

The persistent cross-shelf bioregionalization of coastal oceans

Patrick Pata^{1,2}, Moira Galbraith³, Kelly Young³, Andrew Margolin¹, R. Ian Perry⁴, and Brian P.V. Hunt^{1,2,5}

¹Institute for the Oceans and Fisheries, University of British Columbia ²Department of Earth, Ocean and Atmospheric Sciences, University of British Columbia

³Institute of Ocean Sciences, Fisheries & Oceans Canada ⁴Pacific Biological Station, Fisheries and Oceans Canada ⁵Hakai Institute

Access the article here:



tinyurl.com/bczooplankton



p.pata@oceans.ubc.ca
@patrickpata

Background

- Understanding oceanic ecological processes requires identifying biogeographic regions but incorporating the partitioning of zooplankton communities has been limited.
- Zooplankton account for a large portion of animal biomass and are good indicators of environmental changes in the ocean.
- Coastal oceans are characterized by steep cross-shelf gradients with complex geomorphology and dynamic oceanography.

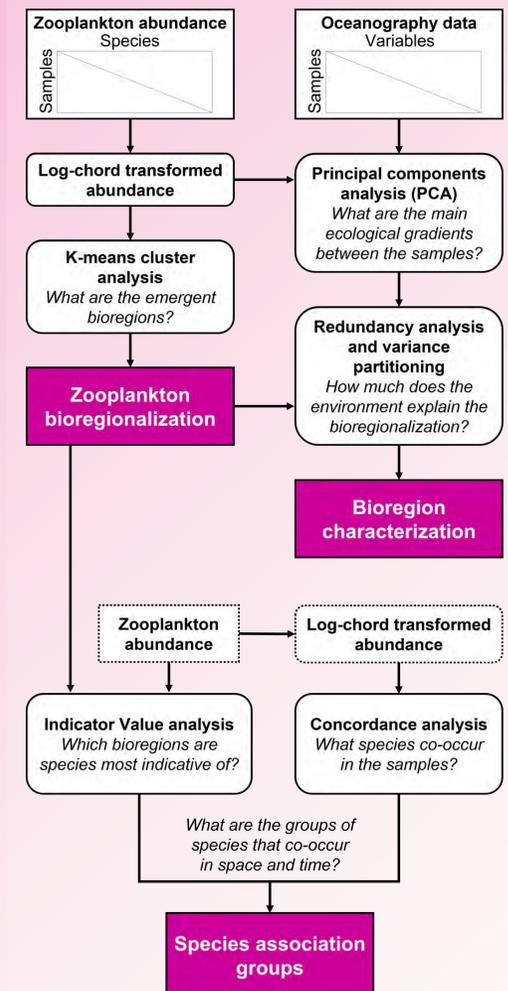
Objectives

- To identify bioregions based on zooplankton distributions
- To characterize the physical environment and community composition of the bioregions

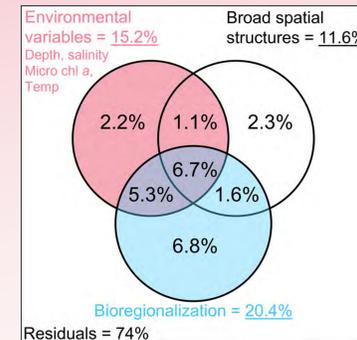
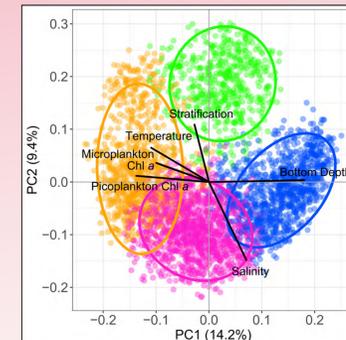
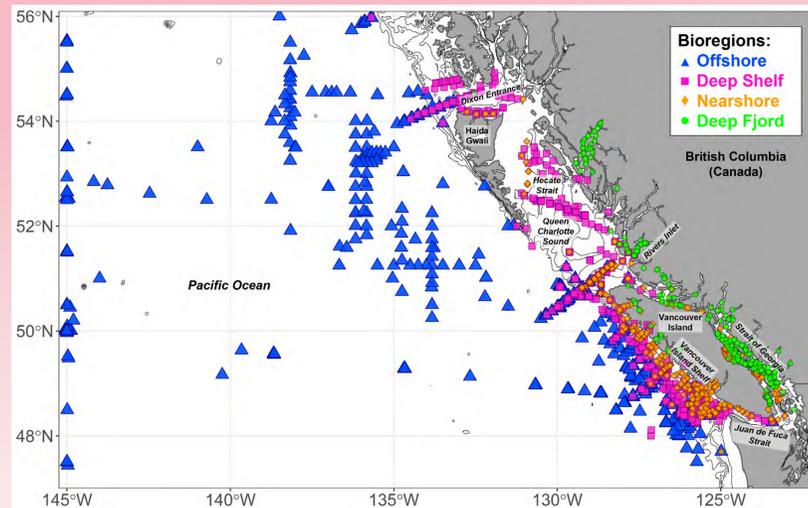
Zooplankton Dataset

