Ocean Acidification: A *Brief* Overview

DEPARTMENT OF ECOLOGY
State of Washington

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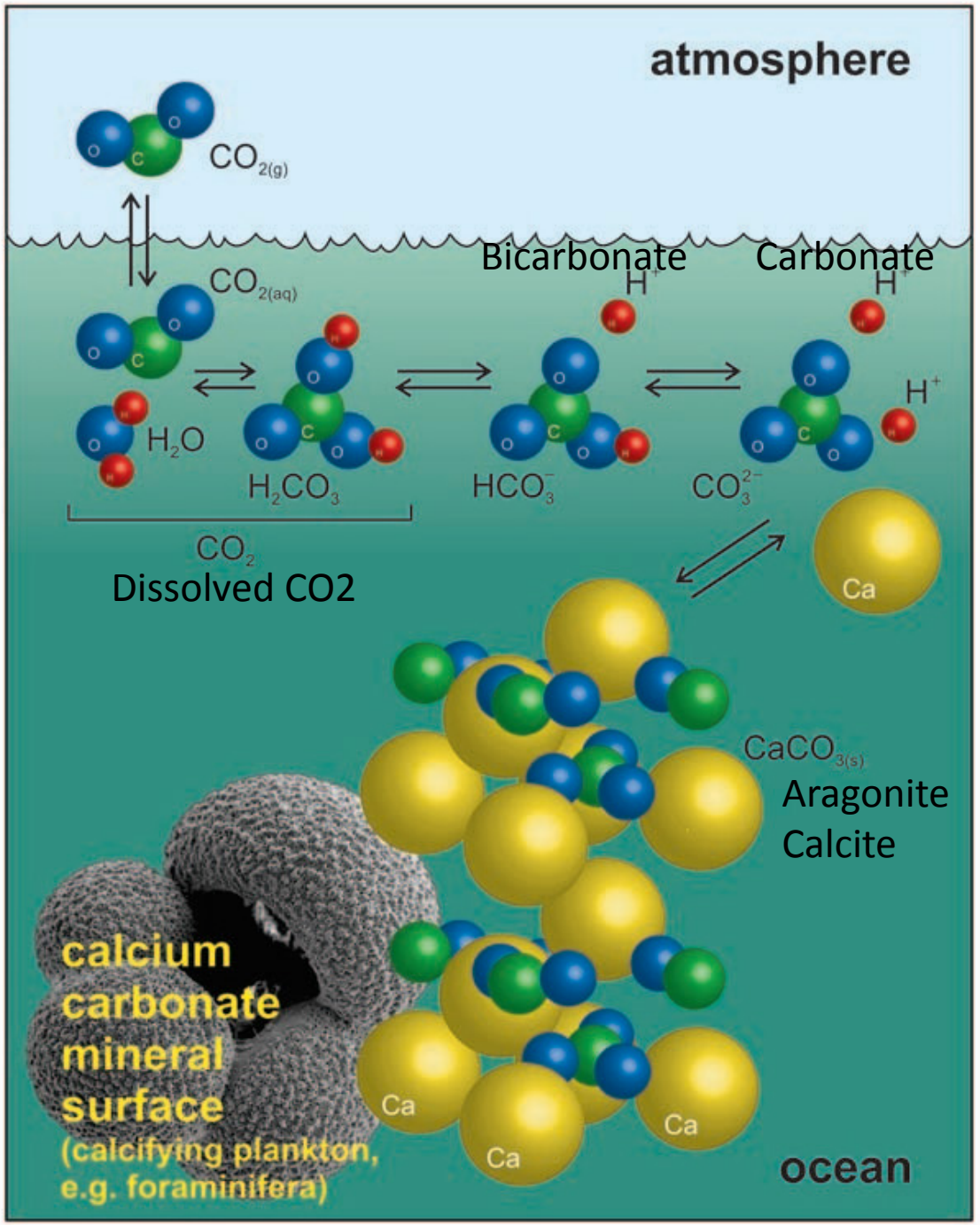
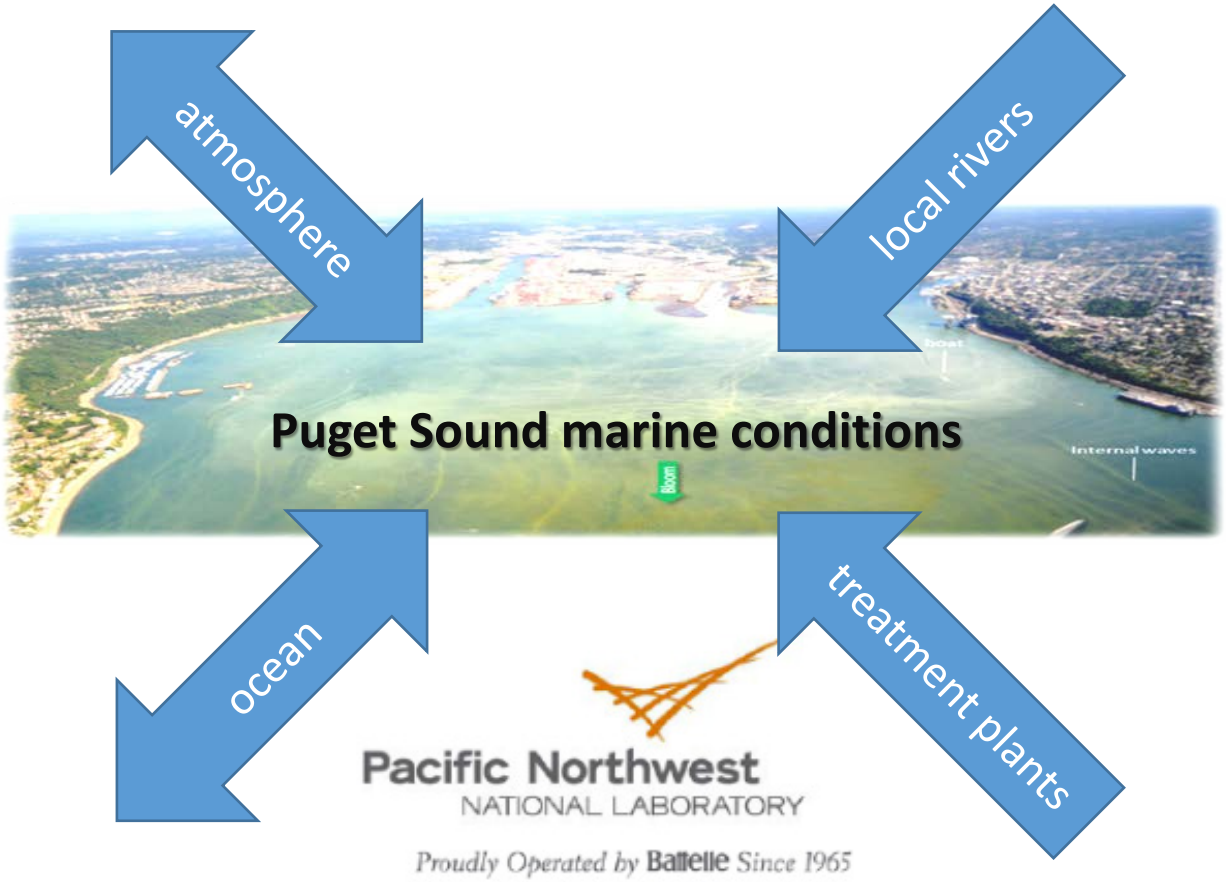


