Spatial and Temporal Patterns of Zooplankton Species in the Gulf of Alaska Revealed by Image Analysis

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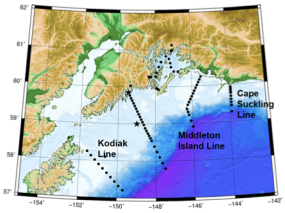
INTRODUCTION

- 2019 was 22nd year of physical, chemical, phytoplankton, zooplankton, and seabird sampling along the GAK Transect Line
- NSF's LTER program in 2017 added the Kodiak, Middleton, and Cape Suckling lines
- Monitoring of species present at stations gives an understanding of and ability to monitor life in the Gulf
- GAK is historically sorted under a microscope but all other lines made use of the Zooscan



METHODOLOGY

- Samples were collected on the Spring (May), Summer (July) and Fall (Sept.) 2018 cruises aboard the RV. *Sikuliaq*, R.V. *Woldstad*, and R.V. *Tiglax*, respectively
- Samples caught in the upper 200m of the water column using 505 µm Bongo or Multinets
- Samples are split down to a fraction of about 500 animals by Folsom Splitters
- Fraction is then digitized using Zooscan
- Using existing training sets, ImageJ sorted through the images to identify and organize animals into separate species
- Files are manually validated to account for software inaccuracies
- Data from each scan is appended into one matrix, adjusted for subsampling and volume filtered
- Traditional microscope-based analysis along the Seward Line provides comparison to abundances derived from that approach

CONCLUSION

- Spring cruise showed clear separation between inshore, offshore, and mid stations with inshore and offshore sharing more similarity
- Summer cruise showed inshore, offshore, and mid station separations again with inshore and offshore sharing more similarity
- Fall cruise lacked distinct mid stations and the inshore stations splitting first to show the least similarity
- Combing all cruises, Spring cruise separates first, and in its entirety, driven by the dominance of *Neocalanus* spp. in the upper 200m of the water column. After spring, *Neocalanus* leaves the shelf to enter diapause in deeper waters
- Summer and Fall cruises remain intermingled showing similarity in the samples from those stations
- Zooscan accelerates the process of identifying and counting zooplankton, but requires validation to resolve genera
- Currently exploring the best ways to combine the two processing approaches for cluster analyses

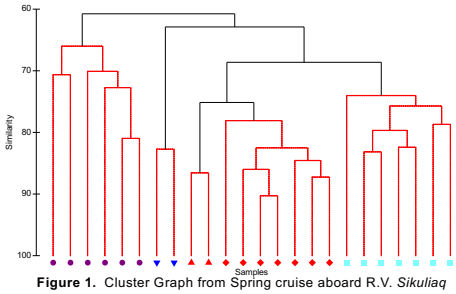


Figure 1. Cluster Graph from Spring cruise aboard R.V. *Sikuliaq*

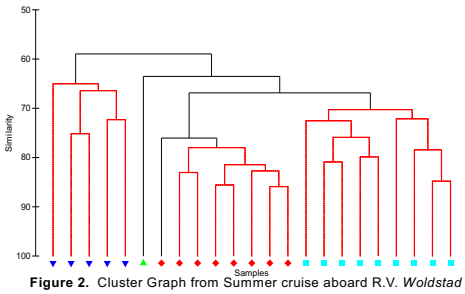


Figure 2. Cluster Graph from Summer cruise aboard R.V. *Woldstad*

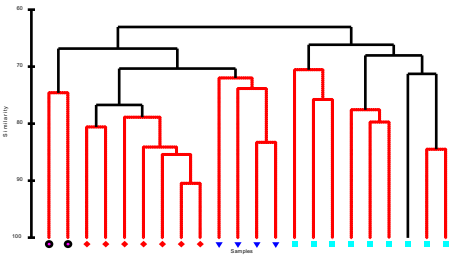


Figure 3. Cluster Graph from Fall cruise aboard R.V. *Tiglax*

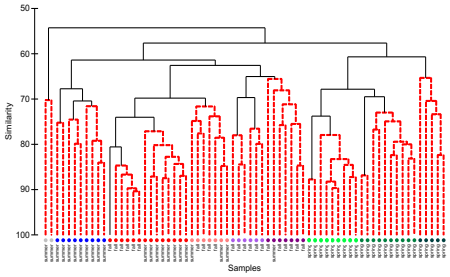


Figure 5. Cluster Graph of all three 2018 cruises

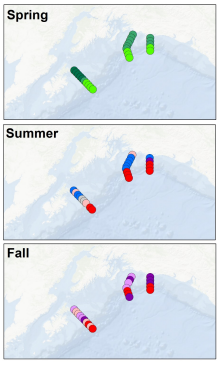
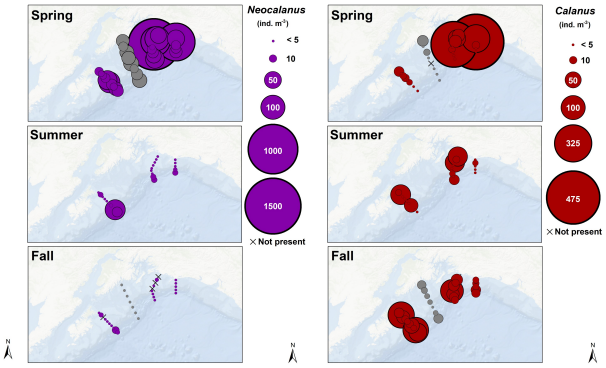


Figure 4. Cluster Map of all three 2018 cruises



Figures 6 &7. Bubble Maps of *Neocalanus* and *Calanus* counts from all 2018 cruises

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Undergraduate at University of California Santa Cruz