- 3,721 net samples collected in the BC coastal ocean and adjacent offshore waters during spring and summer from 1995 to 2014
- 160 most common zooplankton species found in $\geq 3\%$ of samples

Overview of methodology



Cluster analysis of 20 years of zooplankton observations identified 4 bioregions along the cross-shelf gradient

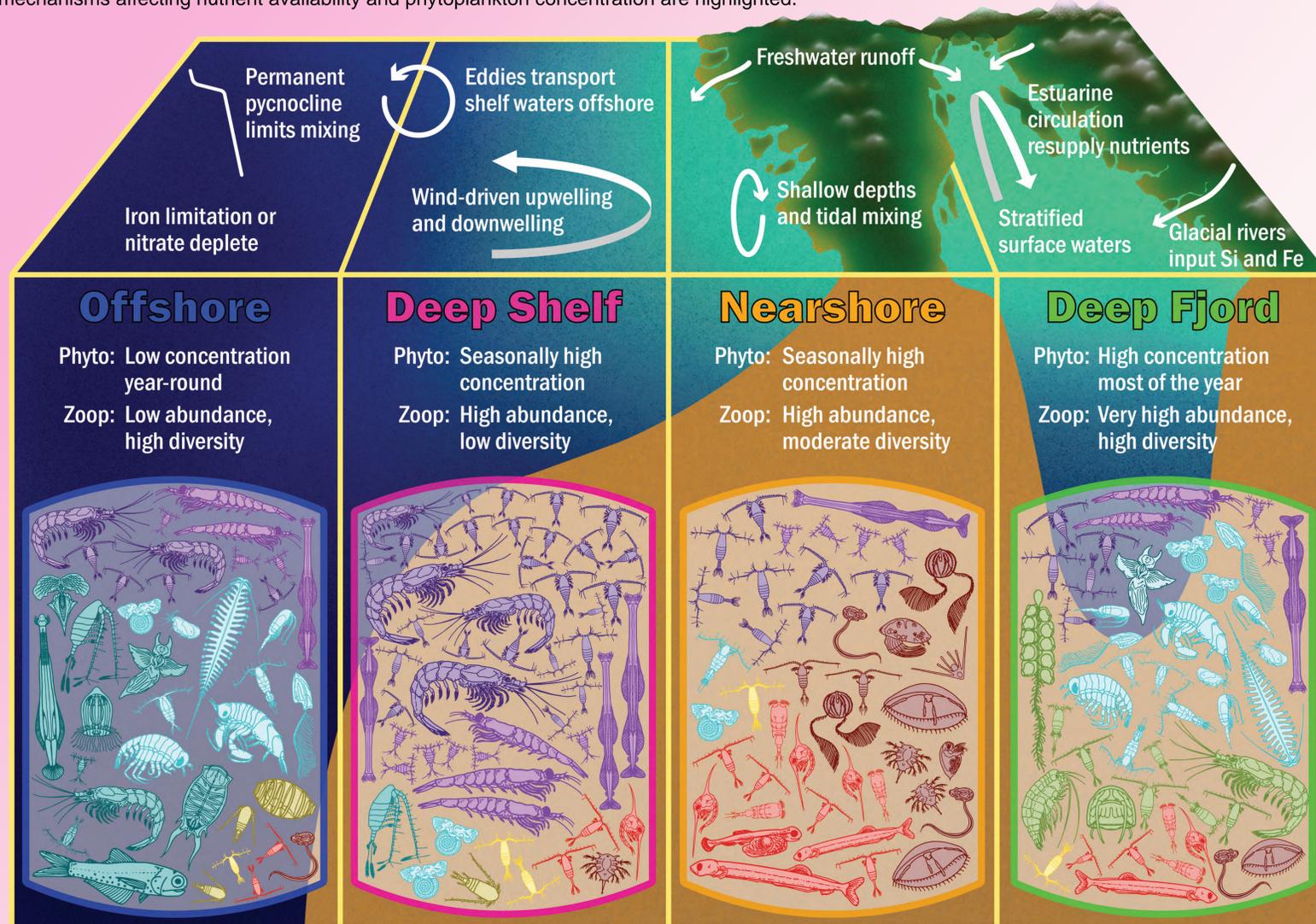


PCA of zooplankton abundances shows that bioregions mainly differ along the bottom depth, phytoplankton concentration, and salinity gradients.