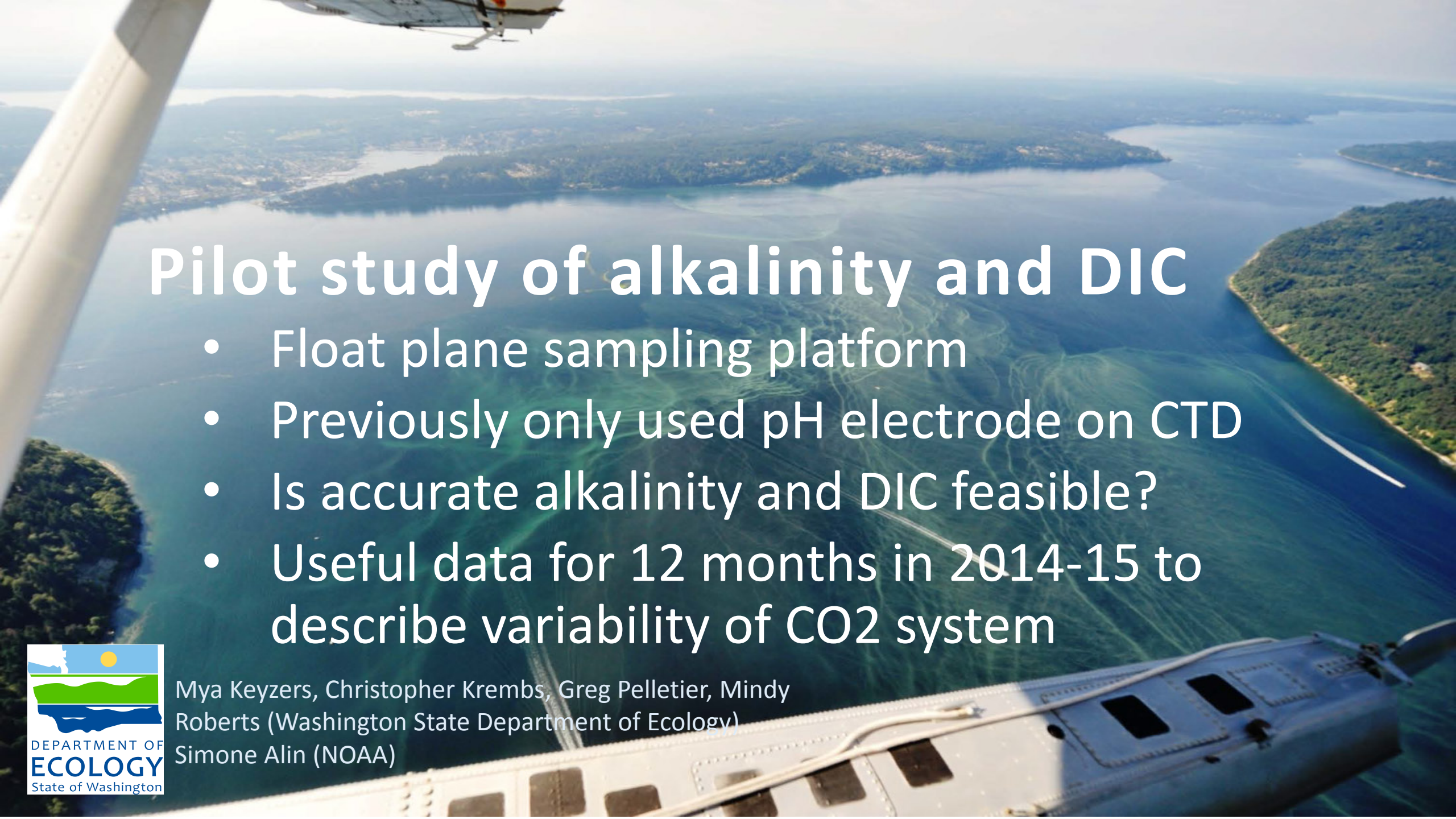
http://www.nature.com/scitable/knowledge/library/ocean-acidification-25822734

Acidification model development status

- 1. Model setup and testing
  - Based on Salish Sea model
  - Adding carbon system (ALK, DIC)
- 2. Calibration to marine data
  - Completed
  - Verification with larger data set of observations
- 3. Scenarios
  - Global vs. local impacts of nutrient loading
  - Evaluate relative influences



Thanks for the funding, EPA!



Pilot study of alkalinity and DIC

- Float plane sampling platform
- Previously only used pH electrode on CTD
- Is accurate alkalinity and DIC feasible?
- Useful data for 12 months in 2014-15 to describe variability of CO2 system

Mya Keyzers, Christopher Krembs, Greg Pelletier, Mindy Roberts (Washington State Department of Ecology)
Simone Alin (NOAA)

