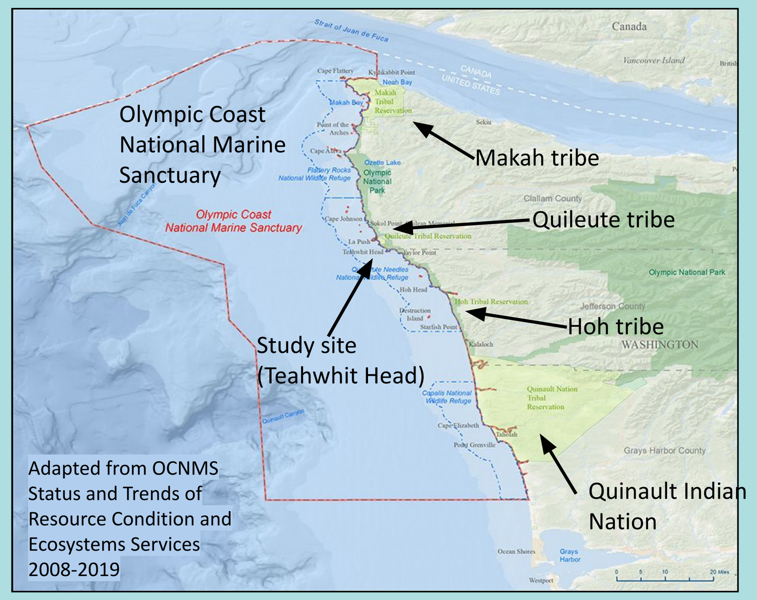
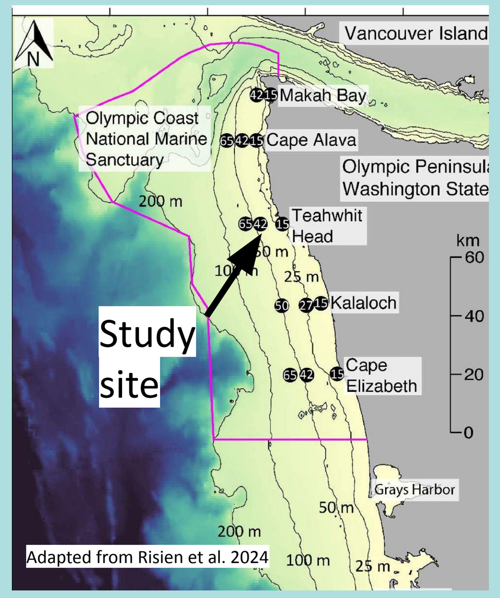
Effects of Hypoxia on Species Presence in Olympic Coast National Marine Sanctuary

Eleanor Crotty[1,2], Shannon Brown[1,3], Sean M. McAllister[1,3], Jeannette Waddell[4], Kathryn R Hough[4], Simone R. Alin[1], Matthew P. Galaska[1], Zachary Gold[1]

[1]Pacific Marine Environmental Lab, Oceanic and Atmospheric Research, National Oceanographic and Atmospheric Administration, Seattle, WA, USA, [2]Reed College, Portland, OR, USA, [3]Cooperative Institute for Climate, Ocean, & Ecosystem Studies, University of Washington, Seattle, WA, USA, [4]Olympic Coast National Marine Sanctuary, National Ocean Service, National Oceanographic and Atmospheric Administration, Port Angeles, WA, 98362

Background





How does species presence change with oxygen saturation?

Environmental DNA (eDNA) is a powerful tool for surveying marine life using DNA that species shed into the environment.

Hypoxic events occur when oxygen levels drop dangerously low: 20-30% saturation for most species. They are worsening worldwide, including in OCNMS[1].

Methods

Acquire oxygen and temperature data from the mooring closest to the sampler

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Clean environmental DNA sequencing data and convert to species presence/absence

