Ship of Opportunity Sampling of Lower Trophic Levels

Sonia Batten and Tony Walne

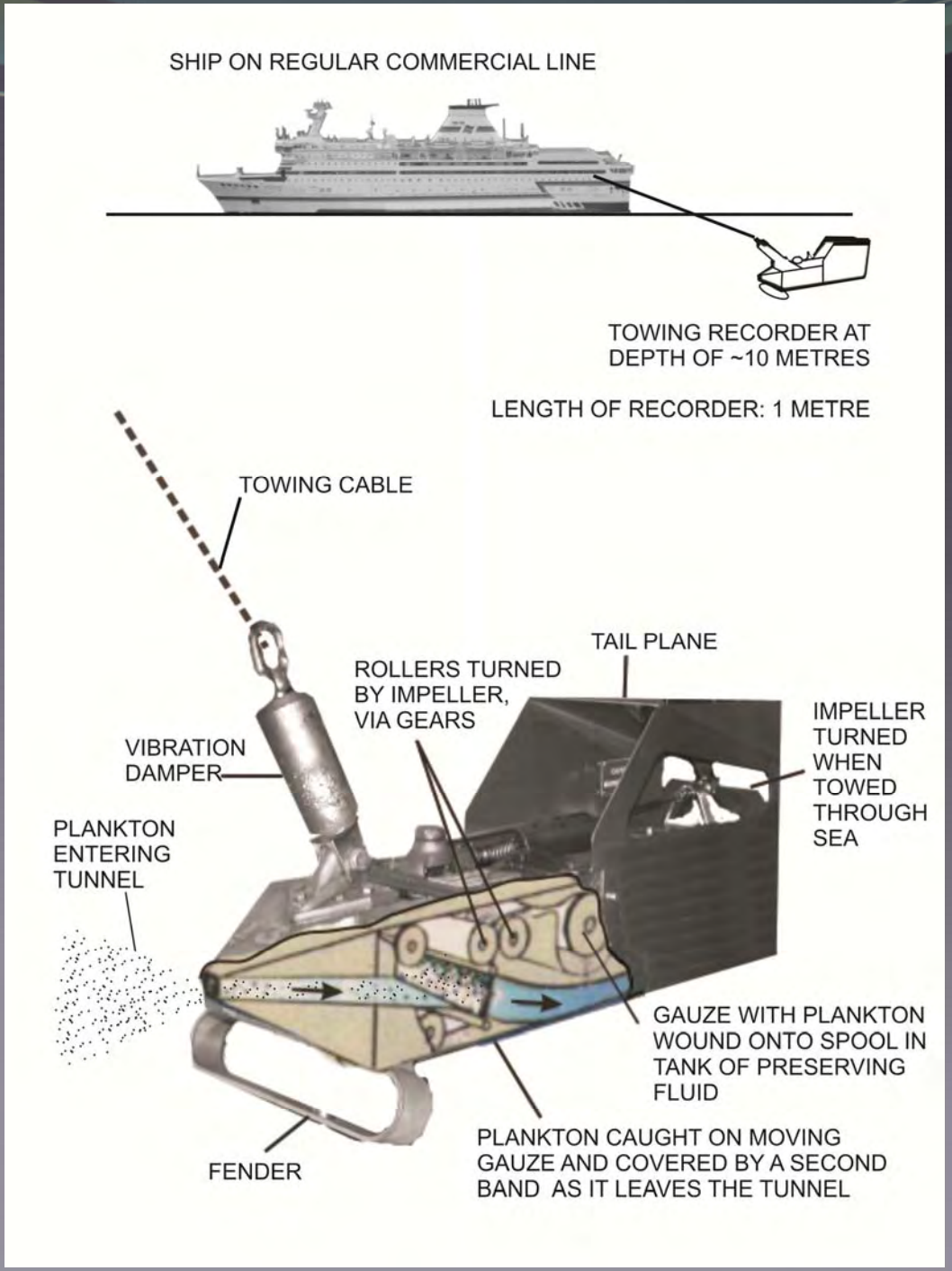
SAHFOS

In this presentation:

- Traditional CPR sampling
- Pros and cons of SoOp sampling & the CPR approach
- Adding value to the CPR
  - Additional variables
  - The CPR as a platform
- Operational biological oceanography?

What is a CPR?

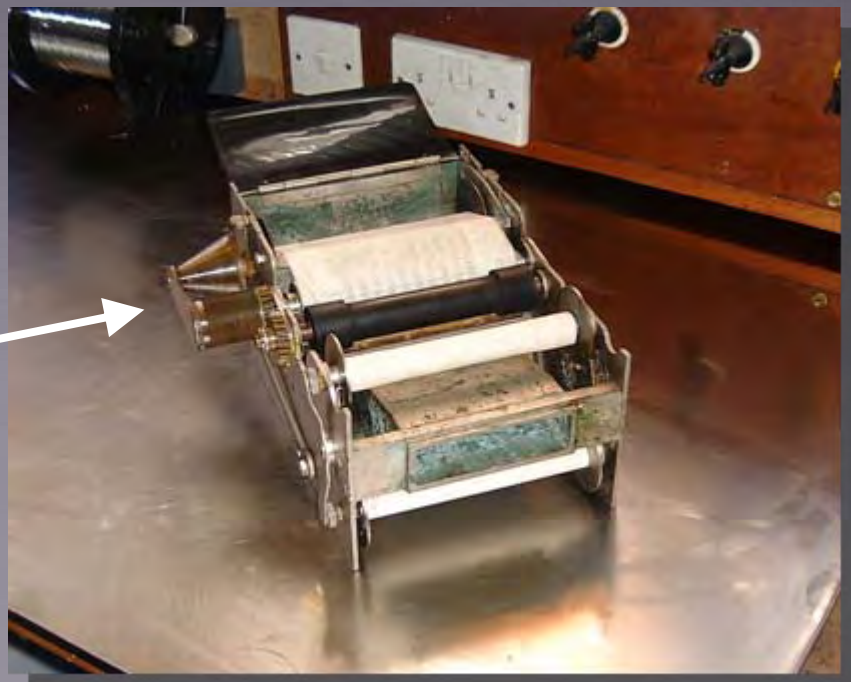
- A robust device for collecting surface plankton over large spatial scales
- capable of operating at high speeds (>20 knots)
- needs a minimum of attention
- designed for ships of opportunity



