Remote sensing of planktonic copepod Calanus finmarchicus (Calanus) in the western North Atlantic

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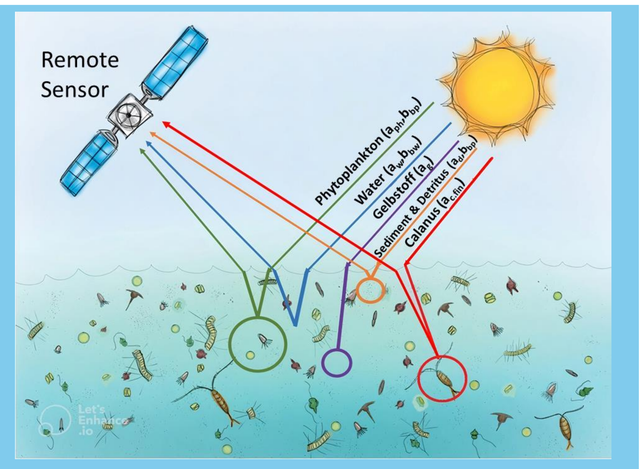
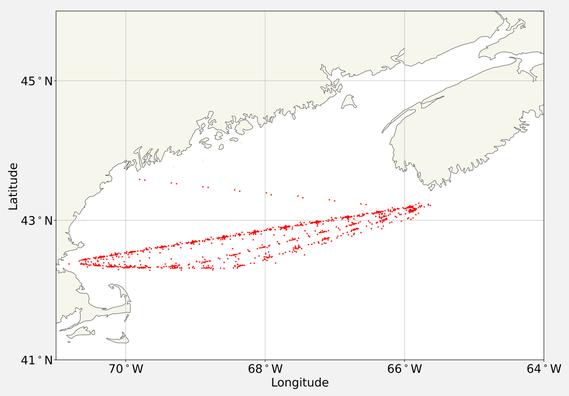
Overview

- The planktonic copepod Calanus finmarchicus (Calanus) plays a vital role in the marine food web as a crucial link between phytoplankton and higher trophic levels.
- Calanus are the prey source for the critically endangered North Atlantic right whale.
- By demonstrating the potential utility of ocean color remote sensing and radiative transfer modeling, this study provides important insights for detecting Calanus in the western North Atlantic.

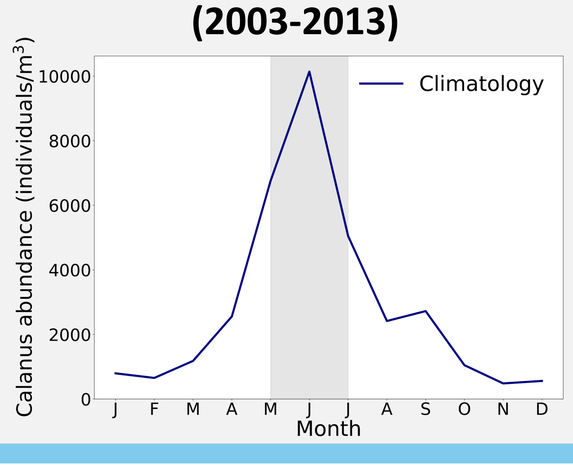


Zooplankton Remote sensing

Gulf of Maine Calanus CPR Datasets (2003-2013)



Calanus CPR Climatology (2003-2013)



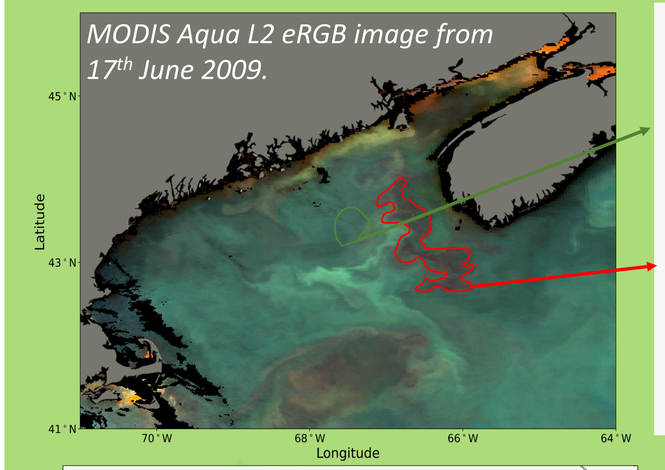
The Continuous Plankton Recorder (CPR) time-series observations (2003 – 2013) of Calanus shows high abundance in the Gulf of Maine during summer months (June – August).