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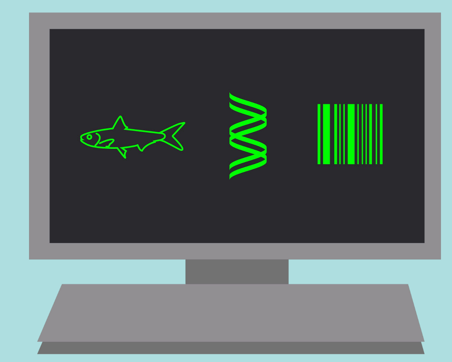
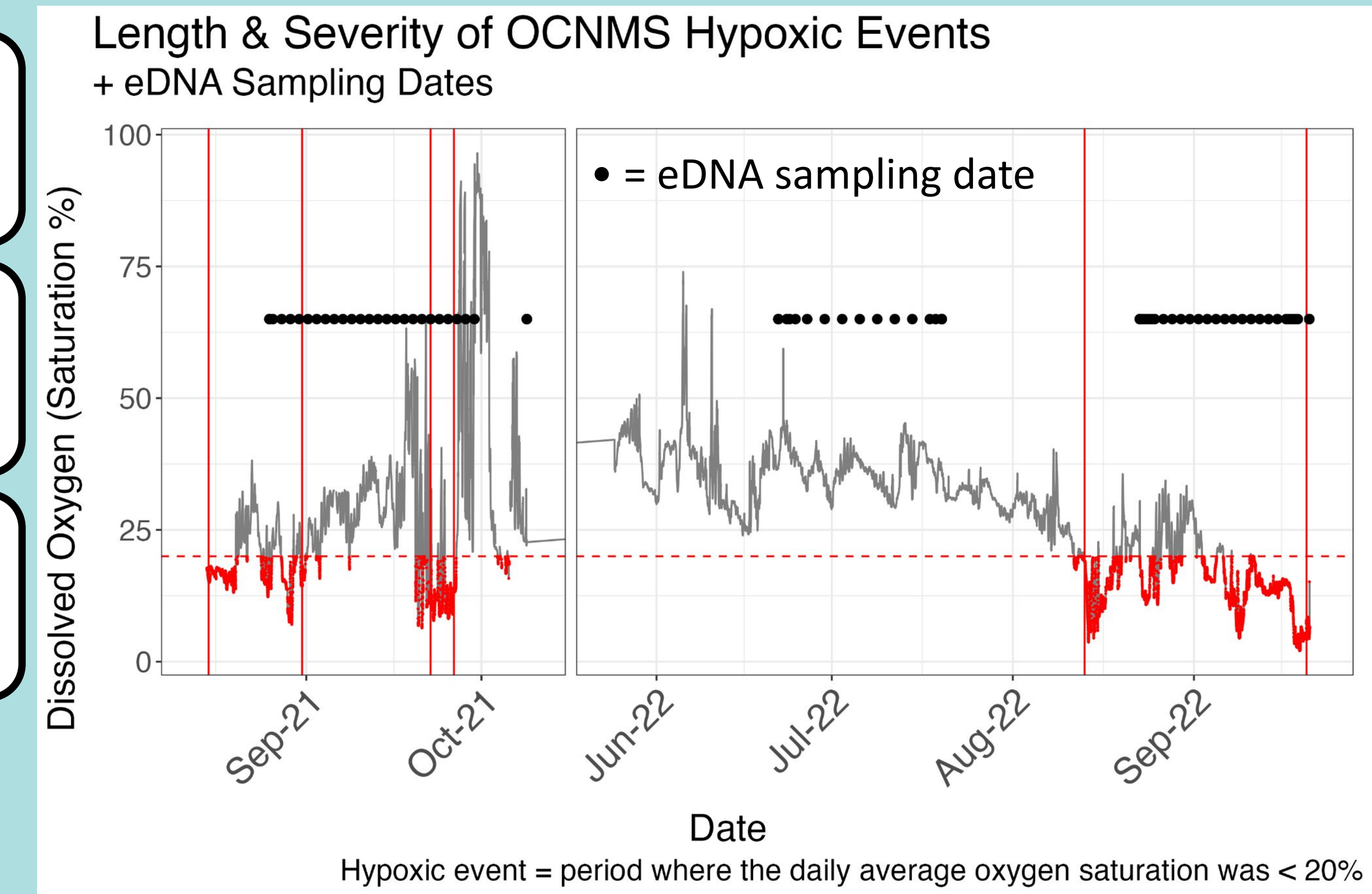
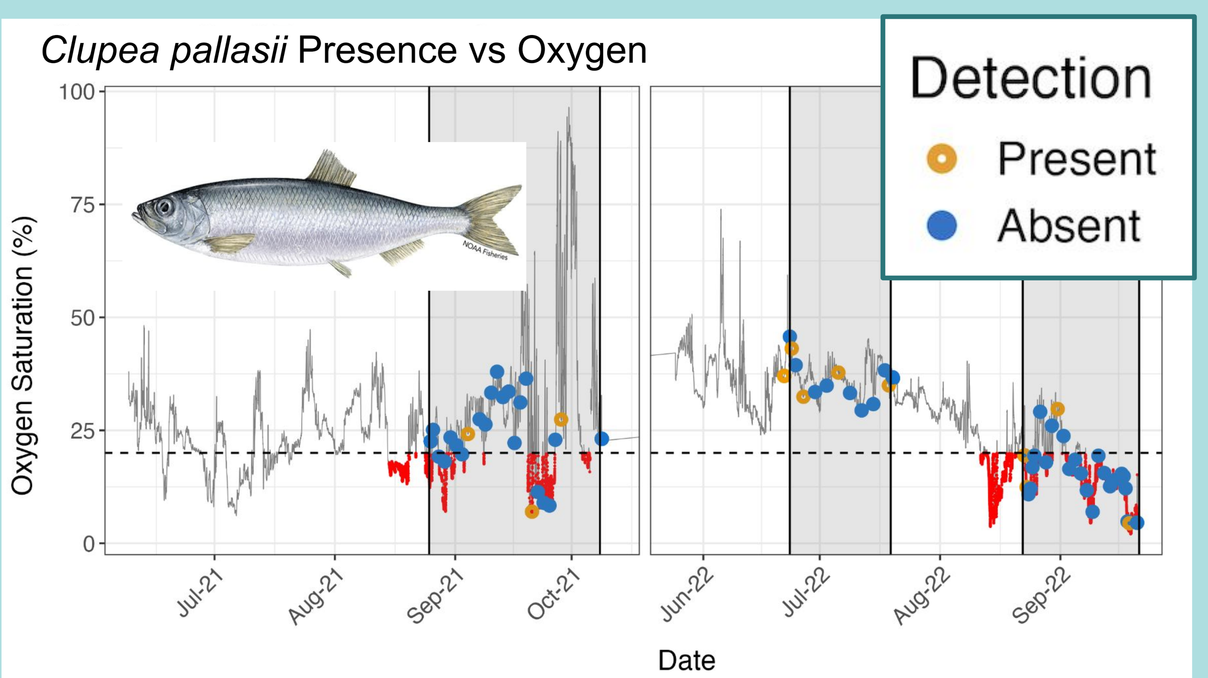
