South Sound Floating Kelp Status, Trends, and Drivers



Danielle Claar

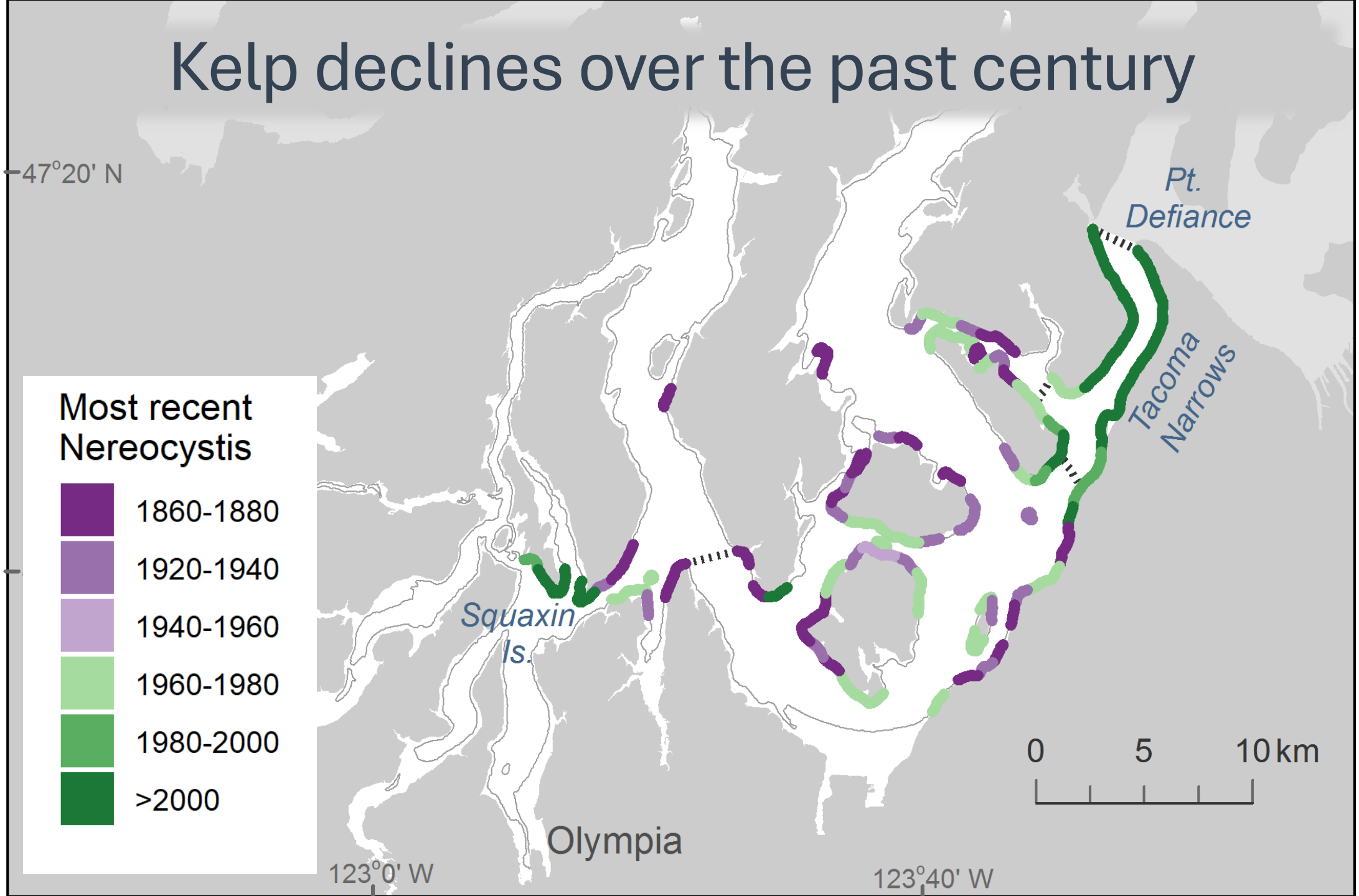
Nearshore Habitat Program, DNR

South Sound Science Symposium