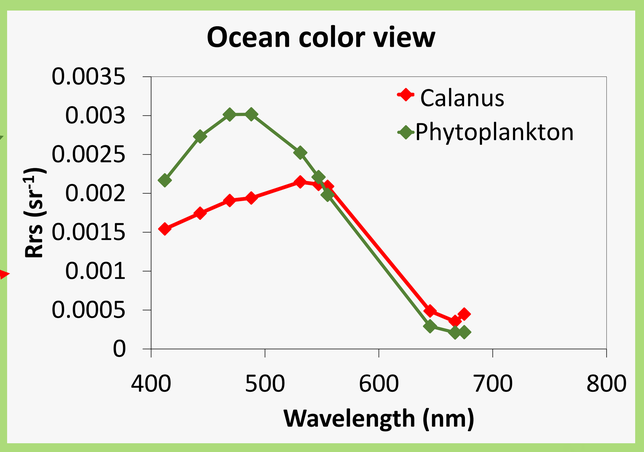
CPR - Satellite matchups

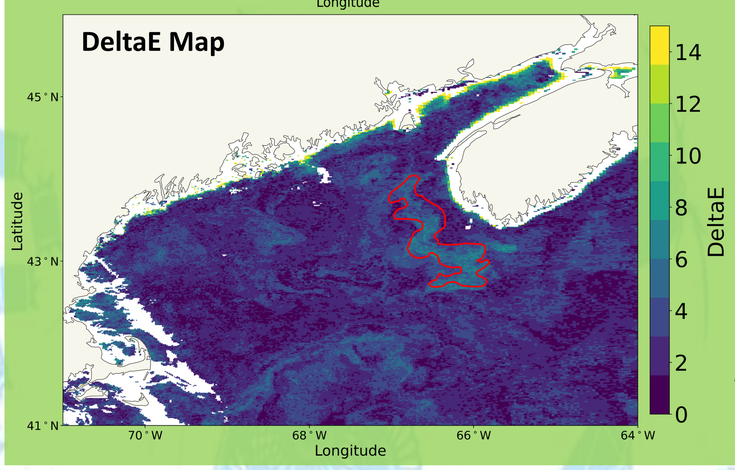
Using CPR-satellite matchups, we're identifying potential Calanus patches in the Gulf of Maine, concentrating on the summer season when they're highly abundant. Our analysis is based on ocean color remote sensing satellite data spanning from 2003 to present.

Ocean color view of Calanus patch in Gulf of Maine

The figure illustrates the Calanus patches with densely-packed red pixels and a distinct spectral signature that differs from phytoplankton.



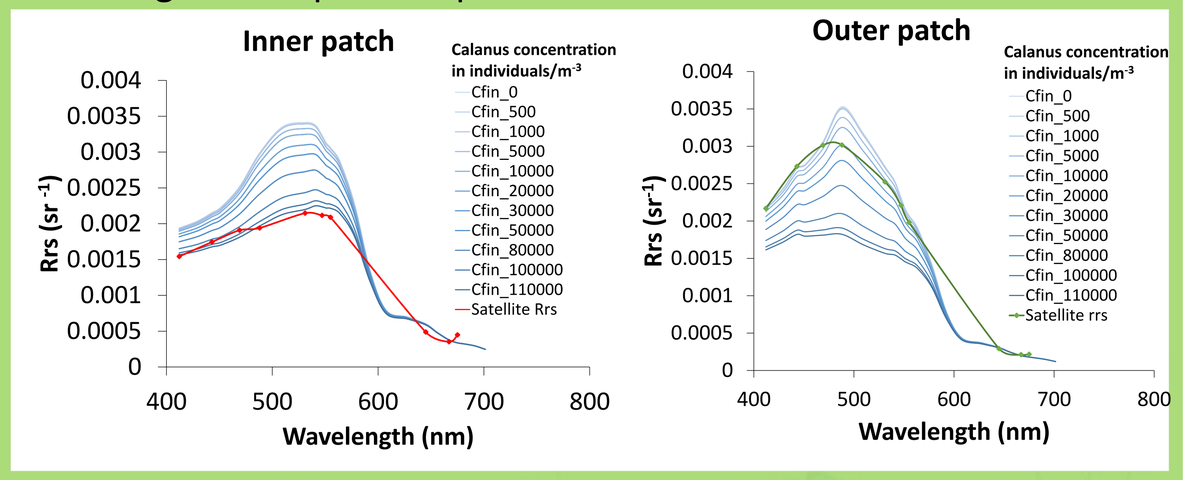




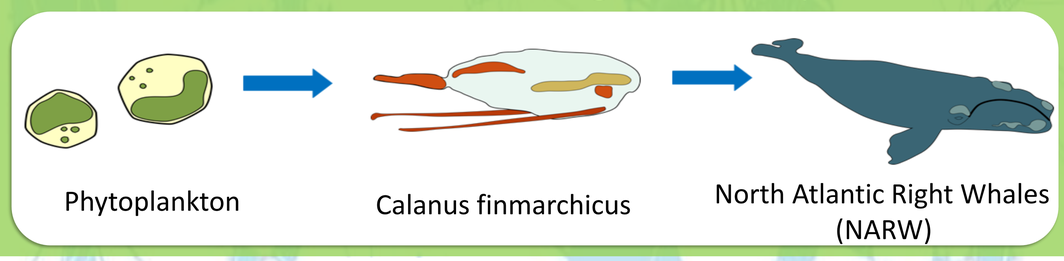
DeltaE measures color contrast based on human eye sensitivity in an RGB image. In the Calanus patch (highlighted in red), the DeltaE shows a significant color difference, implying that the presence of Calanus changes the optical properties of the water in that region.

Radiative transfer modelling

Adding Calanus absorption to the remote sensing reflectance model improved the match with satellite-derived reflectance, enabling a more precise quantification of its abundance.



Our study highlights the importance of using ocean color remote sensing to study and understand complex marine ecosystems and the critical role of Calanus in sustaining these ecosystems.



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