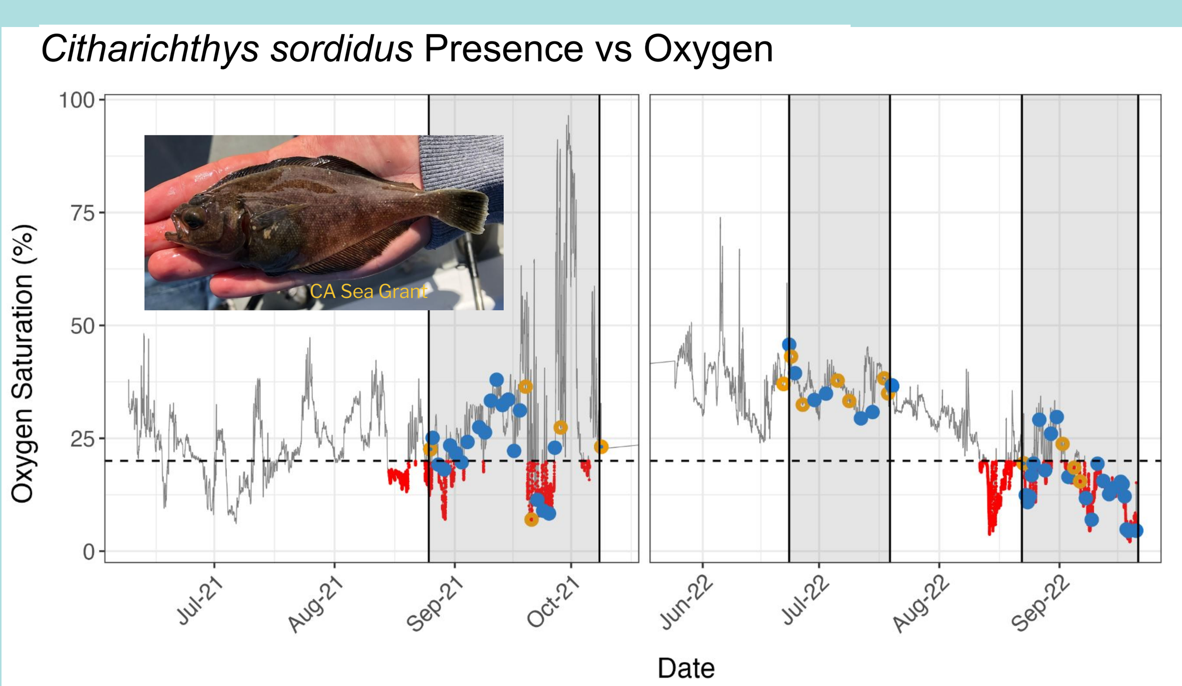
Combine environmental data with species presence/absence and look for patterns using plots and binomial regression