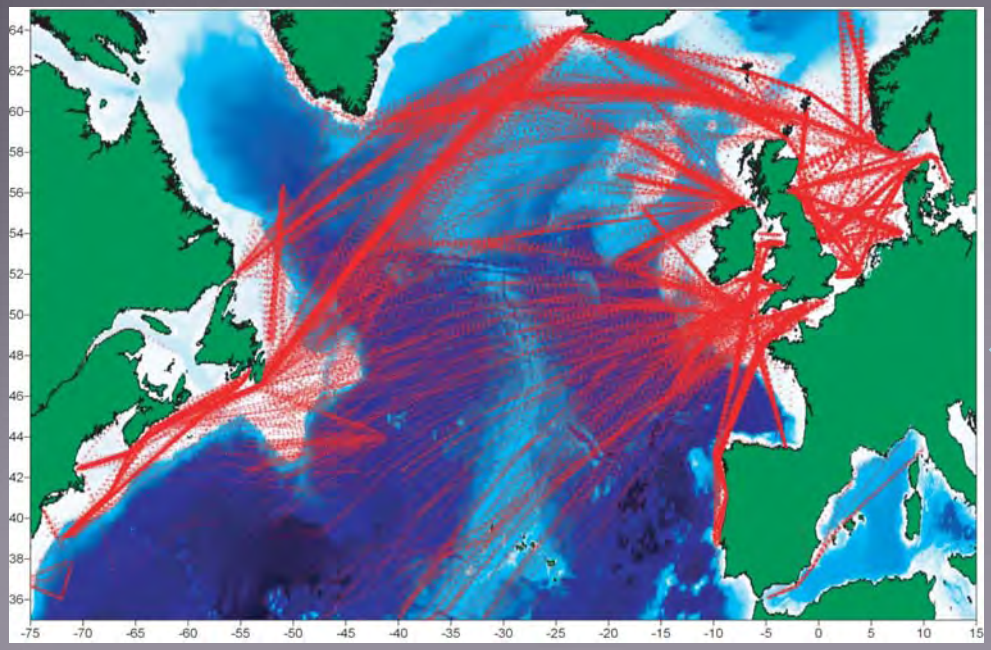
Designed by Alister Hardy in the 1920's

An internal cassette fits into the towing body

Pre-loaded with filtering mesh and wire on a fusee to drive the uptake spool

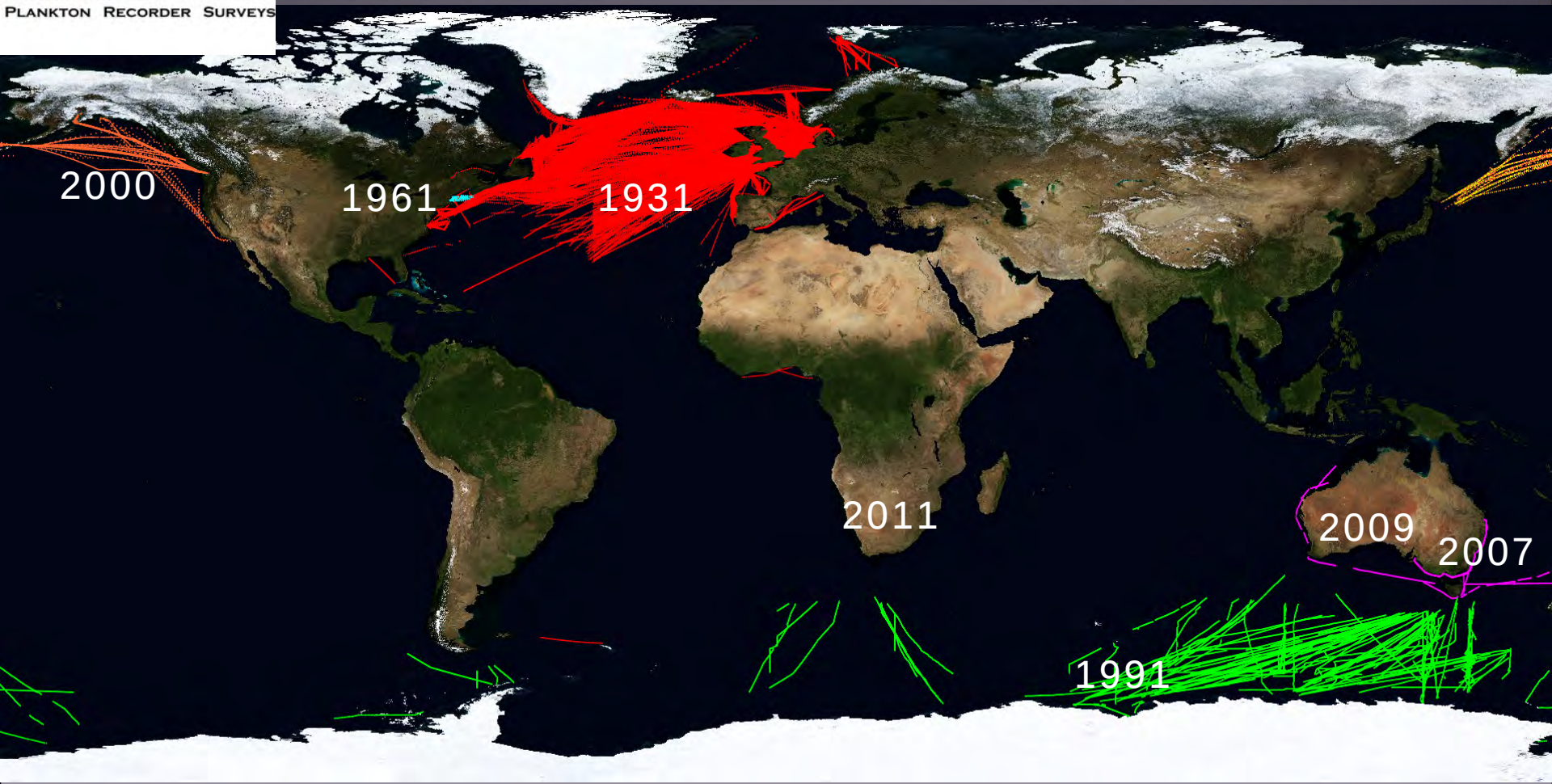


The CPR Survey today



CPR surveys, 1931 to 2011; ~ 1 million samples

GACS
Global Alliance of Continuous Plankton Recorder Surveys



Pros and Cons: (note that limitations of the methodology won't be discussed here, too big a topic, but see literature)

+ Cheap!
  + particularly important for remote ocean regions
  + can tailor analysis to match funding.
+ Reliable
+ Internally consistent
+ Other instrumentation can be added (see later)
+ Sample archive for future studies

- Sample analysis is labour intensive
- Lack of control over timing and location
- Liaising with ships
  - low on their priority list
  - discrepancies with info.

