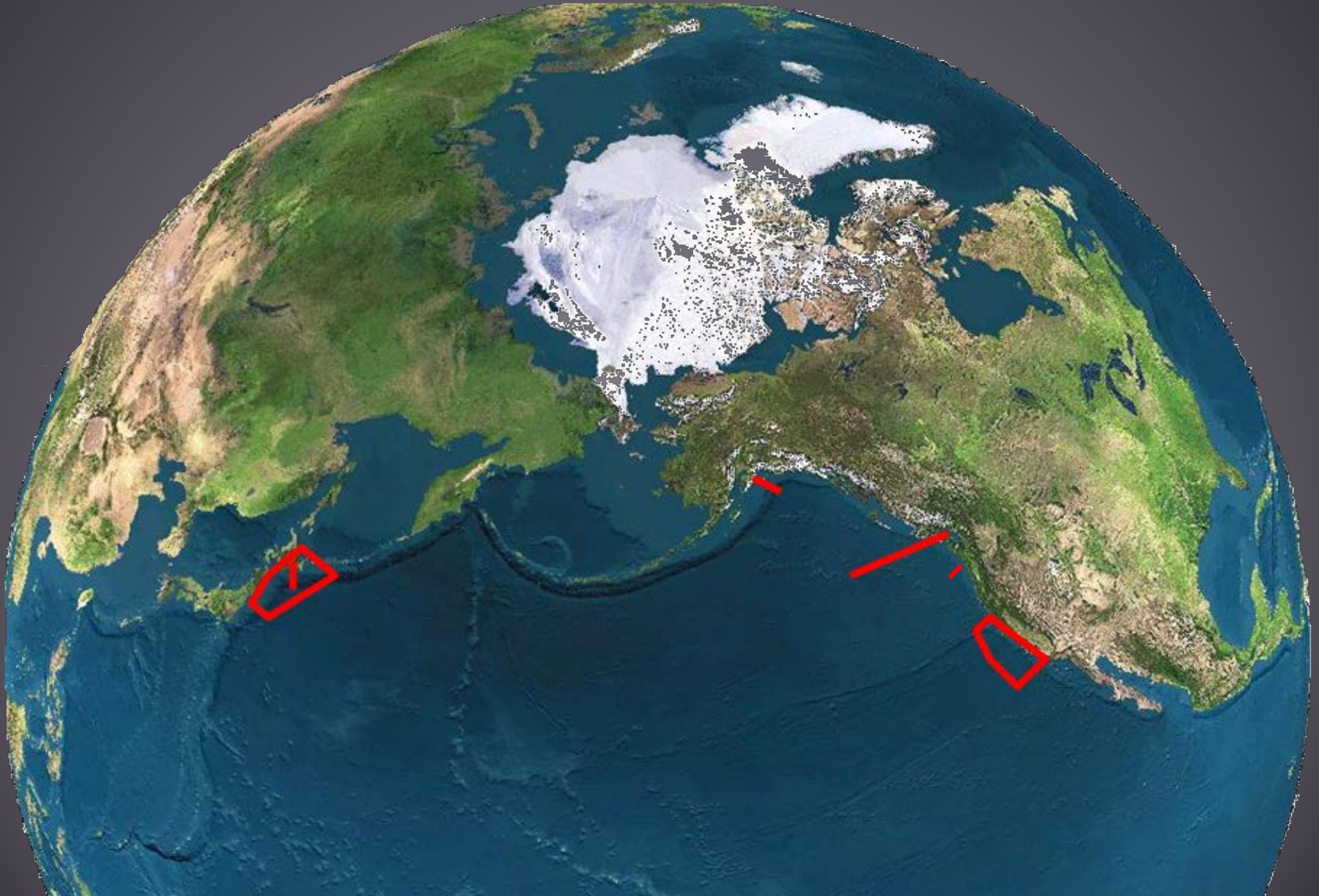
Invited to PICES in 1998,

MONITOR approval of the approach

Proposal submission

First routine seasonal sampling in 2000.

Historical biological observations made > once per year





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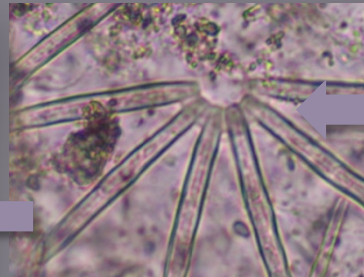
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# The CPR survey



# Pacific CPR Survey history

Pilot transect sampled in 1997, California to Alaska, undertaken by SAMFOS

I Invited to PICES in 1998,  
MONITOR approval of the approach  
Proposal submission

First routine seasonal sampling in 2000.

Then.....mild panic..... How to demonstrate relevance with only a few years of data?

# Survey Evolution

1. Don't panic, observations are always interesting
2. Initial papers focused on distributions, within-year patterns etc

FISHERIES OCEANOGRAPHY

*Fish. Oceanogr.* 12:3, 201–208, 2003

FISHERIES OCEANOGRAPHY

*Fish. Oceanogr.* 16:6, 536–546, 2007

## Plankton populations at the bifurcation of the North Pacific Current

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### ABSTRACT

As the eastward-flowing North Pacific Current approaches the North American continent it bifurcates into the southward-flowing California Current and the northward-flowing Alaska Current. This bifurcation occurs in the south-eastern Gulf of Alaska and can vary in position. Dynamic height data from Project Argo floats have recently enabled the creation of surface circulation maps which show the likely position of the bifurcation; during 2002 it was relatively far north at  $\sim 53^{\circ}\text{N}$  then, during early

either side of the bifurcation need to be better established to determine the impacts of bifurcation movement on the ecosystems of the north-east Pacific.

**Key words:** Alaska Current, California Current, Continuous Plankton Recorder, Gulf of Alaska, North Pacific Current, north-east Pacific, plankton, Project Argo

### INTRODUCTION

As the eastward-flowing North Pacific Current (NPC) approaches the North American continent it bifurcates into the southward-flowing California Current (CC) and the northward-flowing Alaska Current (AC) which then forms the Alaska Gyre. This bifurcation occurs in the south-eastern Gulf of Alaska (GoA) and can vary in position, although its usual latitude is at about  $45^{\circ}\text{N}$ . Dynamic height data from Argo floats have recently enabled the creation

DEEP-SEA RESEARCH  
PART II

[www.elsevier.com/locate/dsr2](http://www.elsevier.com/locate/dsr2)

Plankton  
Alaska

PL1 2PB, UK  
Canada V8L 4B2

Gulf of Alaska in winter  
recorder (CPR) sampled  
of diatoms and calanoid

UK.  
il: [jal@sahfos.ac.uk](mailto:jal@sahfos.ac.uk)