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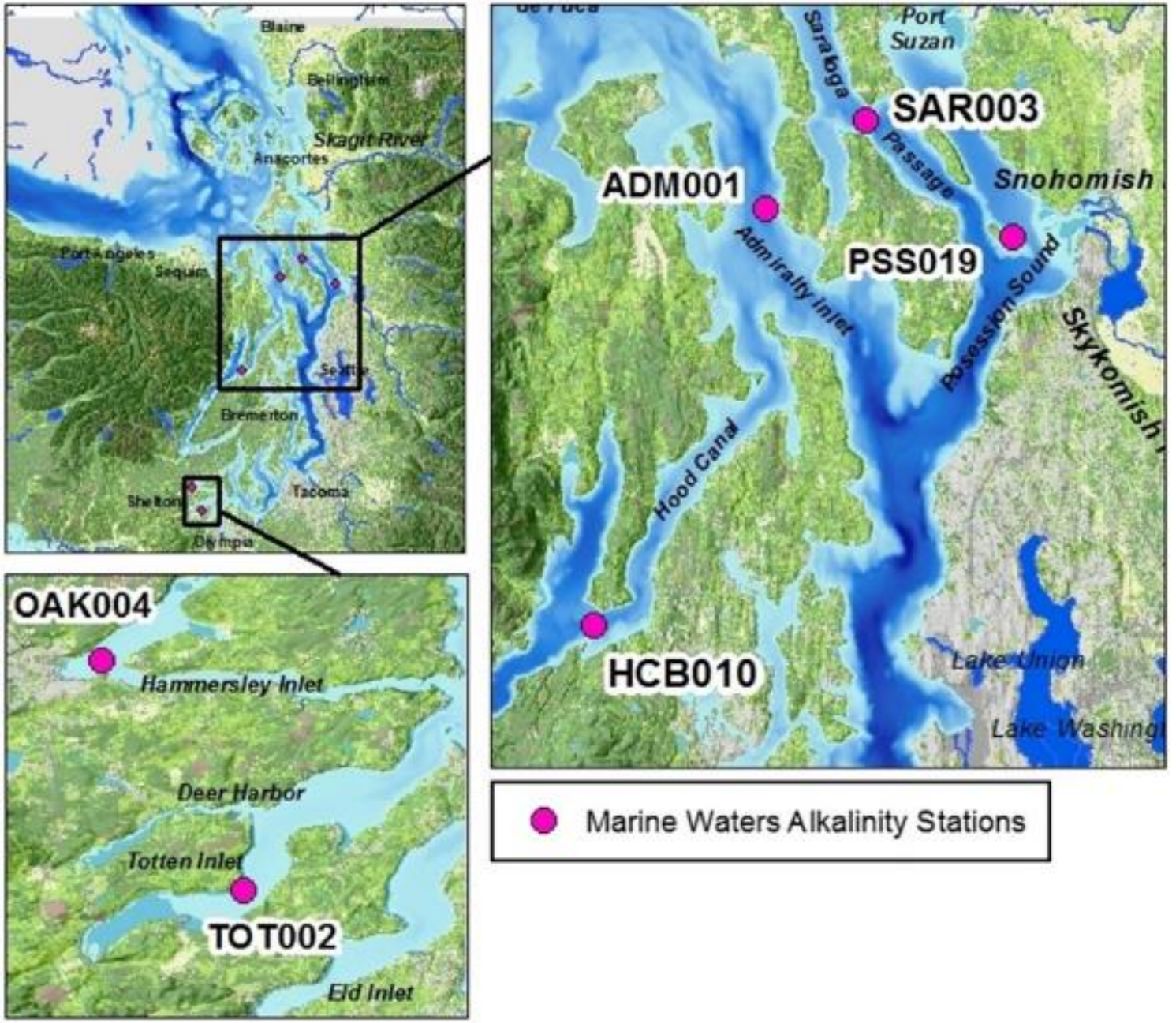
Monitoring locations

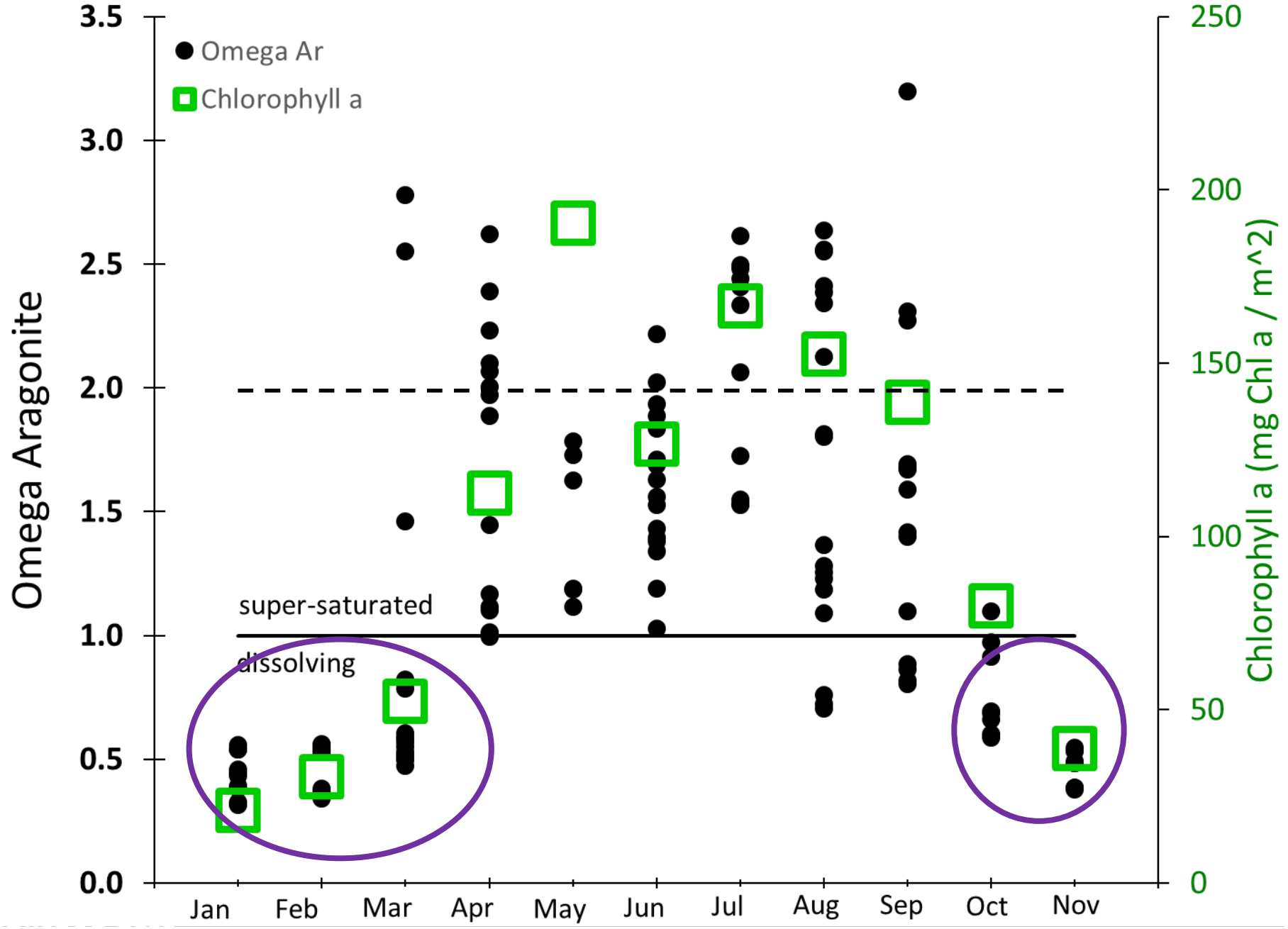
- Admiralty Inlet
- Possession Sound
- Saratoga Passage
- Hood Canal
- Hammersley Inlet
- Totten Inlet