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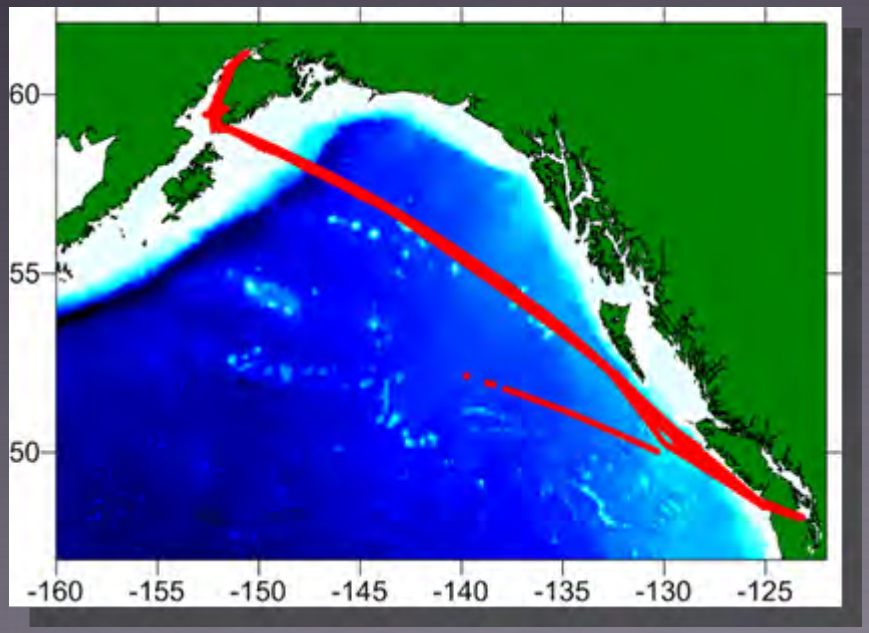
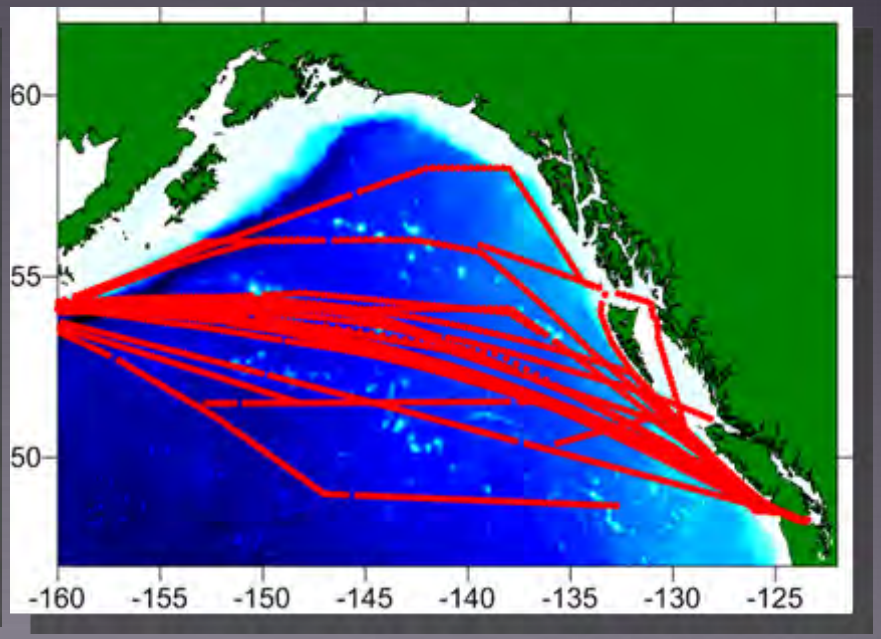
Examples of route consistency





Pacific survey, north south transect.

53 separate transects, 2004-2012
High repeatability

Pacific survey, east-west transect.

33 separate transects, 2000-2012
Lower repeatability

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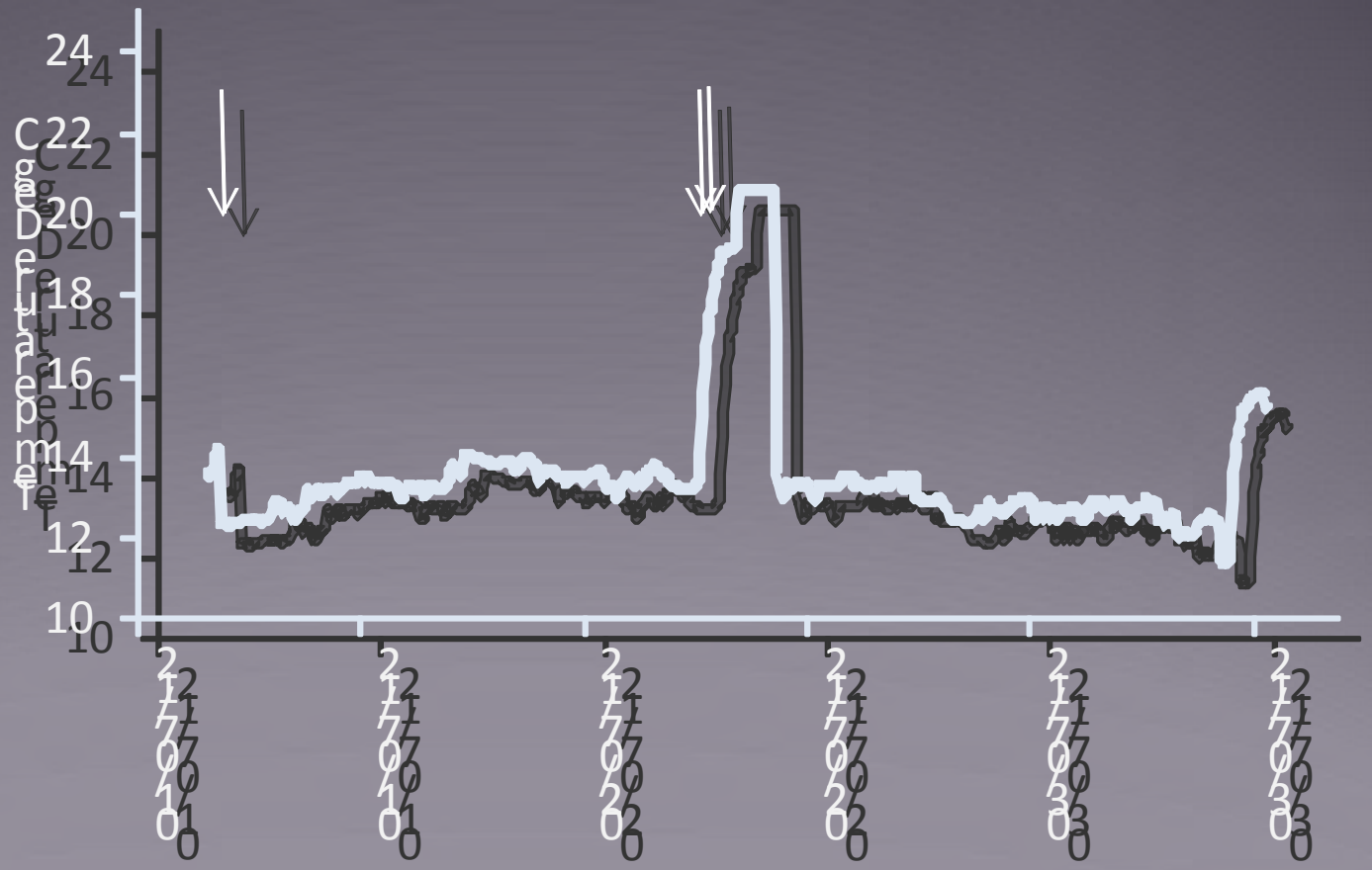
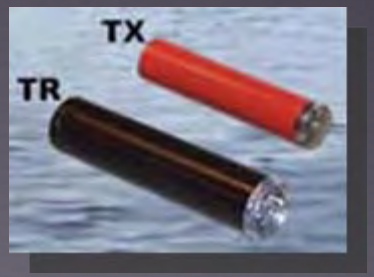
Example of Ship's log conflict

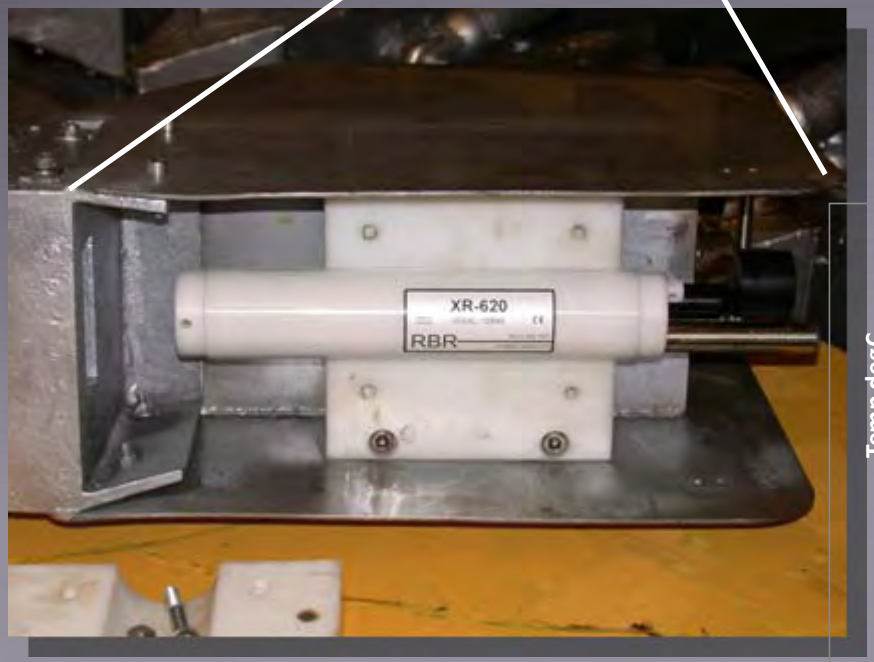
CPR with a temperature sensor fitted deployed in N Atlantic.
Arrows mark ship's log times of shoot and haul – first 2 agree with temperature record, but 4 hour discrepancy with 2nd shoot.
What to do?