Results





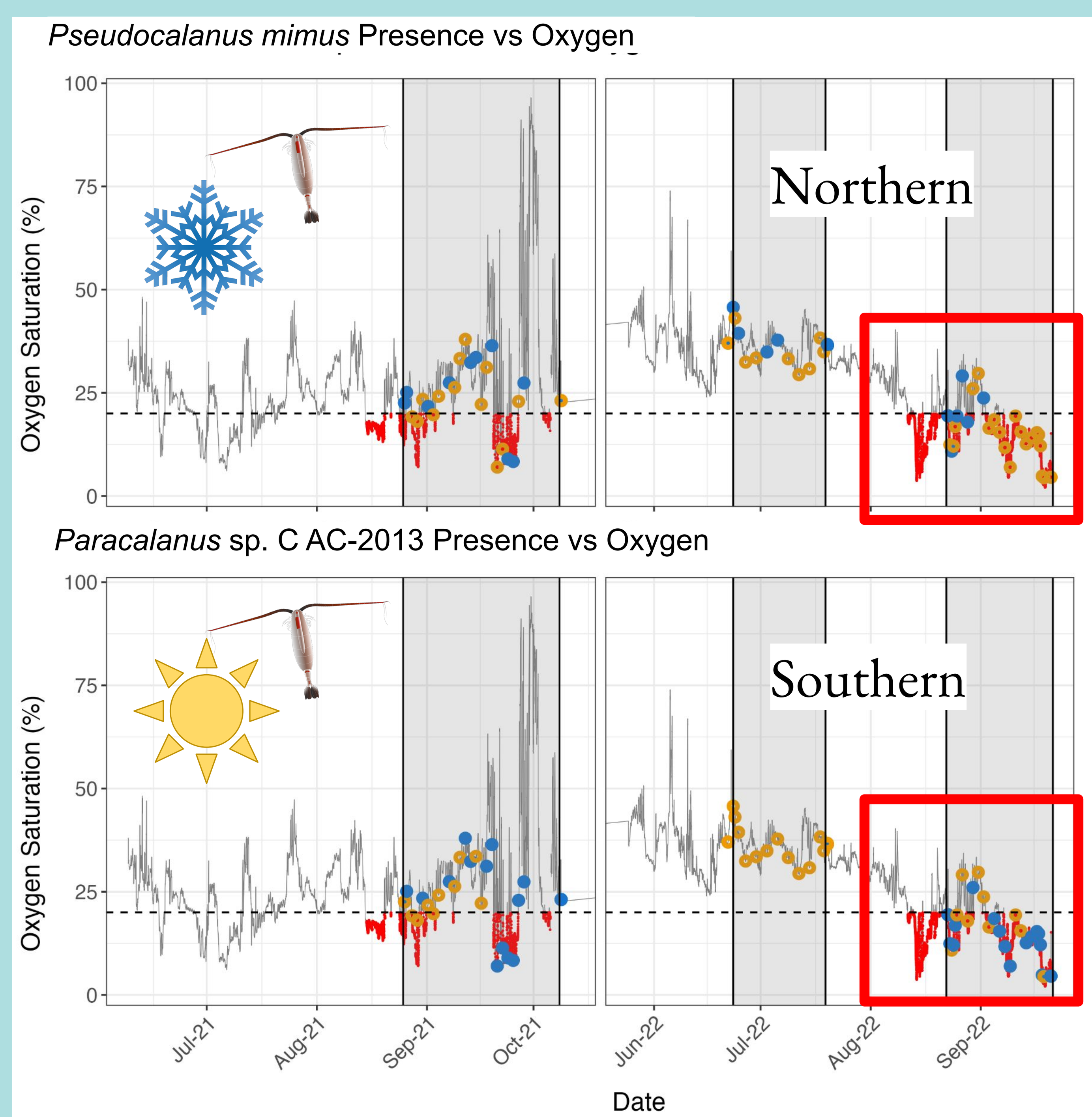
*While *P. mimus* wasn't detected during the major hypoxic event, a different northern copepod, *Acartia longiremis*, was.

Pacific herring:

- Co-developed priority species
- Known hypoxia tolerance[2]
- Binomial regression $p > 0.05$

Pacific sanddab:

- Benthic fish
  - Potentially moving to shallower water during hypoxic events - 50-150 m depth range, our sampler is in 42m deep water
- Known hypoxia tolerance[4]
- Binomial regression $p = 0.006$



These copepods, used as indicator species by NOAA Fisheries[3], had opposite responses to the 2022 hypoxia.

Discussion

- Evidence of hypoxia tolerance in two ecologically important species + hypoxia effects on other species
- This study supports the use of these combined data collection methods in monitoring networks across U.S. marine sanctuaries
- Next steps:
  - Fill 2023 oxygen data gap with models
  - More metrics: community composition, relative abundance

GitHub

Acknowledgments

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