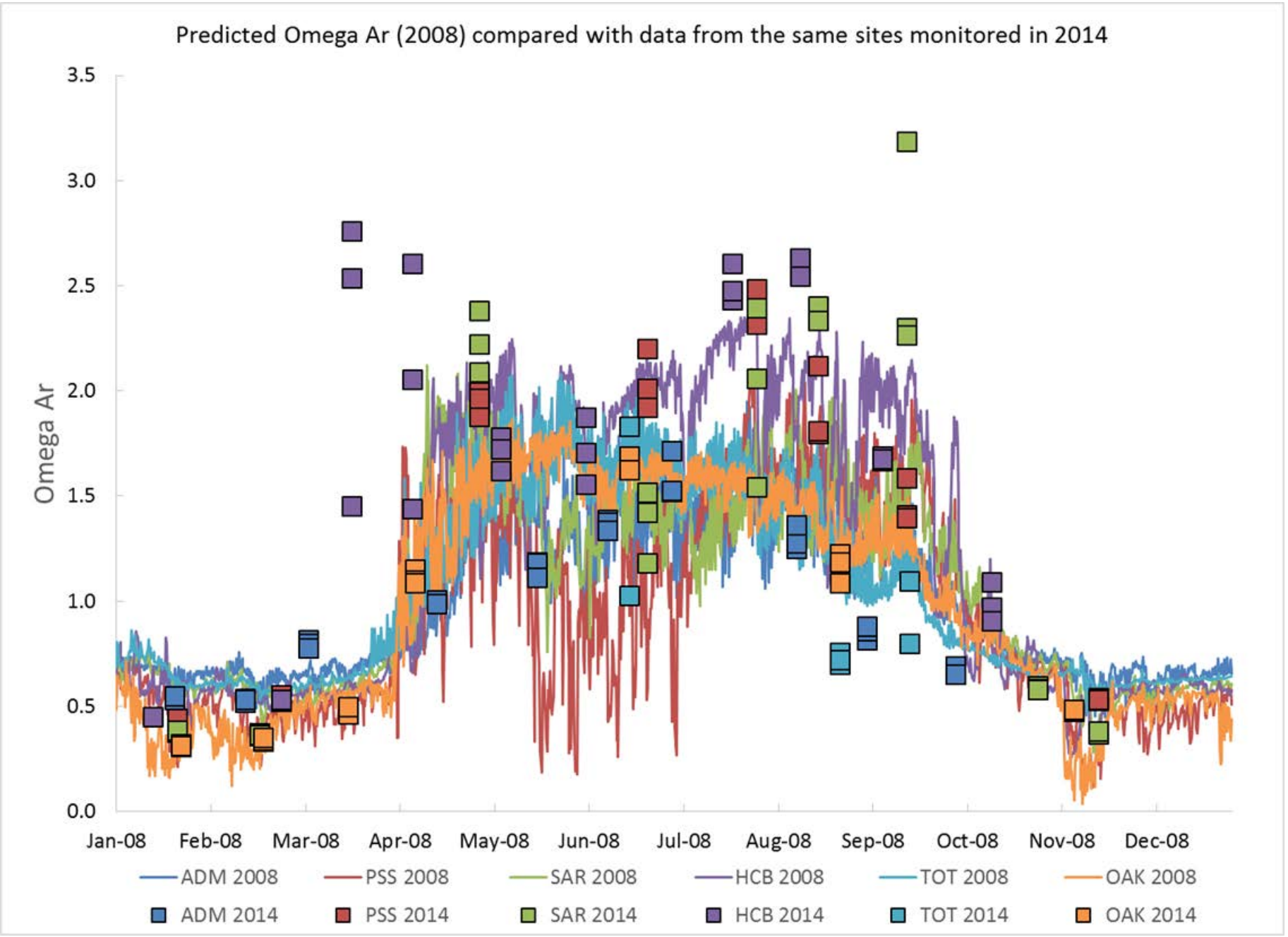


Aragonite saturation state

$$\Omega_{(aragonite)} = [CO_3^{2-}] * [Ca^{2+}] / K_{sp}^{*}{}_{(aragonite)}$$

If $\Omega_{(aragonite)}$ is <1,
then CaCO3 is under-saturated


Omega Ar
Chlorophyll a
Omega Aragonite
Chlorophyll a (mg Chl a / m^2)
super-saturated
dissolving
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
250
200
150
100
50
0
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov