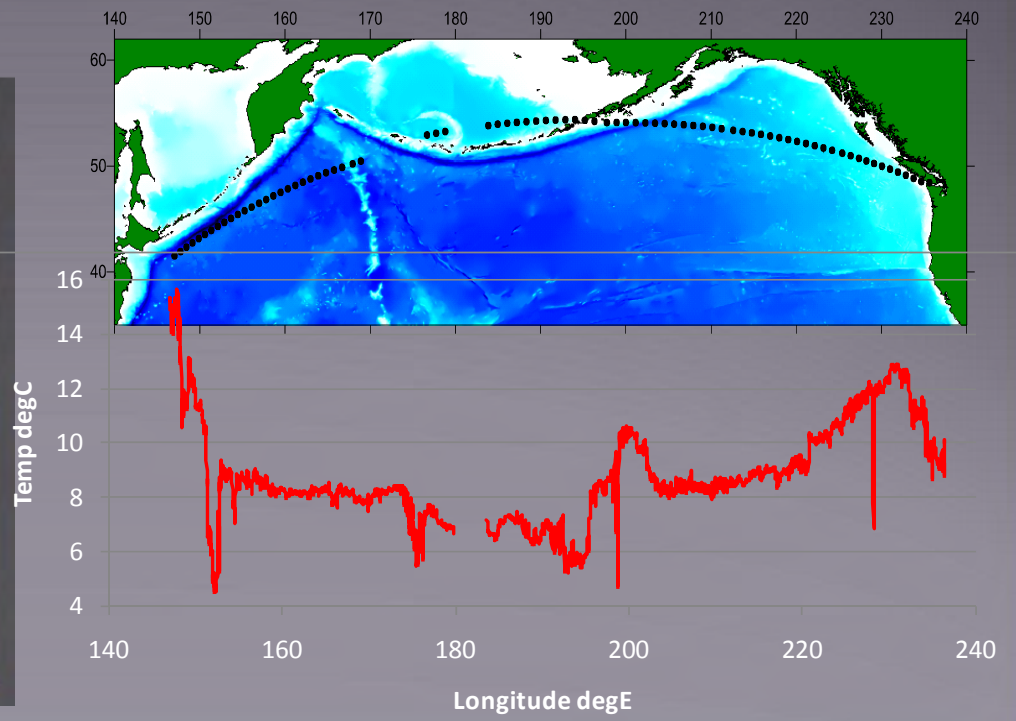


The CPR as a platform – adding instrumentation

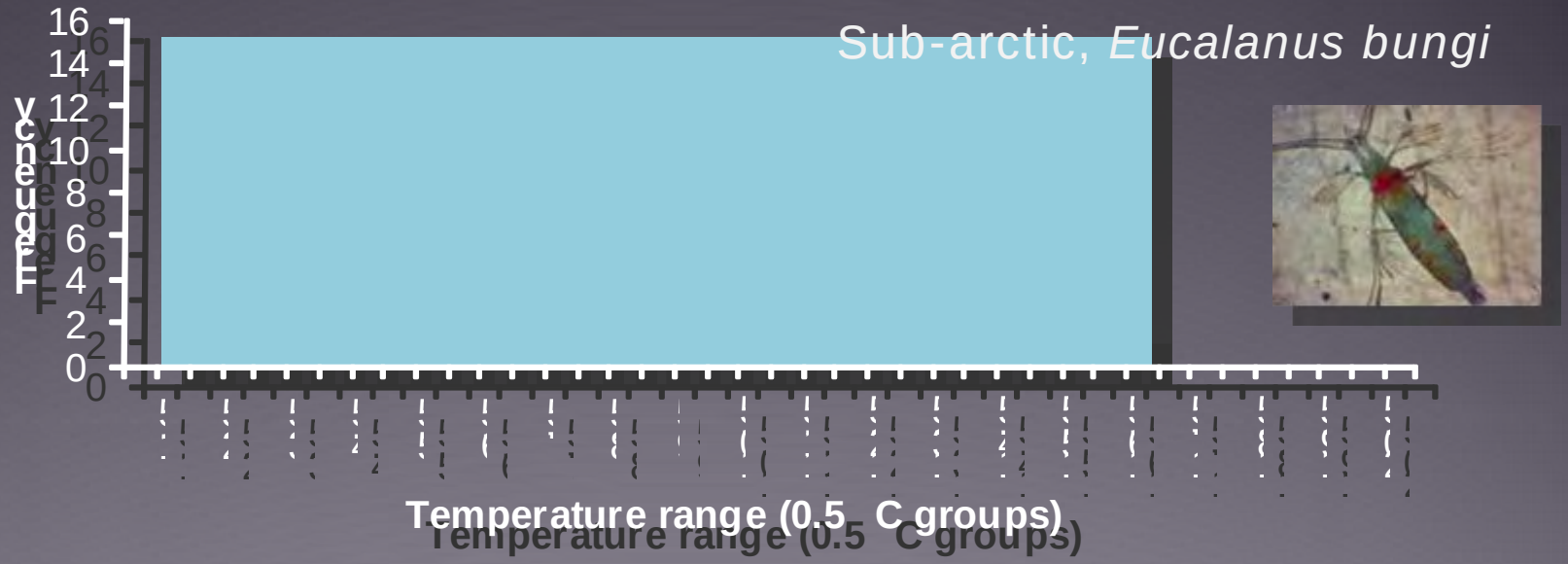
Temperature loggers (most basic)
CTD-F (more expensive)