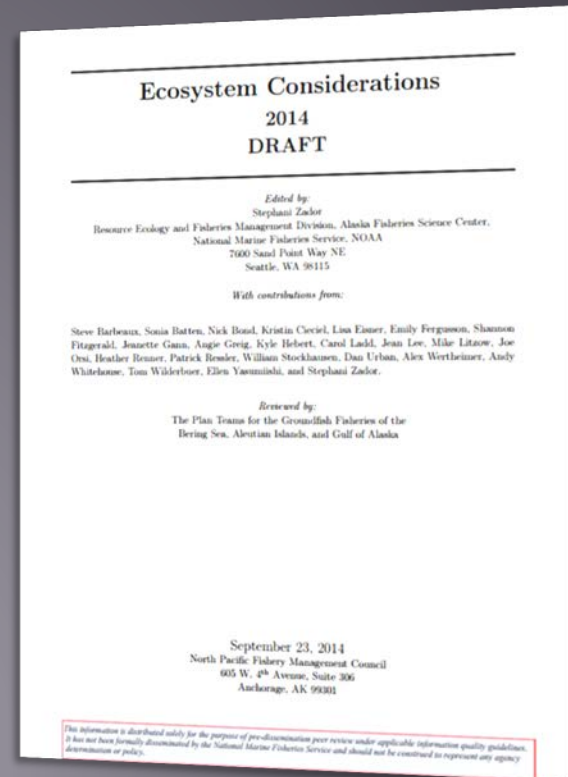
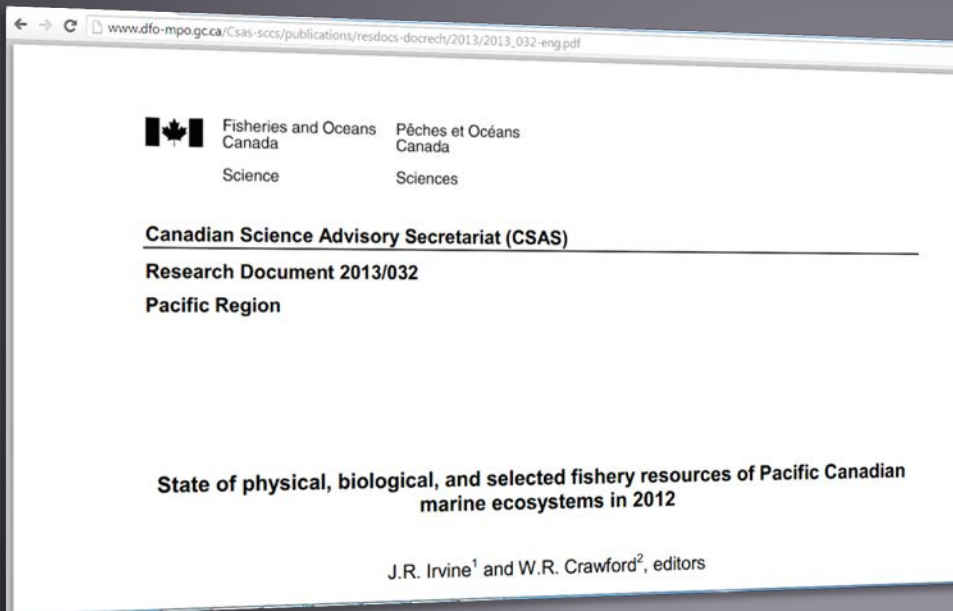
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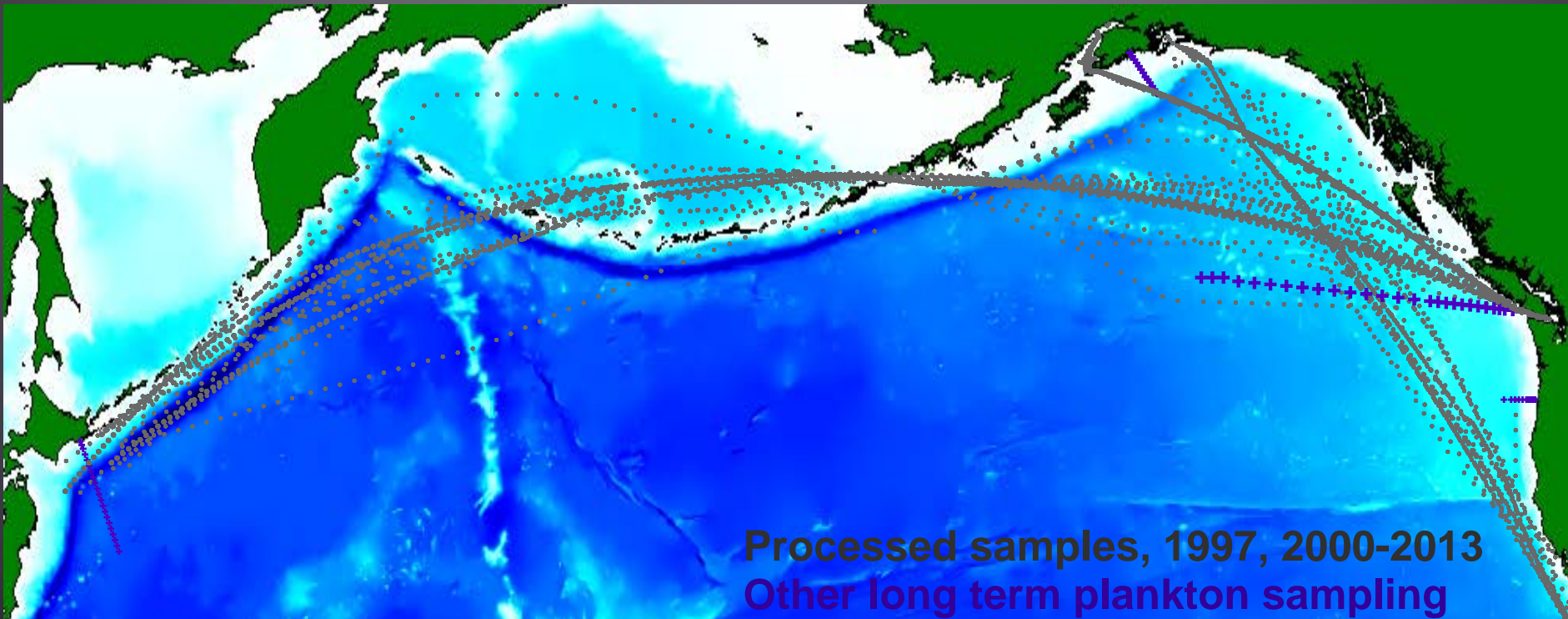
# Survey Evolution

3. Contributions to annual synthesis products such as
  - a. DFO Canada State of the Pacific Ocean report
  - b. NOAA, USA, Ecosystem Considerations report