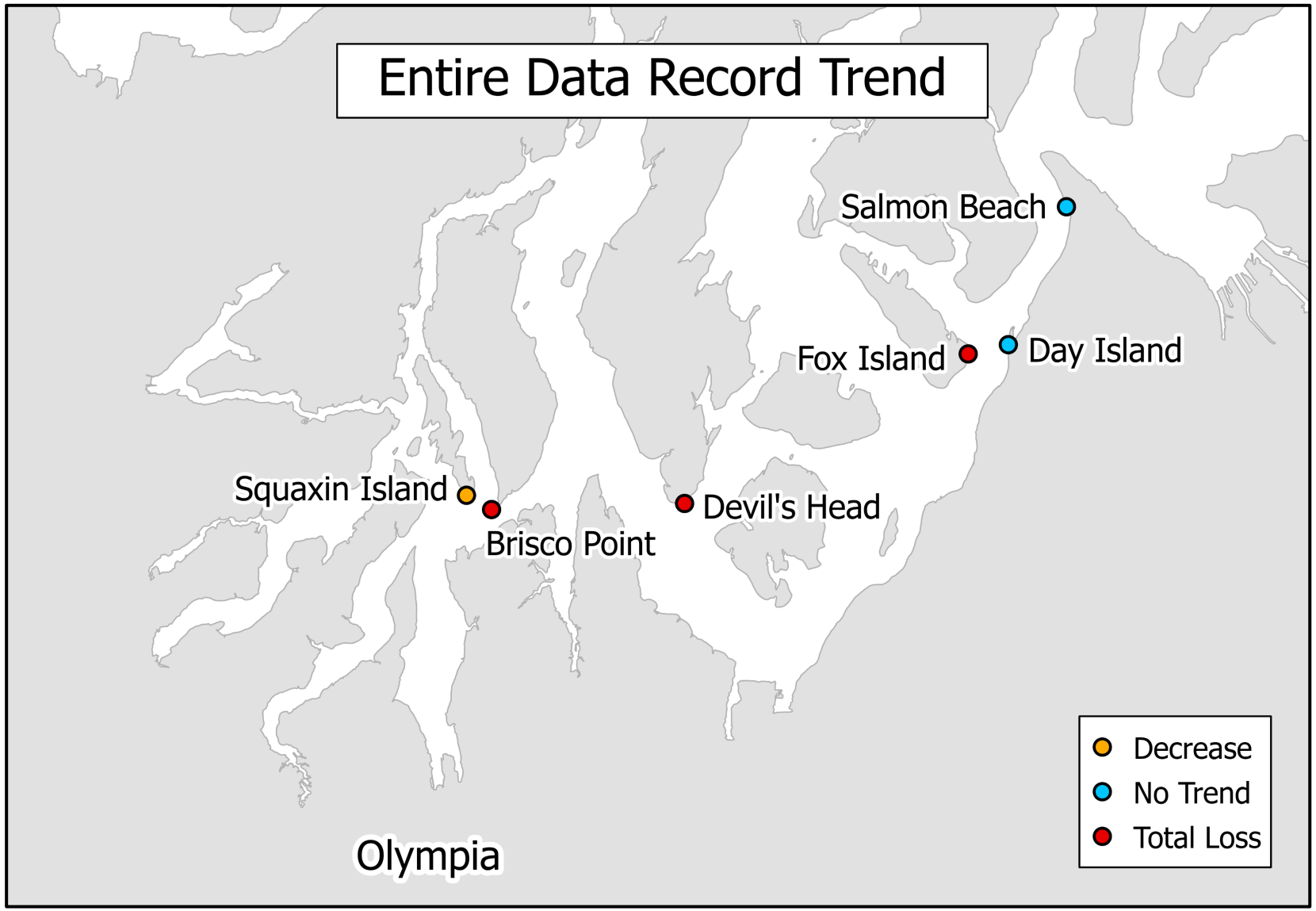
October 15, 2026

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Kelp declines over the past century