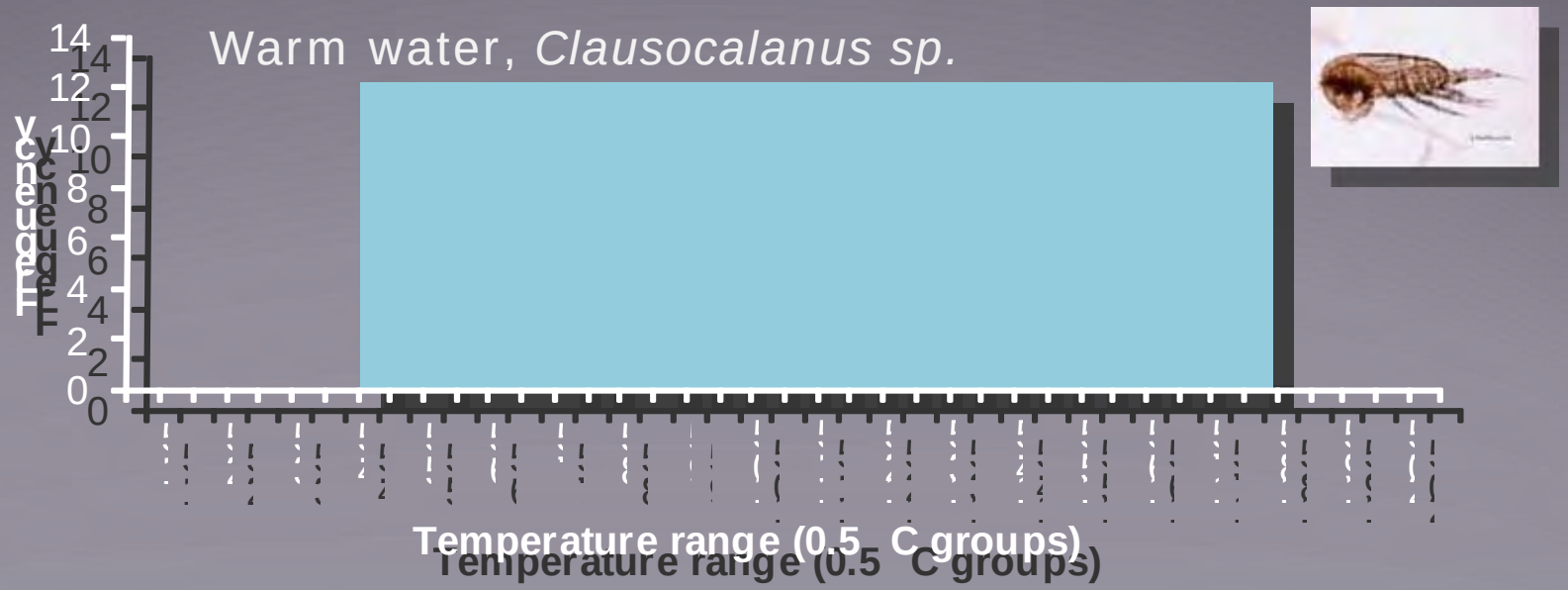




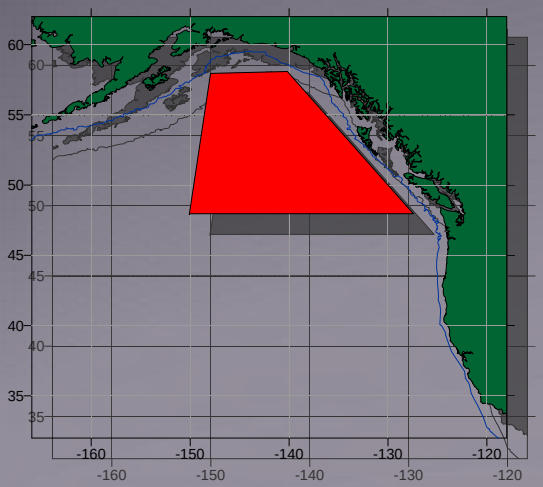


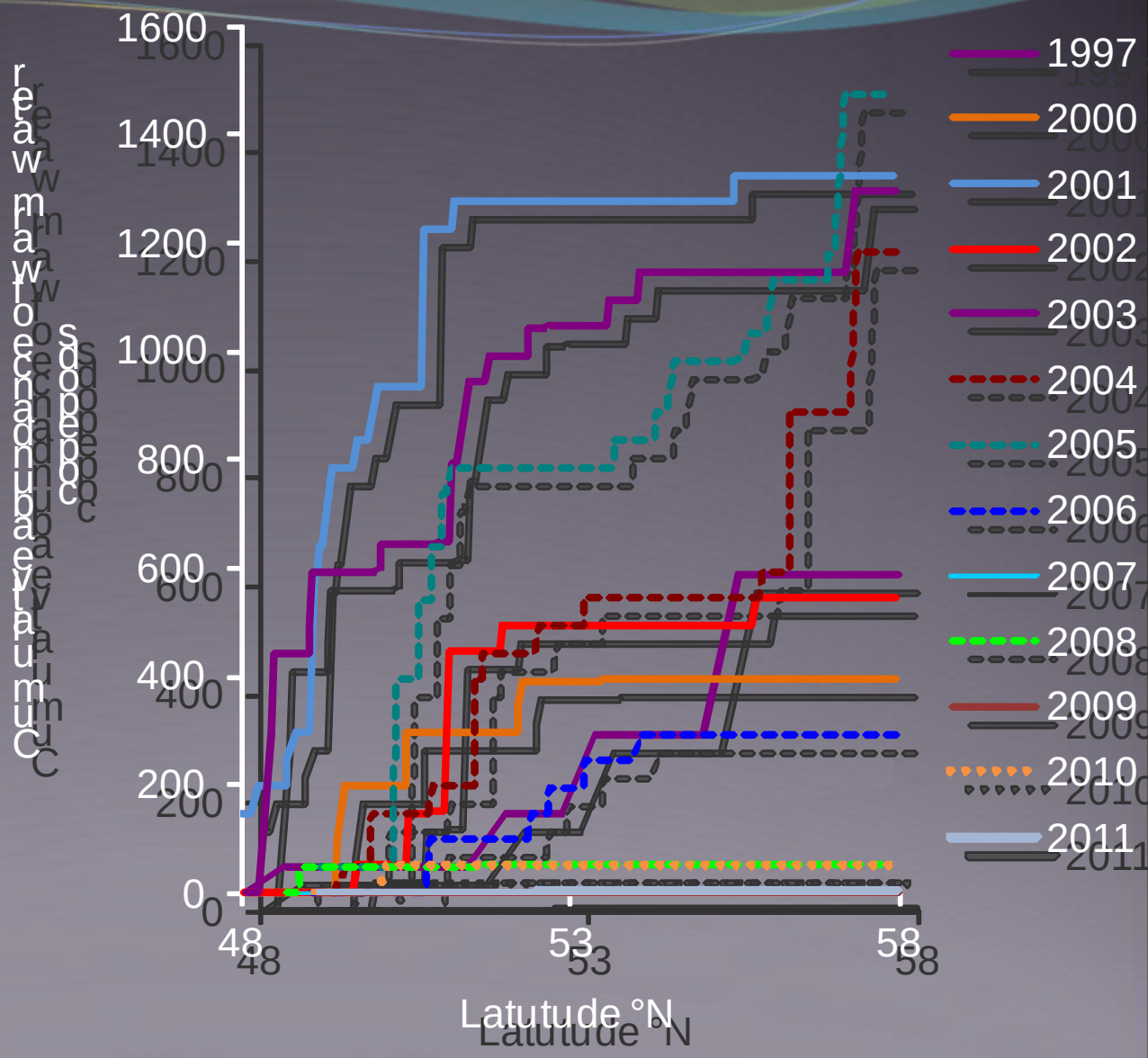
Temperature distributions of two example taxa