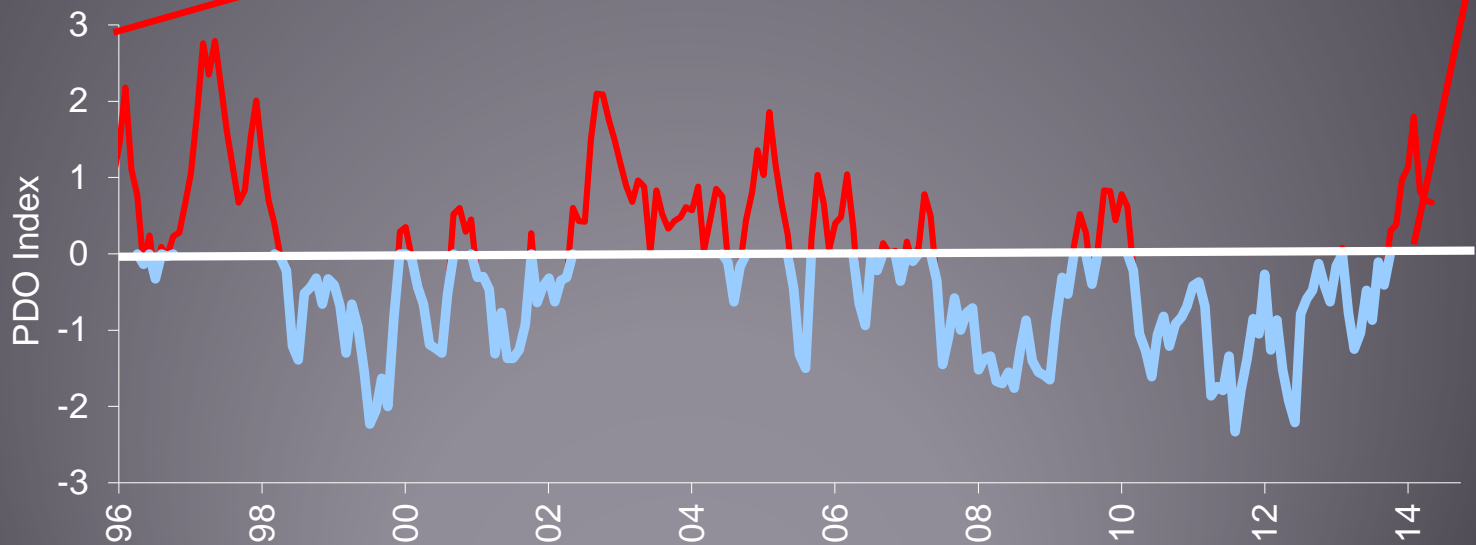
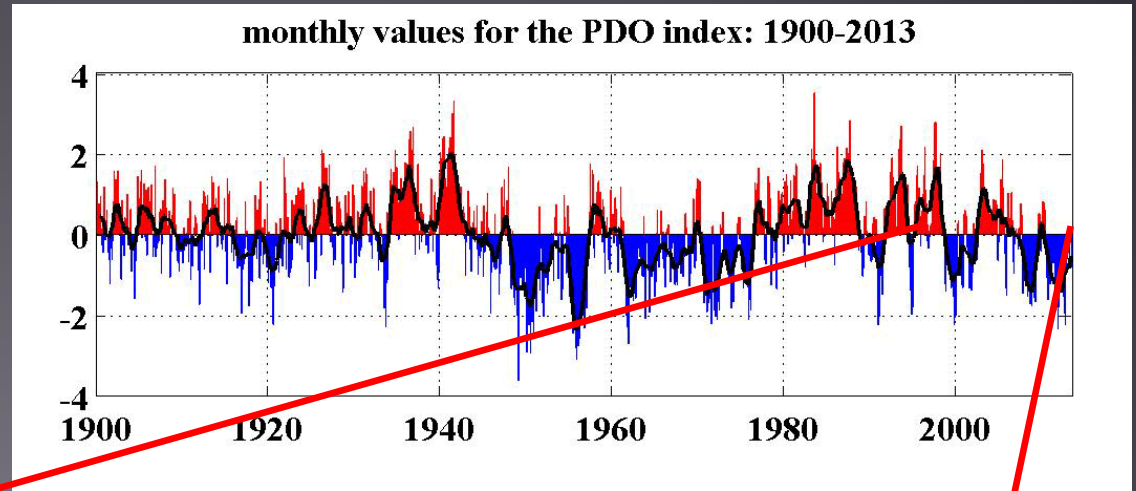


## Where we are in 2014

- ~6,000 analysed samples (over 350 taxa)
- ~20,000 archived samples (available for further analyses)
- 20 peer-reviewed publications

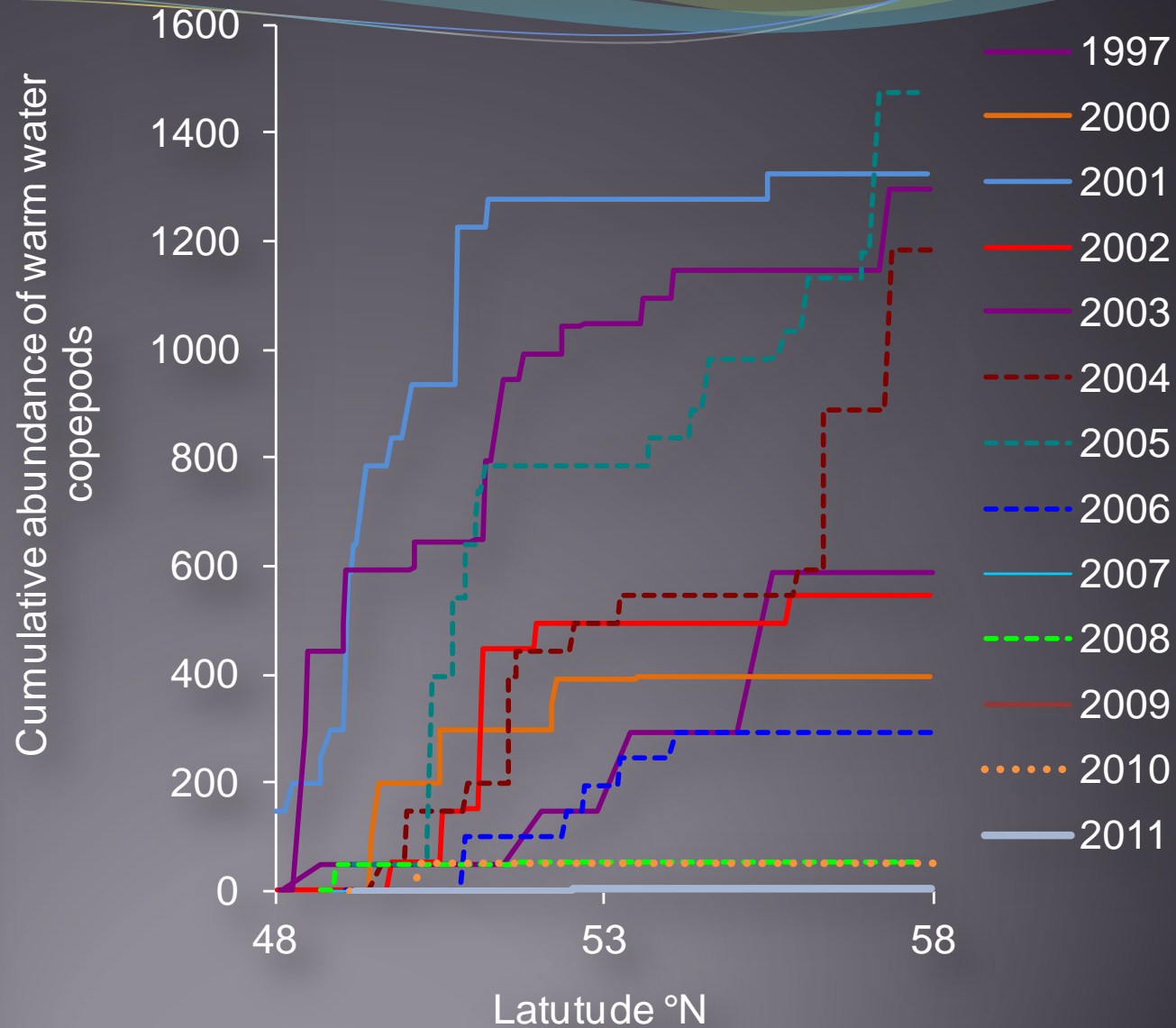
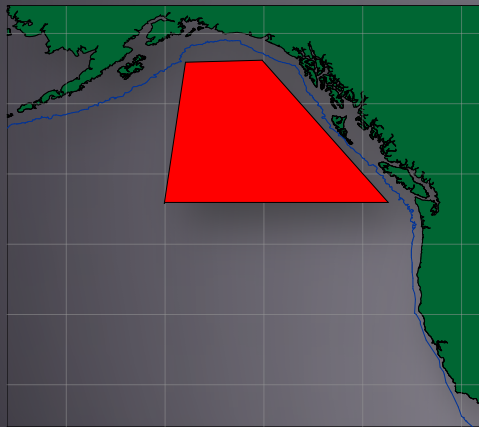