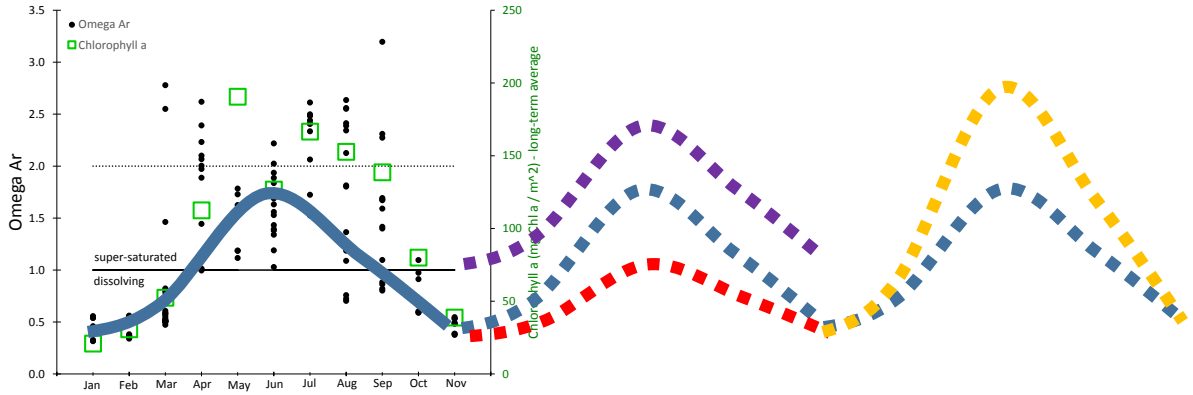


Omega <1 dissolving

Omega <2 can be stressful to calcifiers

Omega >2 is ideal

Need to establish baseline Ω_{arag} soon.
Not part of current marine monitoring…



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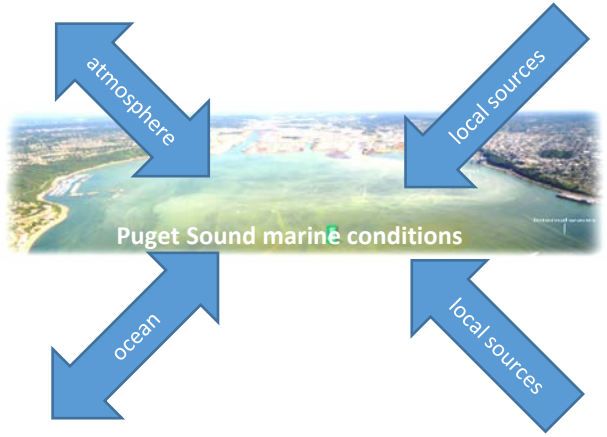
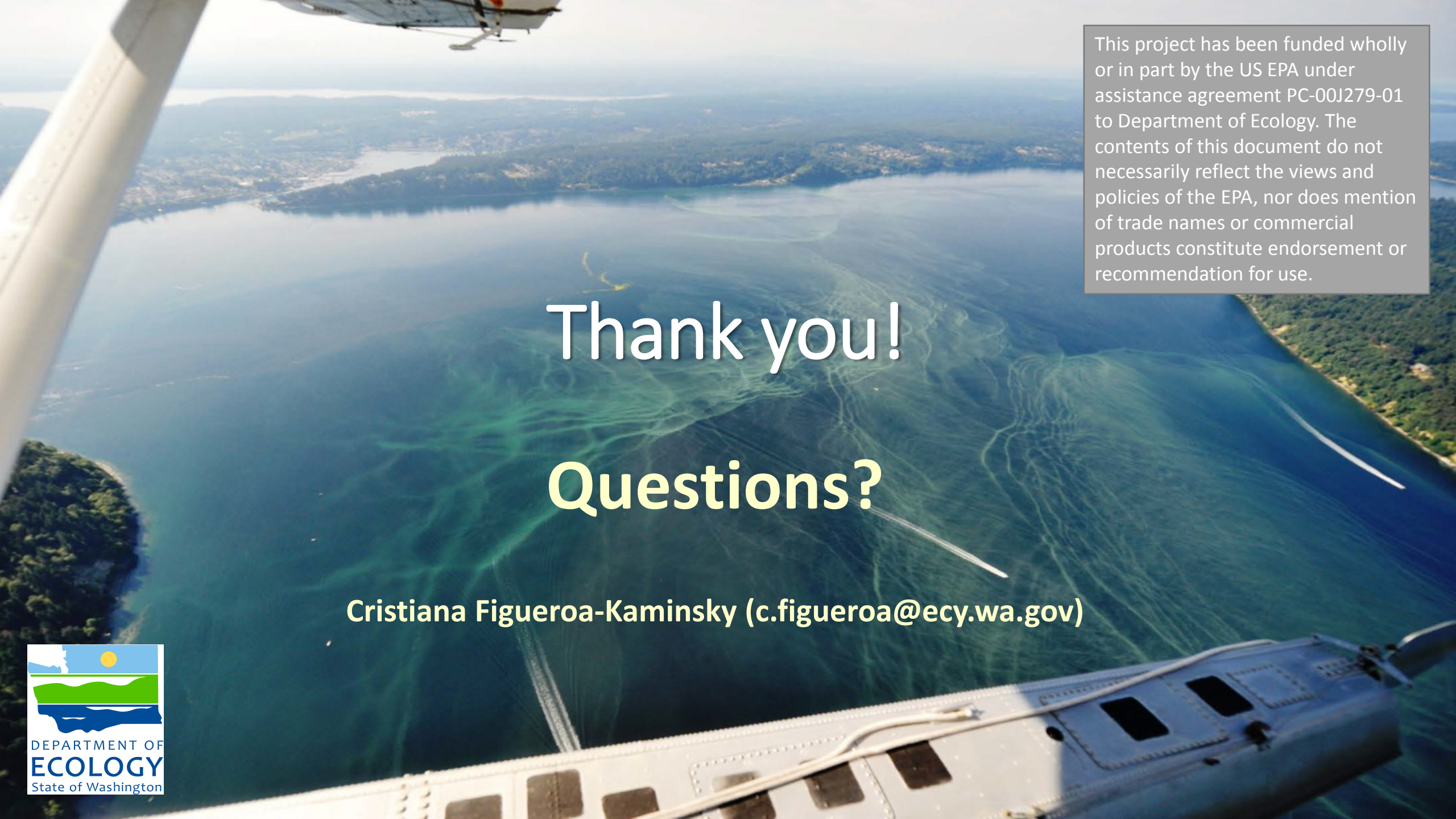
Continued baseline monitoring currently not funded, MRAC is submitting a proposal for supplemental funding





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Thank you!

Questions?