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



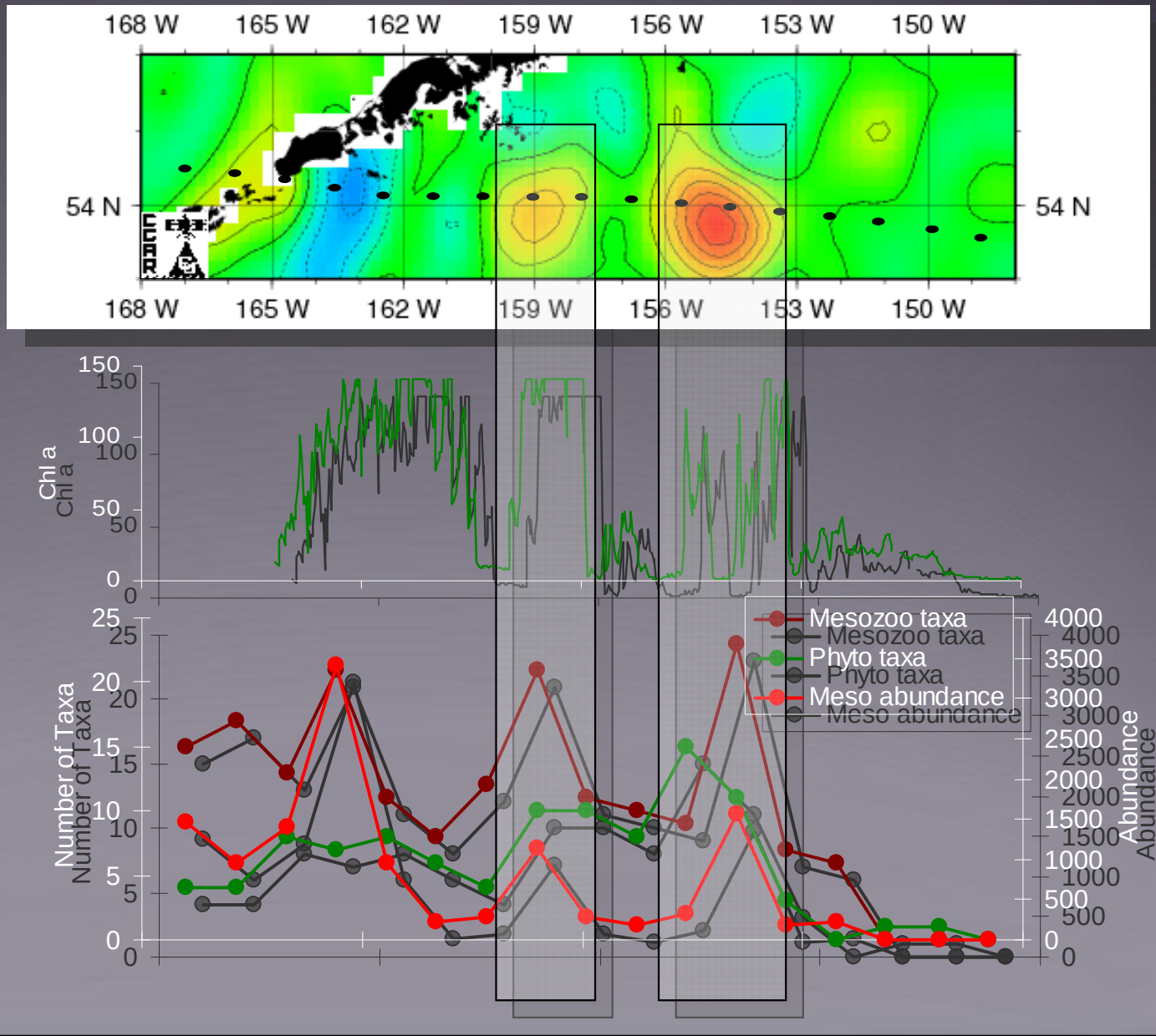


Updated from Batten & Walne (2011), Journal of Plankton Research

Chlorophyll from the CTD

June 2005

Transect through 2 eddies



Bird/mammal observers

- logistically more complex (e.g. diversion insurance, port of departure/arrival)
- more expensive

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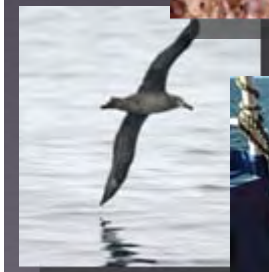
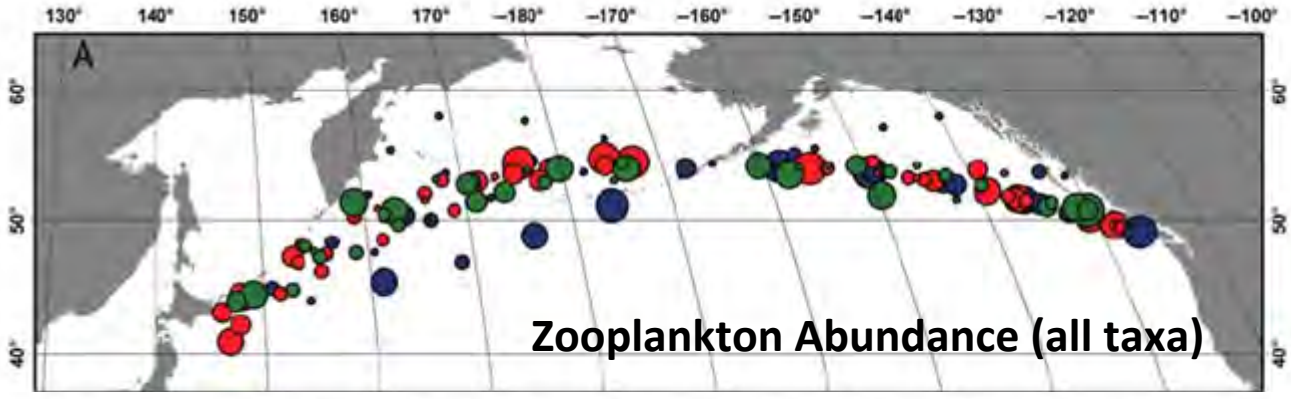
Macro-ecology of plankton–seabird associations in the North Pacific Ocean

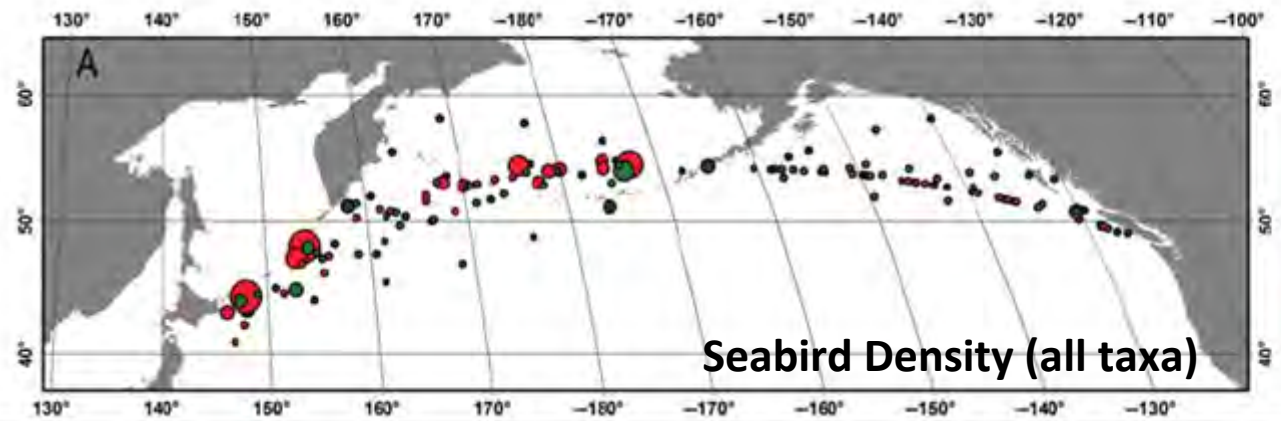
WILLIAM J. SYDEMAN[1]*, SARAH ANN THOMPSON[1], JARROD A. SANTORA[1], MICHAEL F. HENRY[1], KEN H. MORGAN[2] AND SONIA D. BATTEN[3]