Good  
timing  
helps!





Cumulative abundance of warm-water copepods each year, south to north, Mar-Sept, for oceanic region

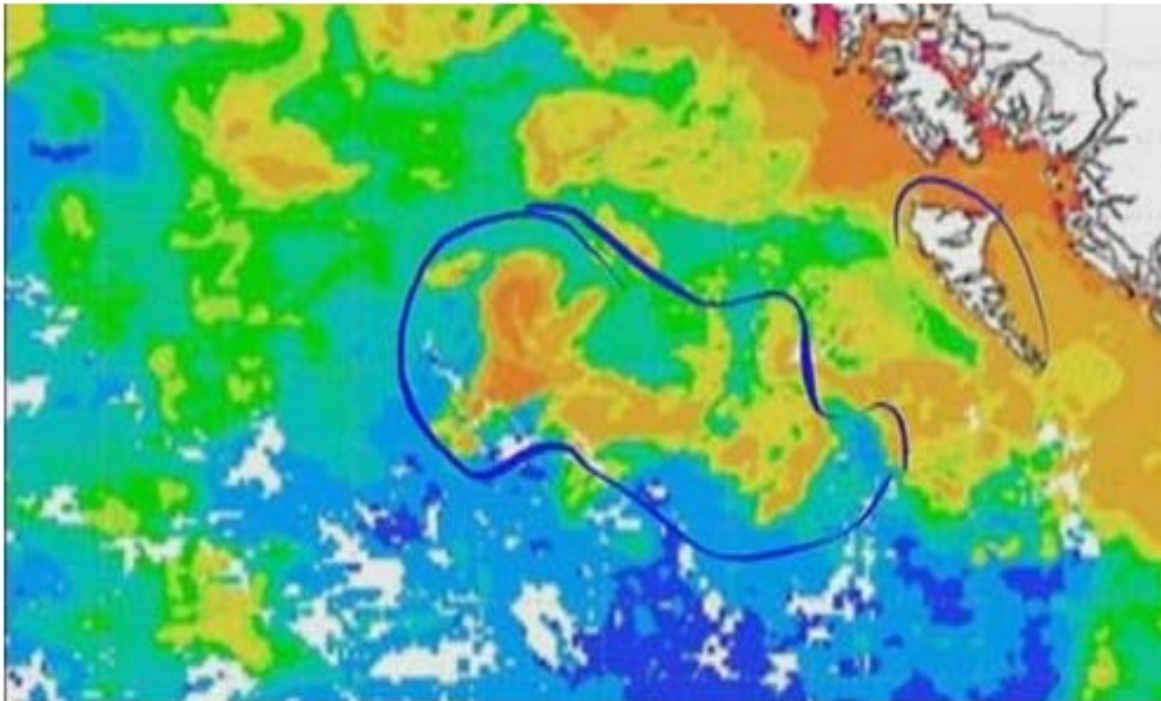


# Example – impact of one-off events

## Iron fertilization project stirs West Coast controversy

Project intended to raise nutrient levels offshore for salmon population

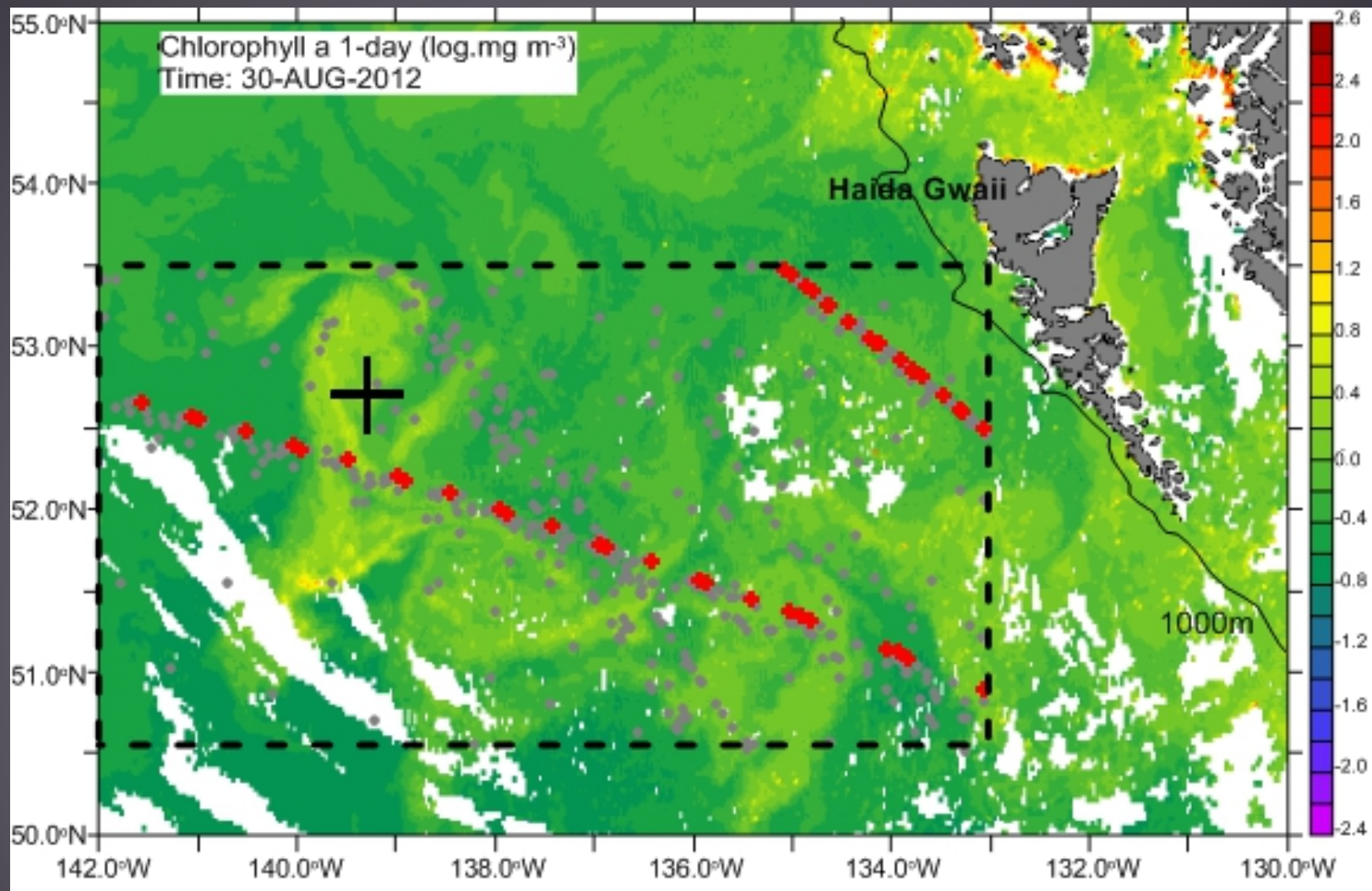
CBC News | Posted: Oct 16, 2012 6:31 AM PT | Last Updated: Oct 16, 2012 11:21 AM PT