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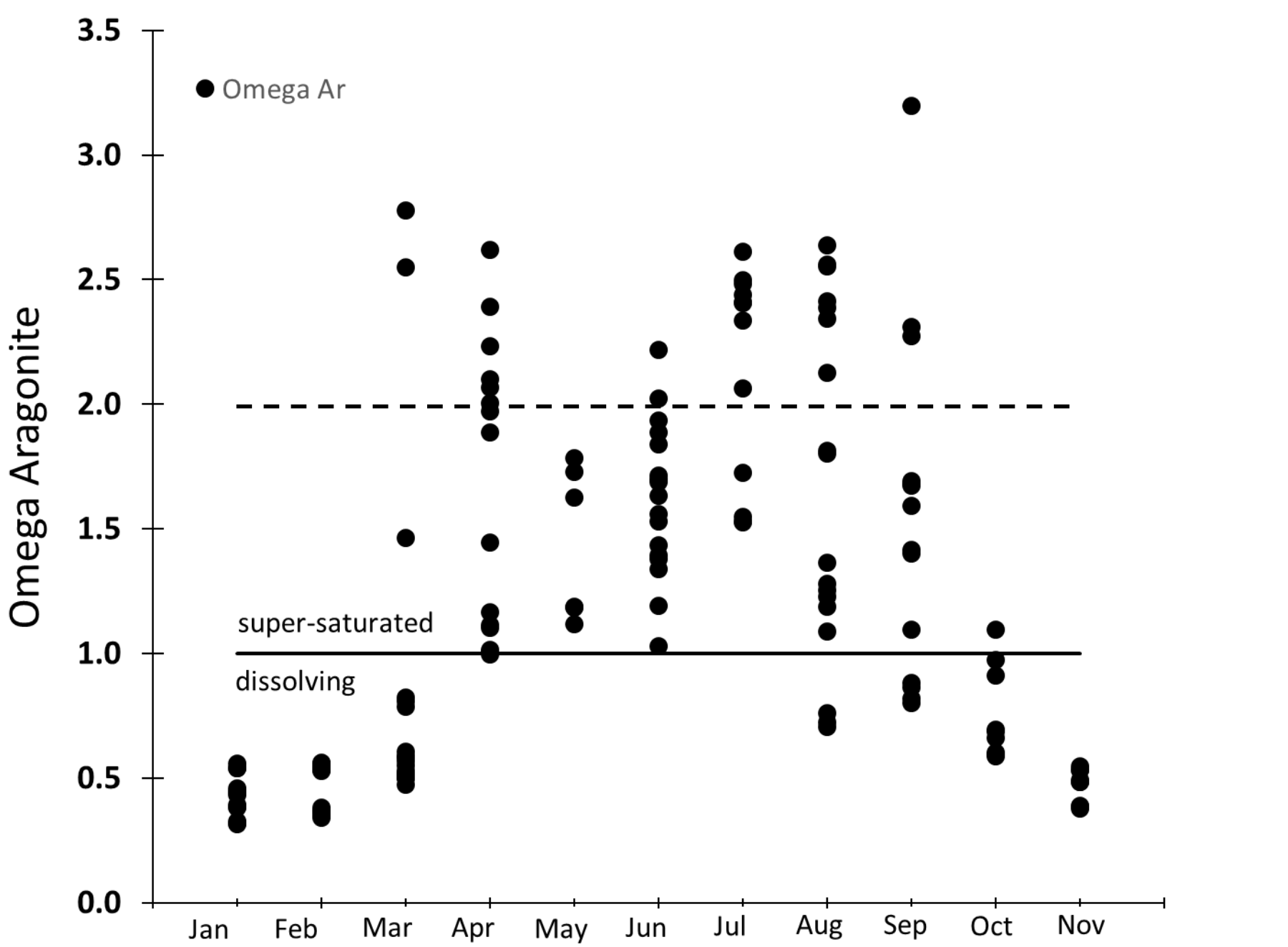
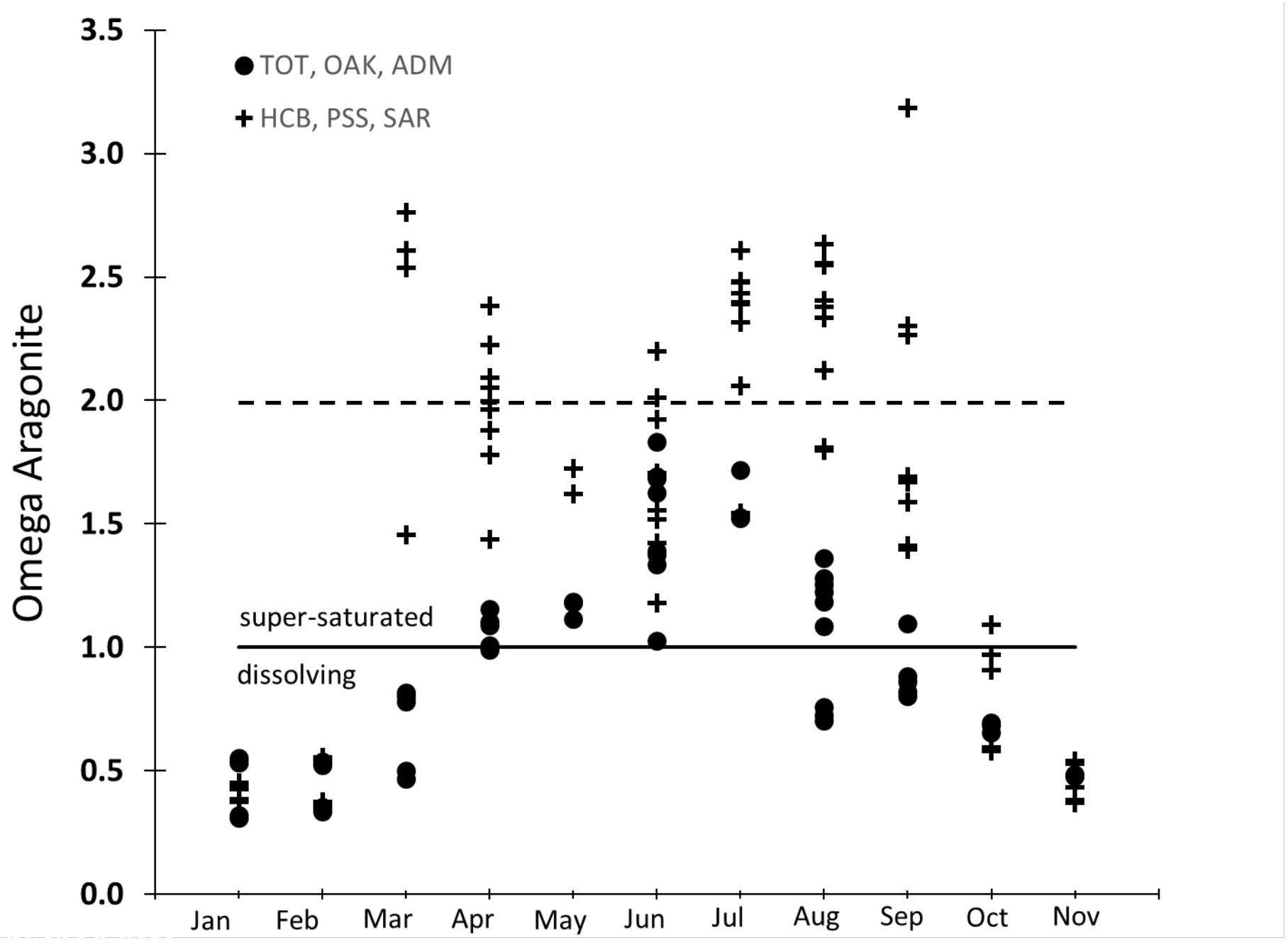
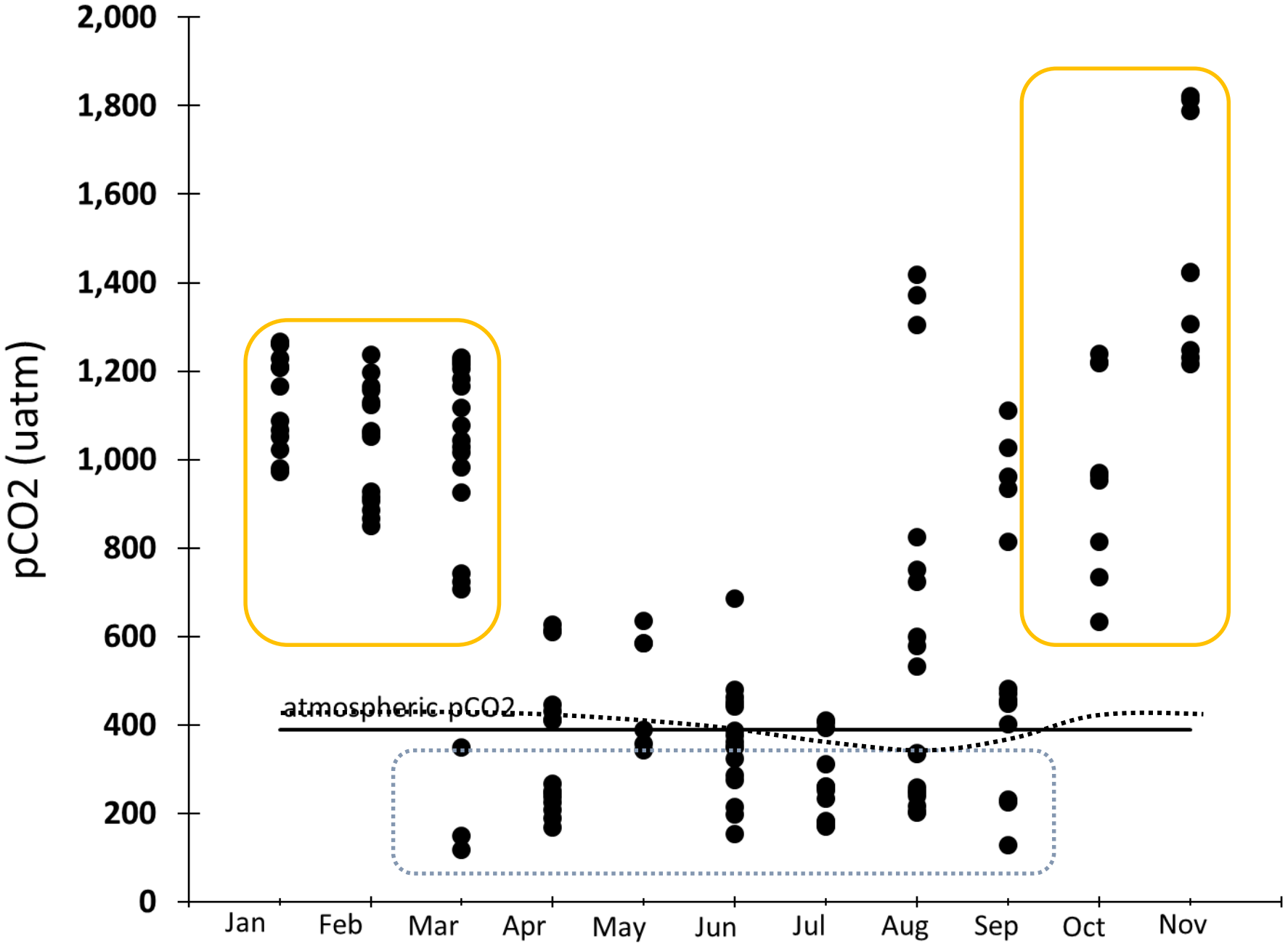
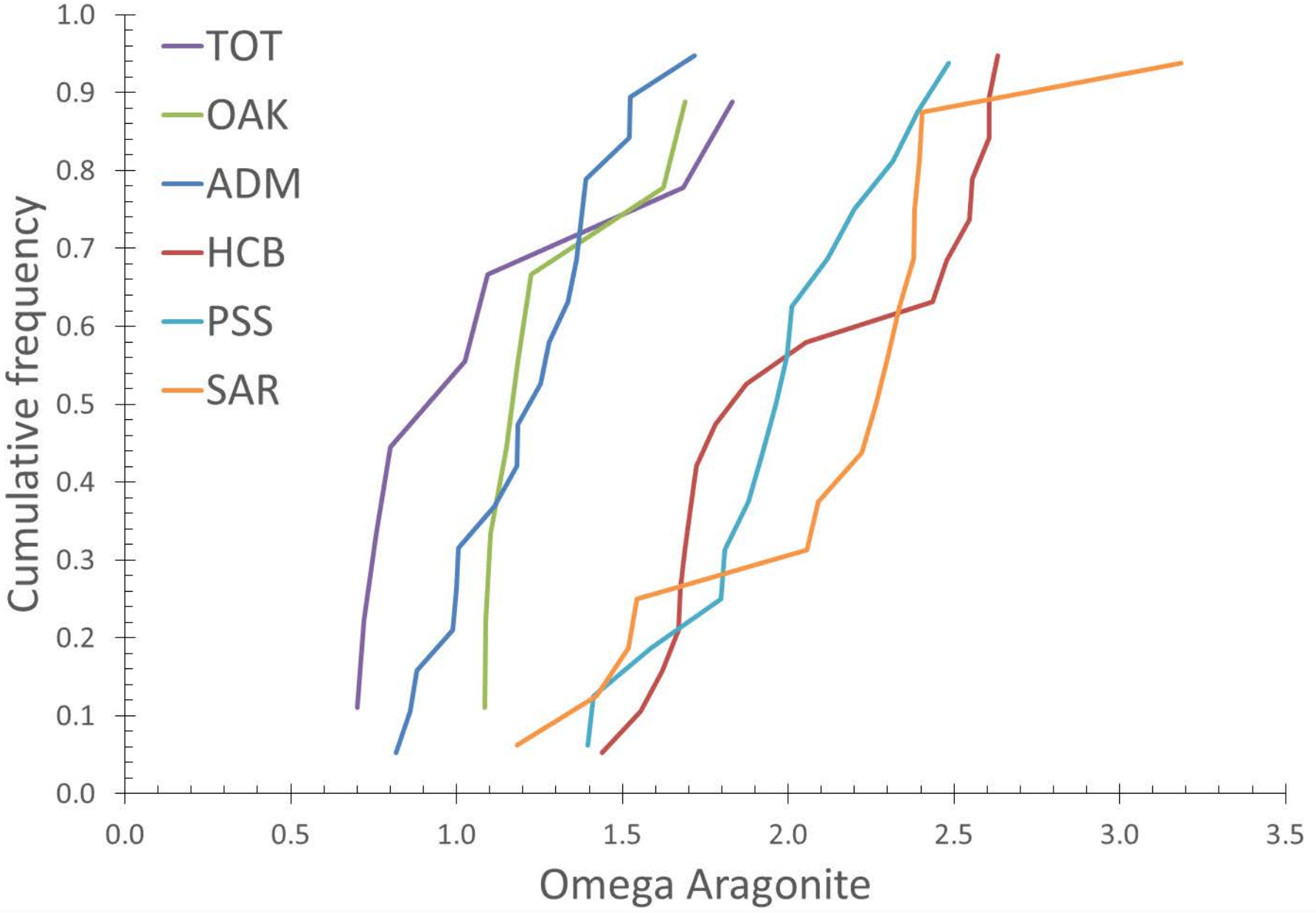
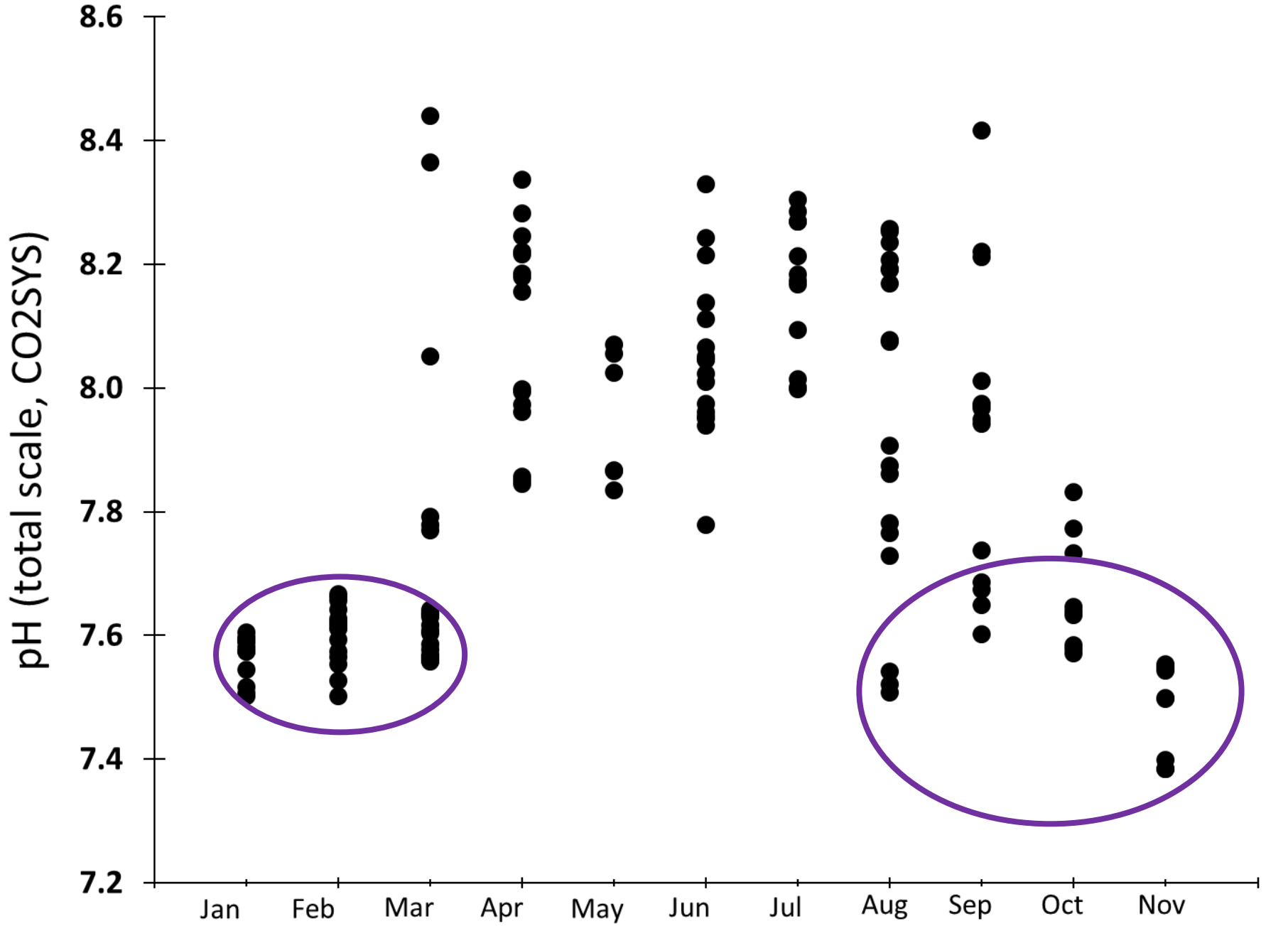

Omega Ar
Omega Aragonite
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
super-saturated
dissolving
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov


TOT, OAK, ADM
HCB, PSS, SAR
Omega Aragonite
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
super-saturated
dissolving
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov


2,000
1,800
1,600
1,400
1,200
1,000
800
600
400
200
0
pCO2 (uatm)
atmospheric pCO2
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov

April-September cumulative frequency of Omega-Ar at depth of 5 m




pH (total scale, CO2SYS)
8.6
8.4
8.2
8.0
7.8
7.6
7.4
7.2
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov