

The Effects of Environmental Changes in the Northern Gulf of Alaska on the Synthesis of Lipid in *Neocalanus flemingeri* and *Neocalanus plumchrus* from 2018-2019

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Purpose

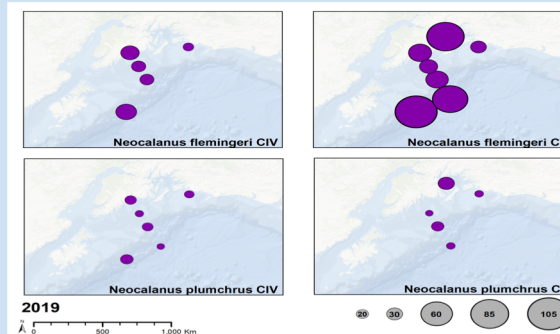
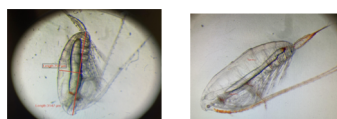
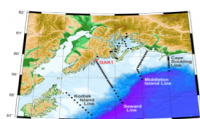
The storage of lipid is an essential aspect of life in high-latitude copepods that rely on it during periods of diapause, for energy storage, and for reproduction. Changes in the amount of lipid present in zooplankton can have detrimental consequence to their future reproductive rate, as well as on the overall ocean ecosystem carrying capacity where lipid-rich zooplankton serve as a main food source for many marine species.

In the sub-arctic Gulf of Alaska, the amount of lipid within the keystone *Neocalanus plumchrus* and *Neocalanus flemingeri* is likely dependent on the environmental temperature, food availability/quality, and their residence time in favorable feeding environments. We examined: 1) whether the lipid content from samples of these two species differed, from 2018 to 2019, across the GOA shelf, and 2) compared the lipid content between *N. plumchrus* and *N. flemingeri*, and between the different life stages of the animals.



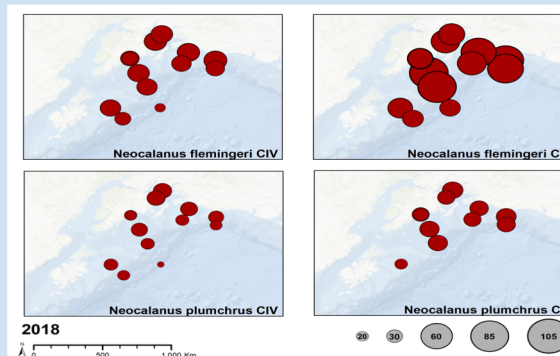
Methods

- Samples were collected along the Cape Suckling Line, the Middleton line, the Seward Line, and the Kodiak Line using a 150 μ m calvet net that was vertically hauled from a max depth of 100m.
- Copepods were live sorted and according to species and stage daily. Approximately 50 of each group were digitally imaged while alive to avoid deterioration of the lipid sac.
- Images were transferred to Spot Imaging software to measure prosome length and height of each animal. Photoshop was used to determine the area of the lipid sacs.



Percent Lipid for *Neocalanus* sp. 2019

- Animals closer to the shelf had greater percent lipid
- *N. flemingeri* had greater percent lipid than *N. plumchrus*

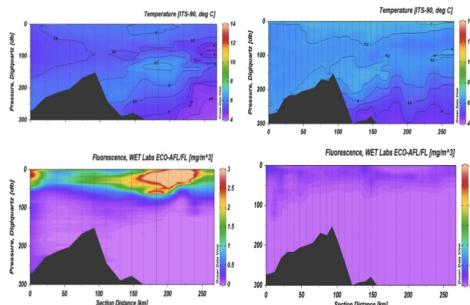


Percent Lipid for *Neocalanus* sp. 2018

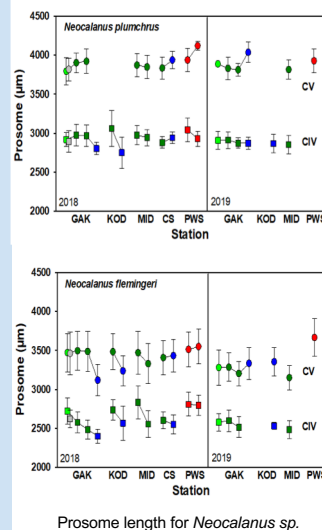
- Animals closer to the shelf had greater percent lipid
- Greater percent lipid when compared to 2019

Background Information

- *Neocalanus plumchrus* and *Neocalanus flemingeri* feed on phytoplankton and incorporating the phytoplankton's fatty acids into their storage lipids.
- Thus, the availability and quality of phytoplankton is vital to the maintenance and success of the lipid sac.
- Environmental factors, such as temperature, influence food availability, when the animals go into diapause, and reproductive patterns.
- The charts below represent the temperature and fluorescence readings of the Seward Line in the Gulf of Alaska in spring 2018 and spring 2019, the other study sites showed similar patterns.



Results



Prosome length for *Neocalanus* sp.

Spring 2018 and Spring 2019

Conclusion

- *N. plumchrus* and *N. flemingeri* both performed better in terms of percent lipid and overall size in 2018 compared to 2019. These findings are possibly indicative of the temperature and fluorescence readings, which show that in the GOA shelf, the water in 2019 was warmer, and there was also substantially less phytoplankton activity.
- In 2018 there was a greater cross shelf difference, as animals in and around the shelf and Prince William Sound, had more lipid than those that were collected at offshore stations.
- *N. flemingeri* had greater percent lipid and *N. plumchrus* had greater prosome length relative to one another. The stage V's of both species were also bigger with more lipid when compared to the stage IV's.

Acknowledgements

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