An experimental project in which 100 tonnes of iron-rich dirt-like material were dumped into the ocean off B.C.'s north coast is sparking controversy. The yellow and brown areas indicate relatively high concentrations of plankton in August (Goddard Earth Sciences Data and Information Services Center)

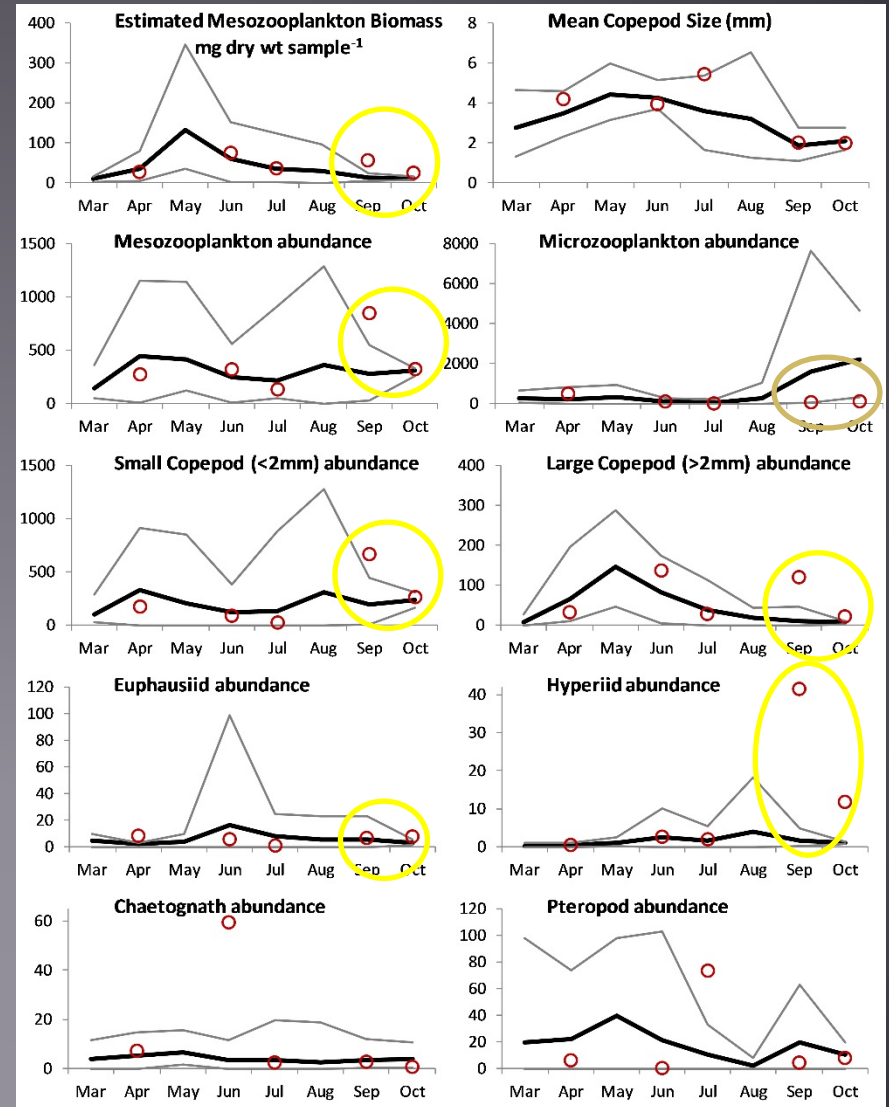
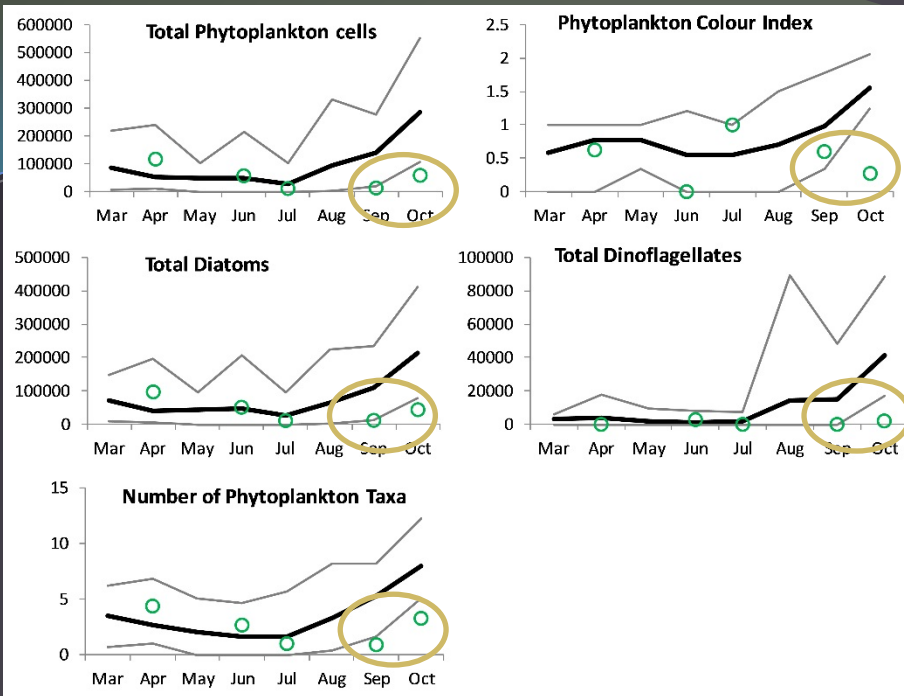


# CPR sampling in 2012, and historical samples (2000-2011)





# Long term monthly means and min/max of plankton indices

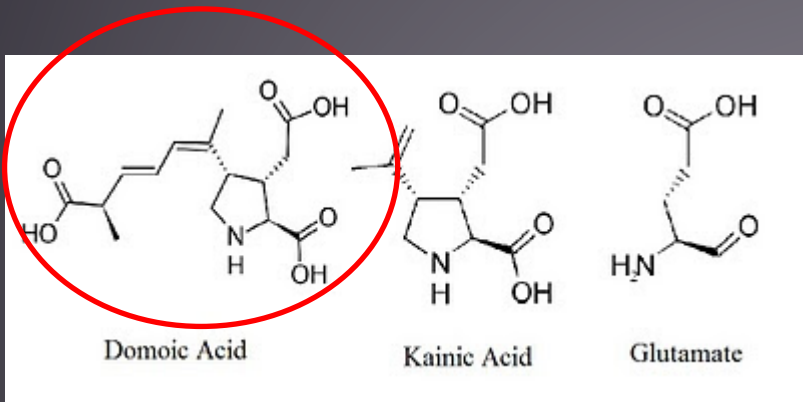


Post-fertilization  
 phytoplankton and  
 microzooplankton **low**,  
 crustacean  
 zooplankton **high**

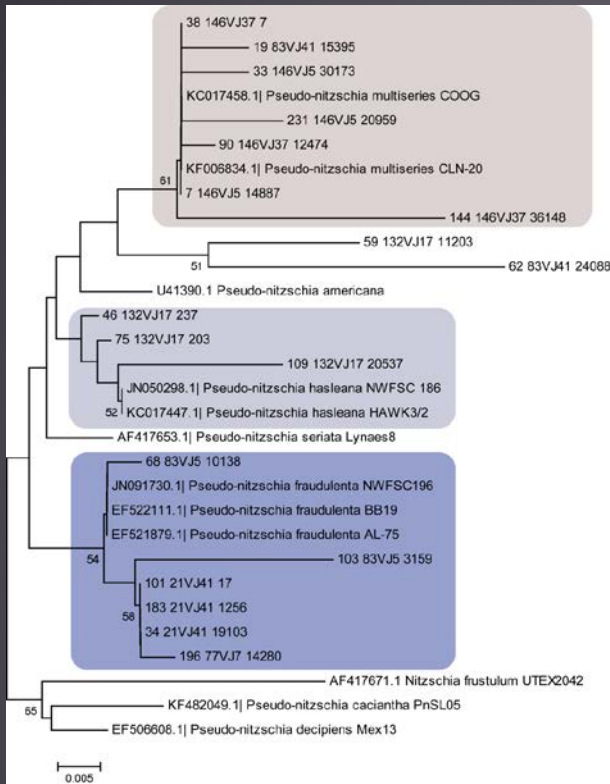
# Adding Value - Using the sample archive - Molecular studies



Pseudo-nitzschia  
Amnesiac Shellfish  
Poisoning



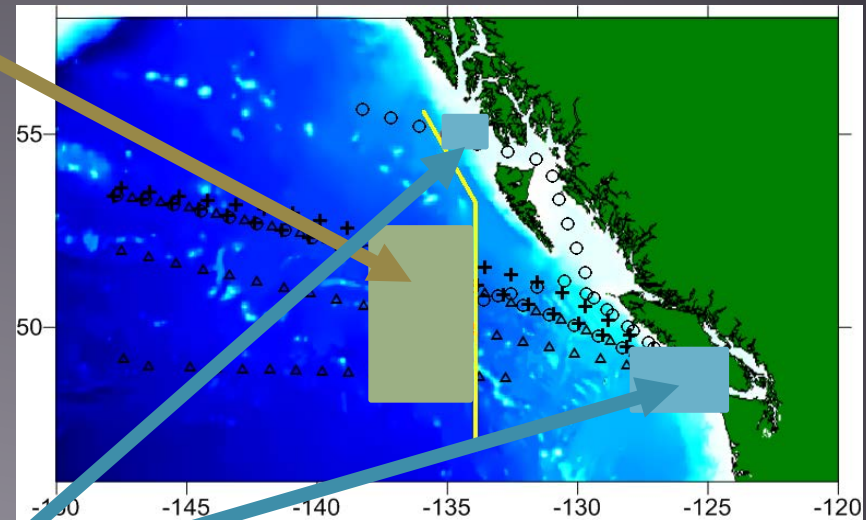
# 141 variants in 3 major species groups were found, which differed between CNEP and ENEP



*P. multiseriata*

*P. hasleana*

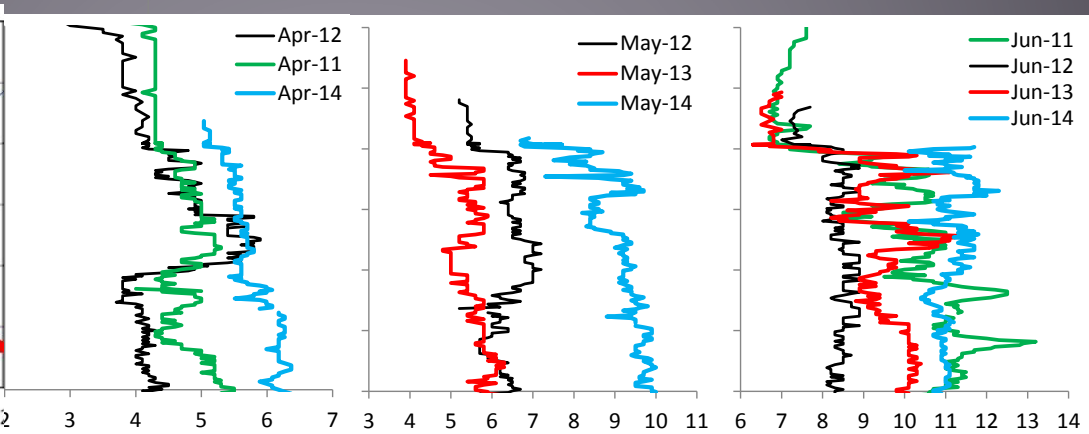
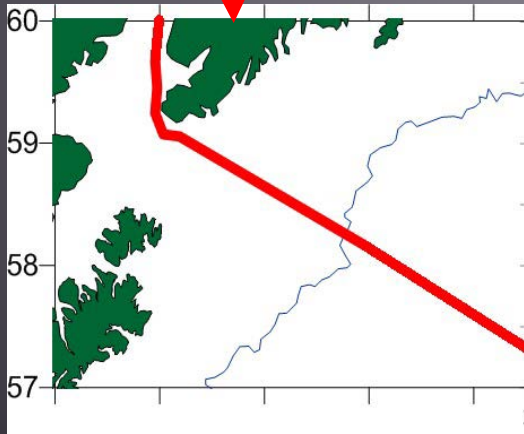
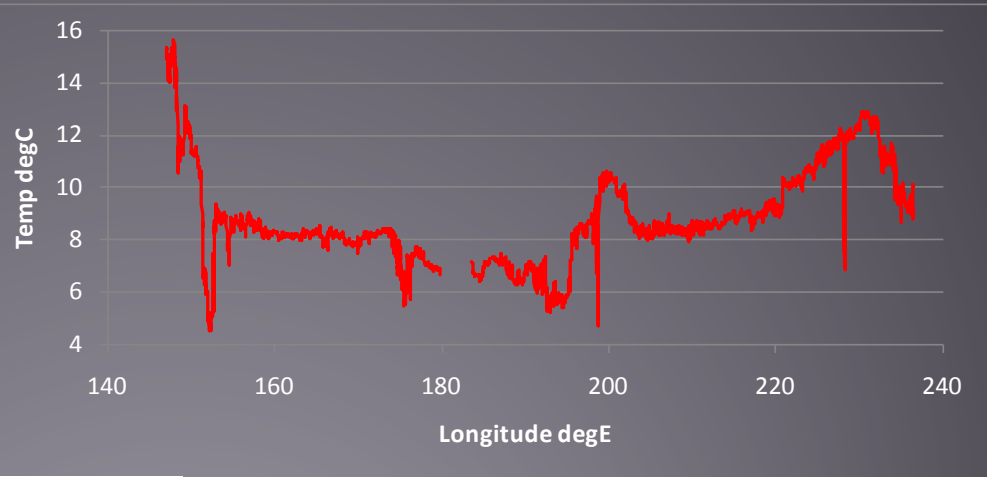
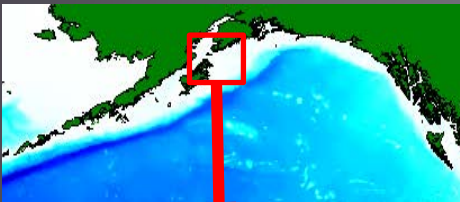
*P. fraudulenta*



And *P. hasleana* found in the CNEP for the first time.



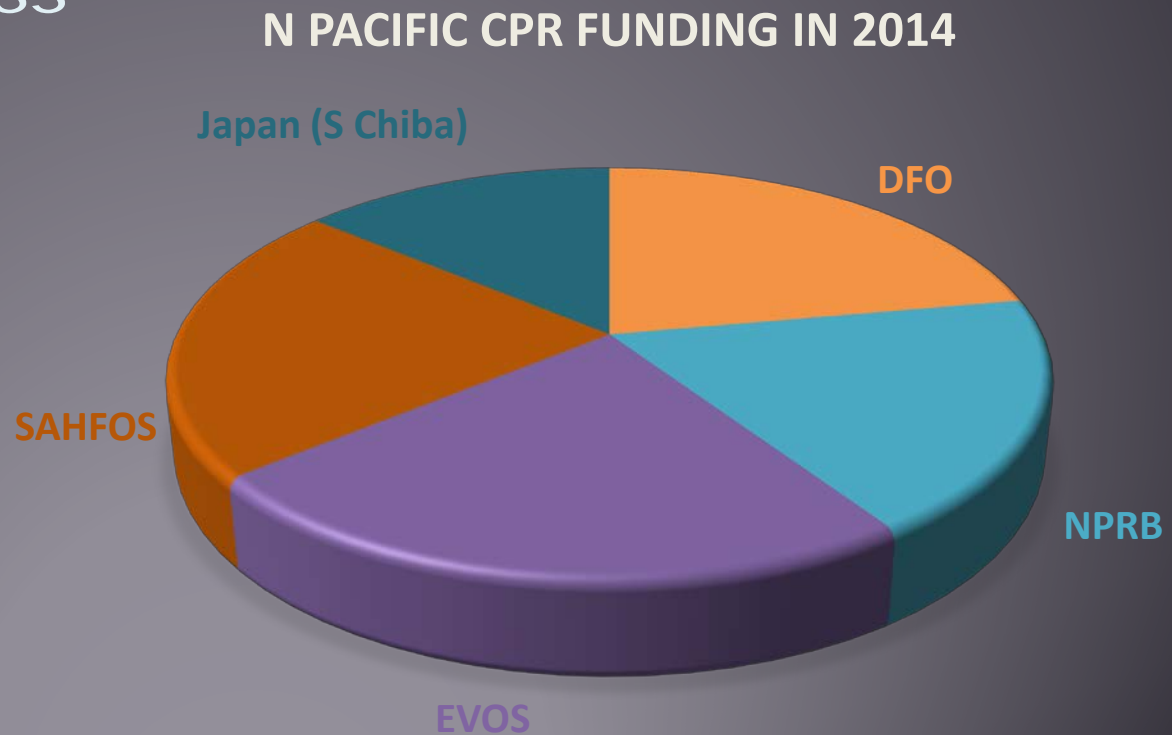
# Adding Value - Instrumentation



# What we've learned: Funding model

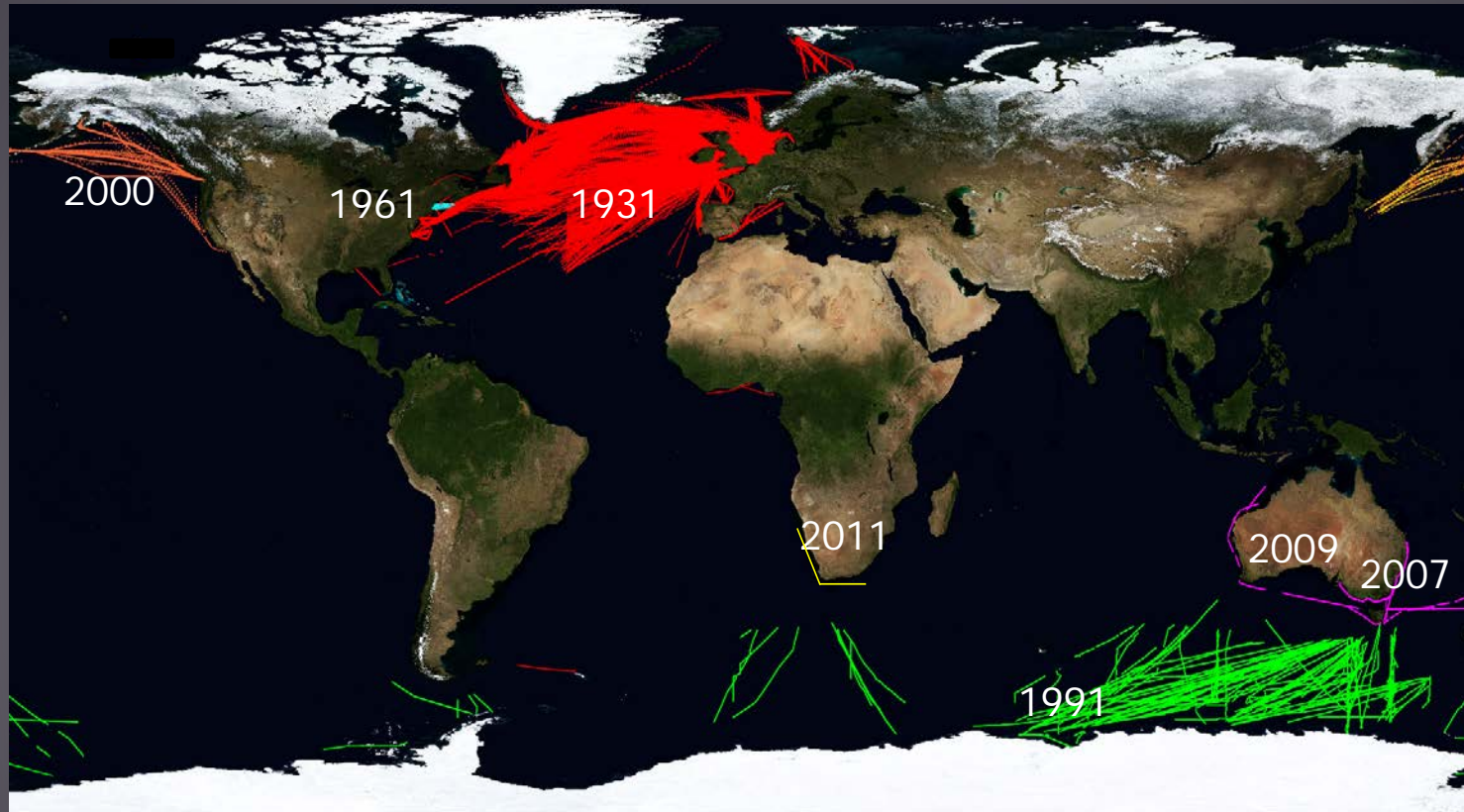
Consortium has worked well in this case  
(but other models also work well)