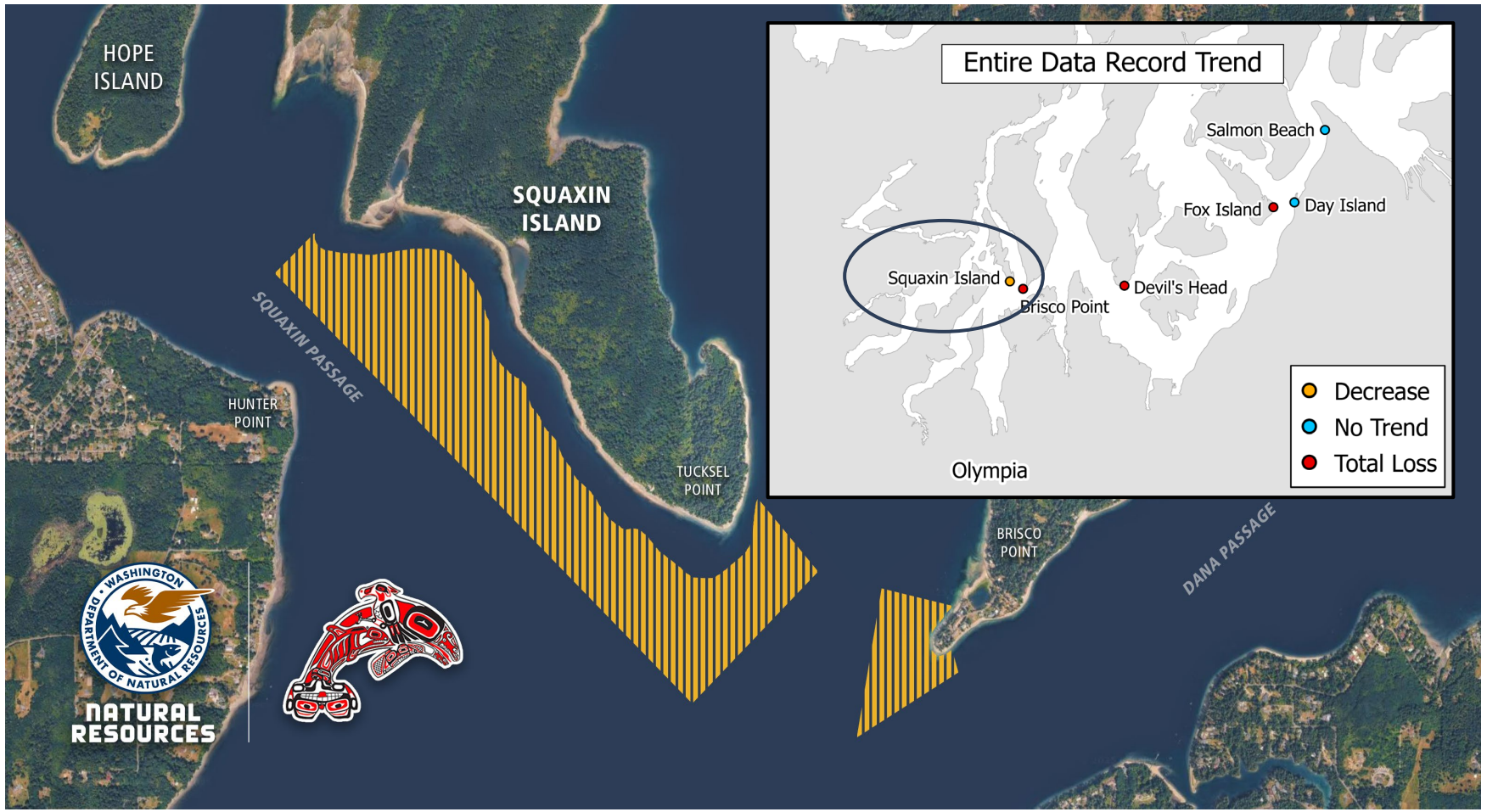
DNR kelp monitoring in South Sound





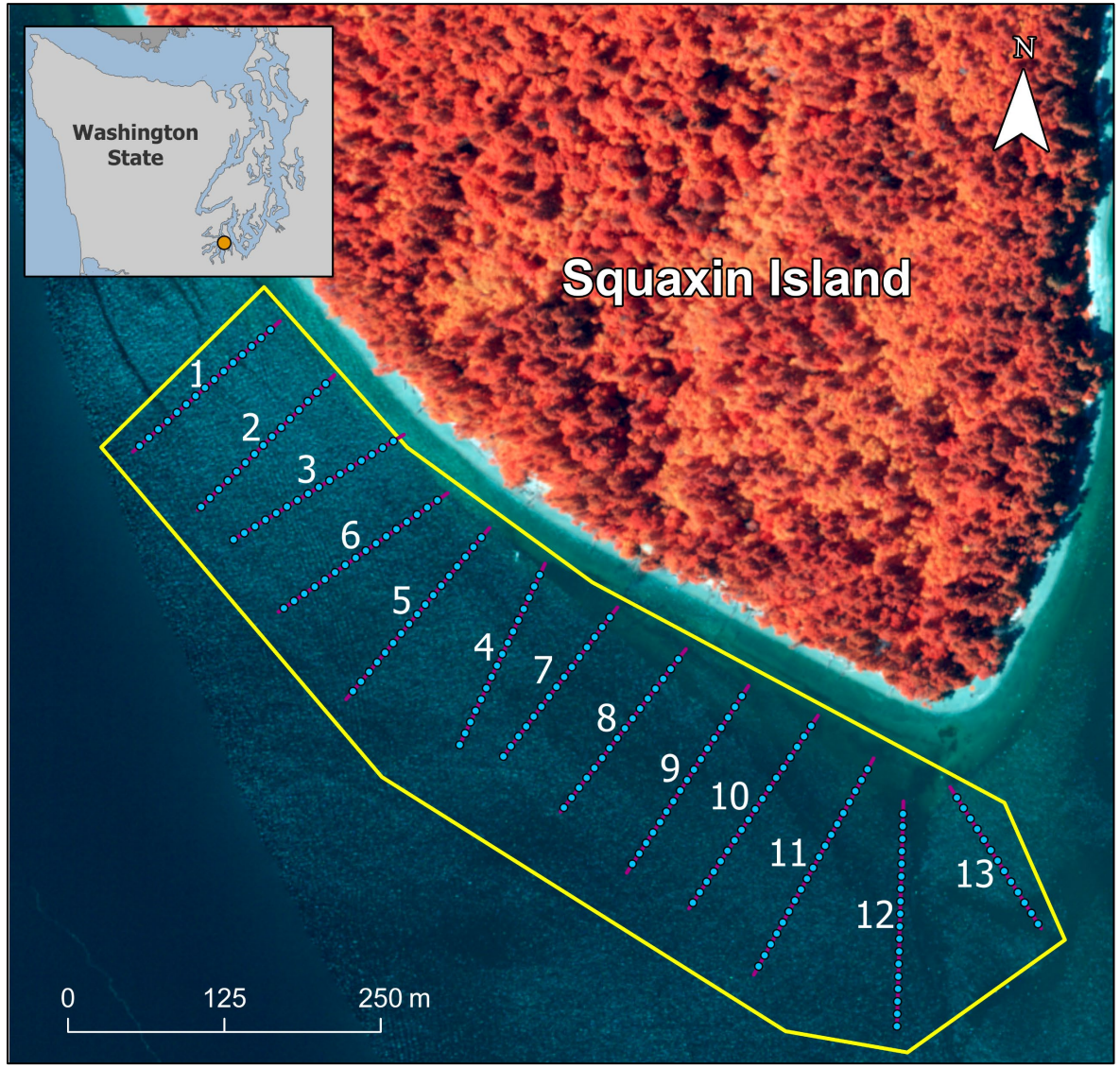