[1]FARALLON INSTITUTE FOR ADVANCED ECOSYSTEM RESEARCH, PO BOX 750756, PETALUMA, CA 94952, USA, [2]CANADIAN WILDLIFE SERVICE, ENVIRONMENT CANADA, C/O INSTITUTE OF OCEAN SCIENCES, FISHERIES AND OCEANS CANADA, 9860 W. SAANICH ROAD, SIDNEY, BRITISH COLUMBIA, CANADA AND [3]SIR ALISTER HARDY FOUNDATION FOR OCEAN SCIENCE, CITADEL HILL, THE LABORATORY, PLYMOUTH PL1 2PB, UK





Zooplankton Abundance (all taxa)



Seabird Density (all taxa)

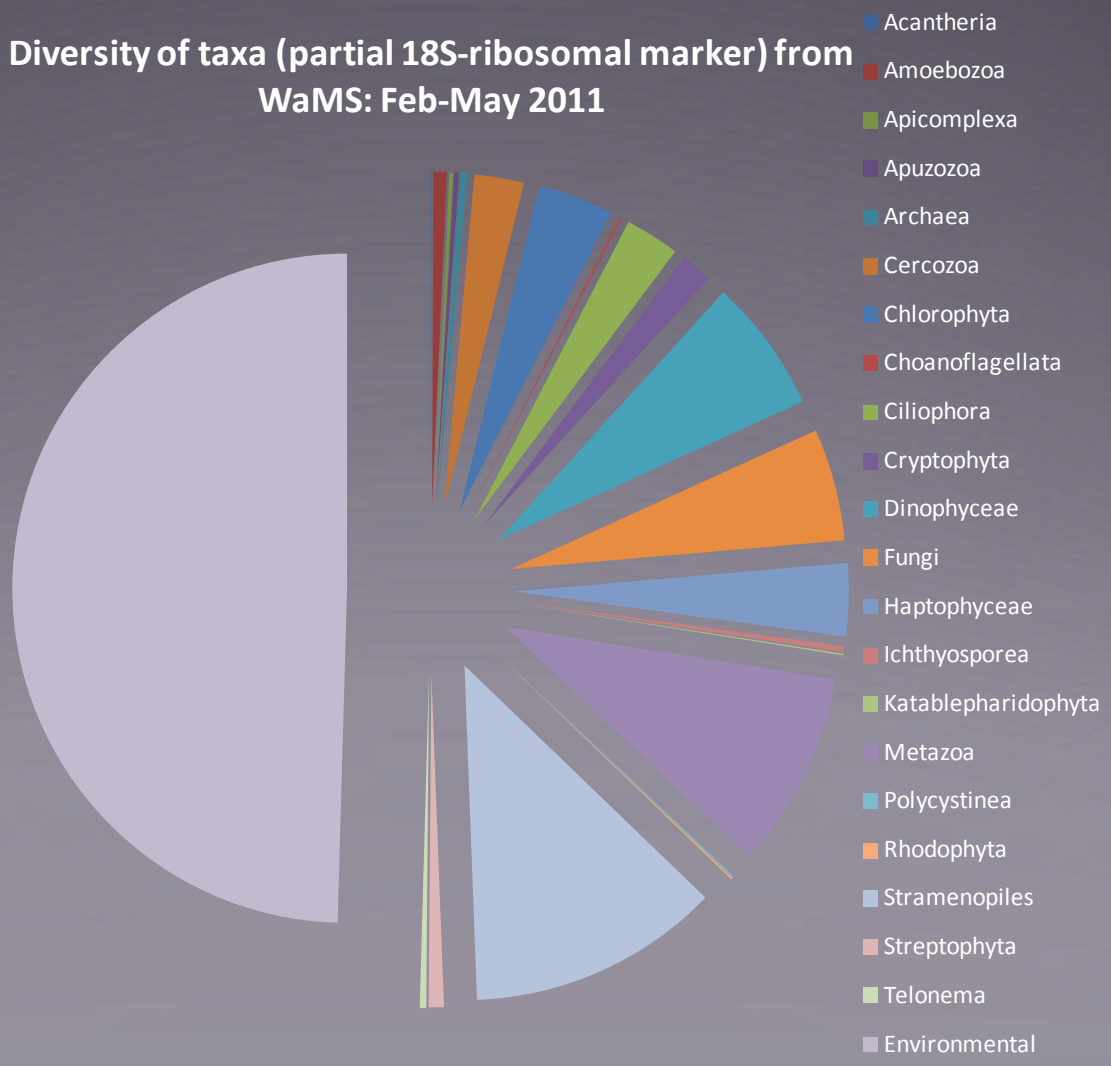
Water and Microplankton Sampler (WaMS).

Aimed at smaller size-fraction (nano and pico) plankton community.