- Highly leveraged
- Resistant to loss of one partner



# Globalisation

CPR surveys around the world, and year of inception





# Globalisation

Regularly updated  
status report  
published  
available online  
from  
[www.sahfos.org](http://www.sahfos.org)

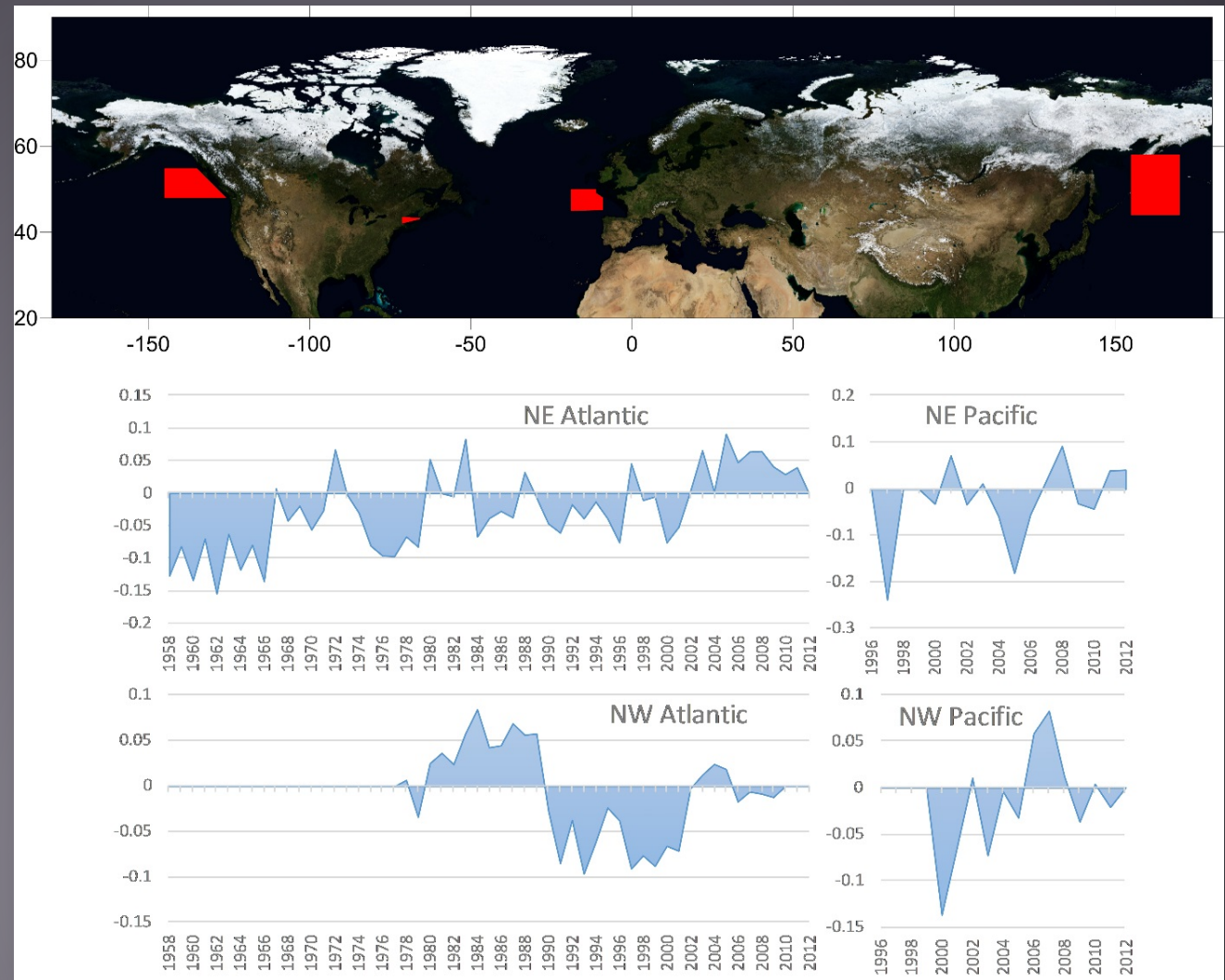


# Copepod Community Size Index

- incorporates community structure
- uses strengths of CPR sampling
- can be globally applied

$$\bar{S} = \frac{\sum_{i=1}^N (L_i \times X_i)}{\sum_{i=1}^N X_i}$$

CCS = length  $L$  (in mm) of each copepod species  $i$  (adult female length), multiplied by its abundance  $X_i$ , summed over all species ( $N$ ) and divided by the total abundance, according to Richardson et al., 2006.



# Summary

- The N Pacific CPR Survey is a successful PICES project
- It has evolved over 15 years, now relevant to regional, basin-scale, and global issues, including responses to climate change.
- Demonstrated value to management agencies through synthesis reports, but could do better in promoting relevance.
- Funding model has proved successful



Further information can be found at:

[www.pices.int/projects/tcprsothnp/default.aspx](http://www.pices.int/projects/tcprsothnp/default.aspx)  
(N Pacific survey and CTD data)

[www.globalcpr.org](http://www.globalcpr.org) (GACS)

[www.sahfos.org](http://www.sahfos.org) (CPR parent organisation)

Thanks to the agencies and organisations for supporting the North Pacific CPR survey:



Exxon Valdez  
Oil Spill Trustee  
Council



And to the ships, their officers and crew and all the SAHFOS technicians who are responsible for sample collection and analysis



Fisheries and Oceans  
Canada

Pêches et Océans  
Canada