Variance partitioning suggests that the bioregionalization captured the broad patterns of zooplankton distributions and can be mostly explained by environmental differences.

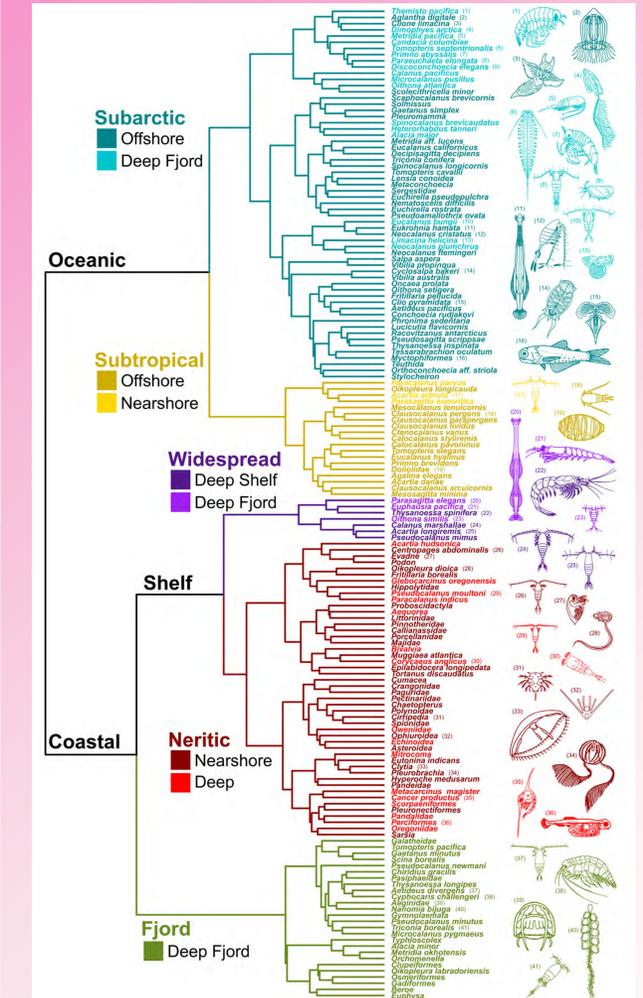
Conceptual summary of the zooplankton bioregionalization along the cross-shelf gradient.

Differences in zooplankton concentration and community composition and the oceanographic mechanisms affecting nutrient availability and phytoplankton concentration are highlighted.

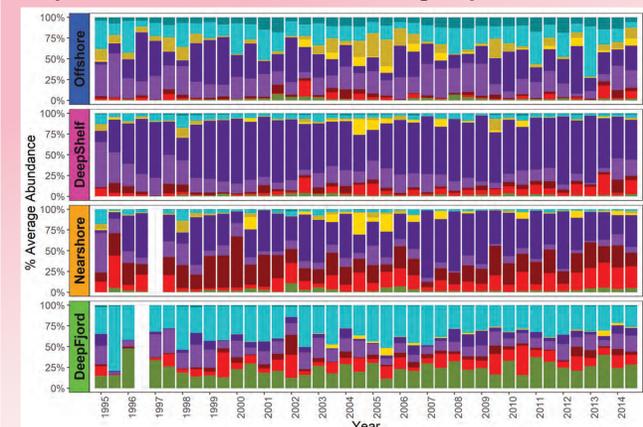


Species association groups: Subarctic, Subtropical, Widespread shelf, Neritic, Fjord

Dendrogram shows the 5 species association groups. Subgroups are based on the bioregion with the highest indicator value for each species.



The relative community composition of the bioregions is persistent based on association group distributions.



Questions for future research

- Can we derive a global zooplankton bioregionalization by aggregating different data types?
- Are bioregions functionally different?
- How does circulation connect bioregions?
- Given the large residual variance, how can we account for dispersal and biotic interactions?