Flow cytometry, Molecular probes and barcoding, Harmful Algal Bloom microarrays

WaMS results

Samples have been analysed for HAB species

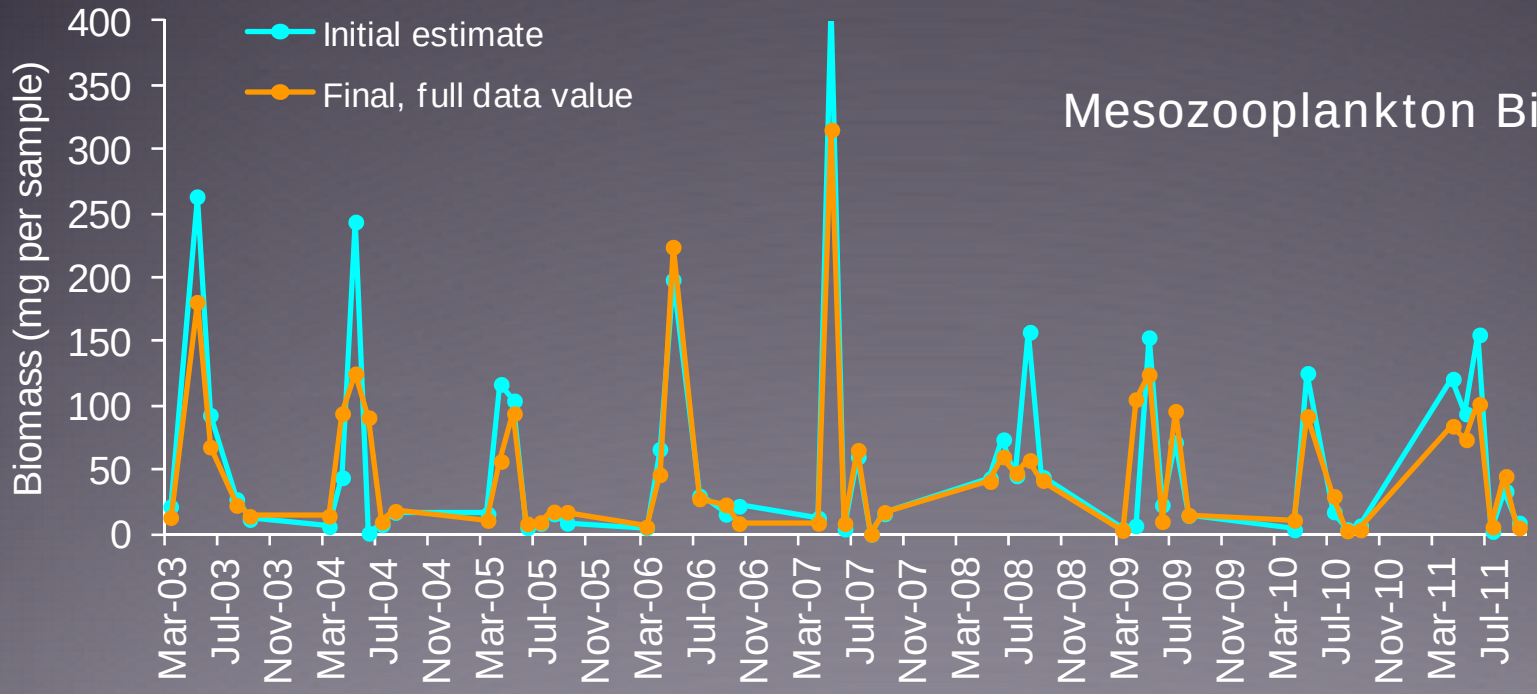


Can we get to operational biological oceanography?

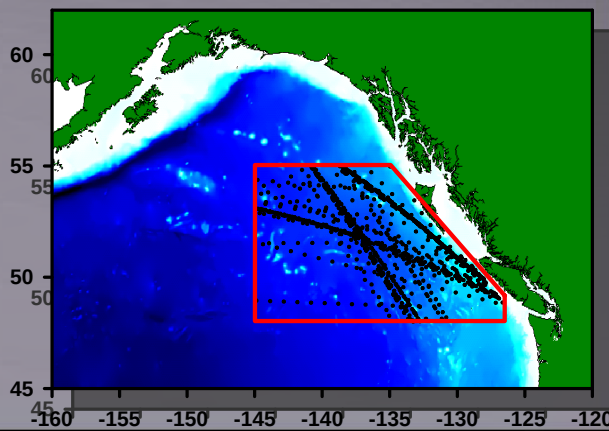
Two approaches:

1. Pacific – process a subset quickly (25%)
   - Preliminary data (not QC'd) available within 2 months
2. Atlantic – process a single transect quickly
   - Analysis of a short transect completed within 16 days (but needed someone to push it along).

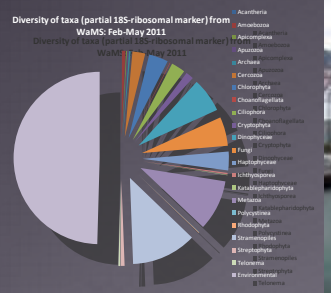
Comparison between subsample and final result

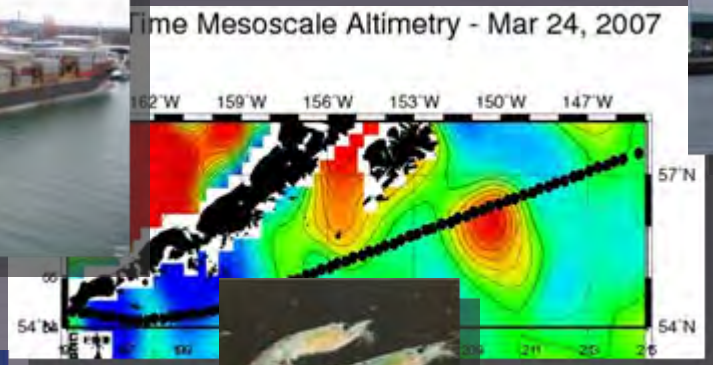


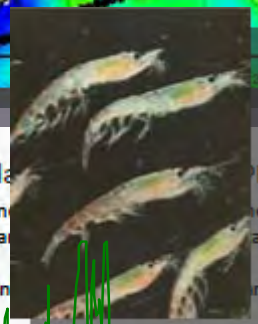
For a large area and a summary index, the result is very good

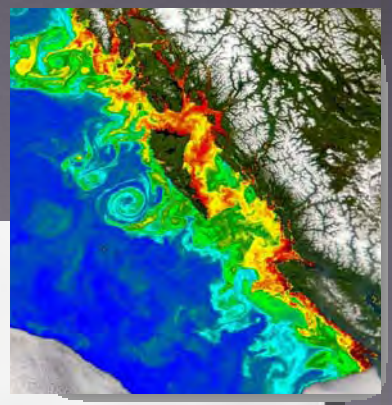


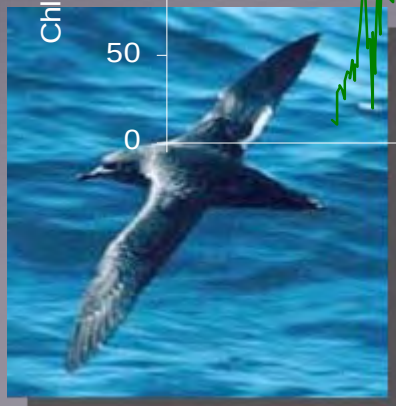
The capabilities for a multi-disciplinary, cost-effective sampling program exist.

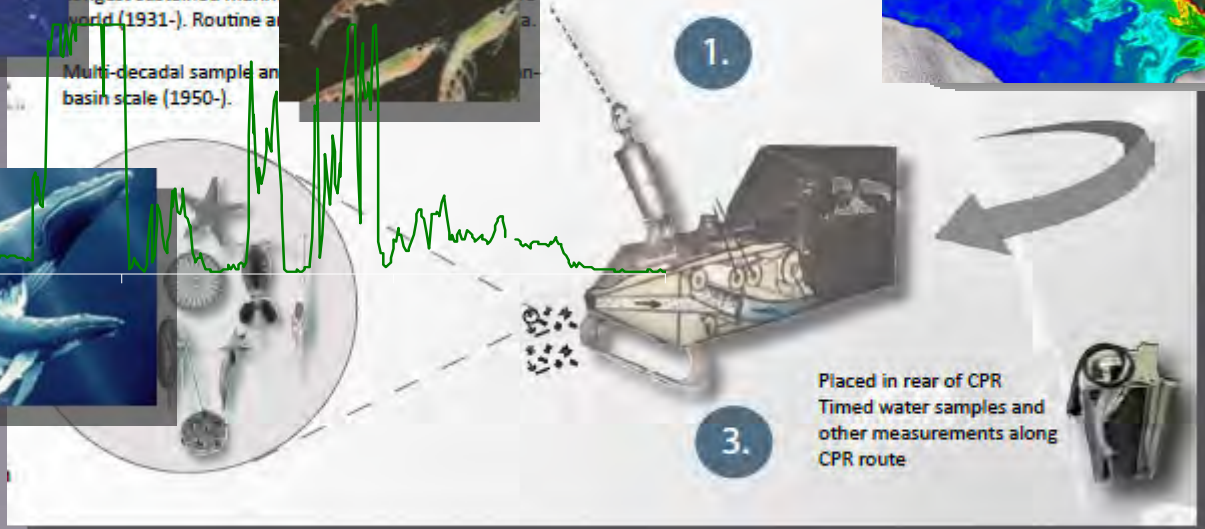












Further information can be found at:

www. globalcpr.org (GACS)

www.sahfos.org (CPR parent organisation)

www.pices.int/projects/tcprsotnp/default.aspx
(N Pacific survey and CTD data)

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