Focus on: Squaxin Island Kelp Bed





Annual floating kelp monitoring at Squaxin Island



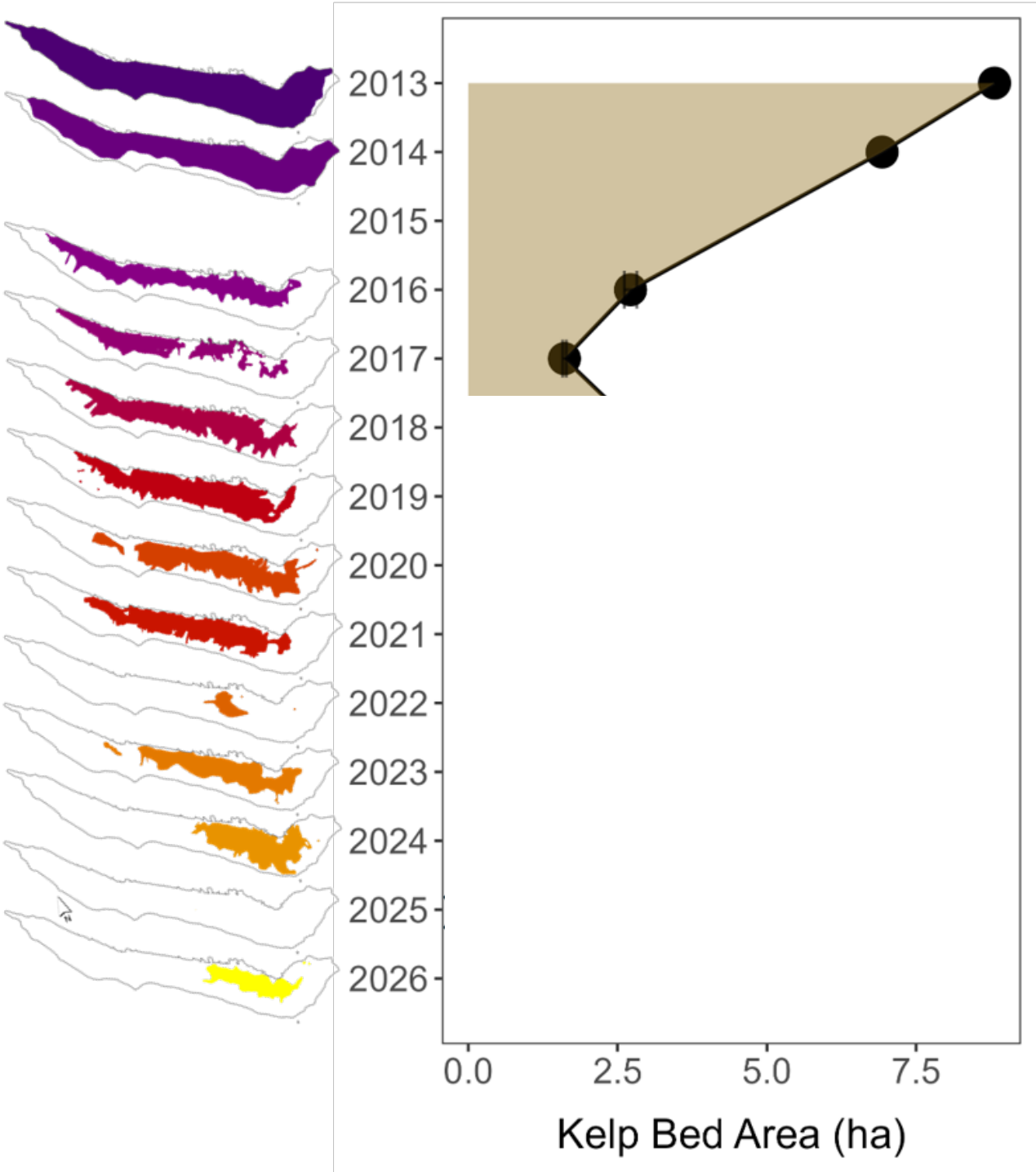
Kayak surveys:

- Started in 2013
- Kelp bed perimeters (3 or more)
- Minimum and maximum depth of floating kelp
- Density and percent cover

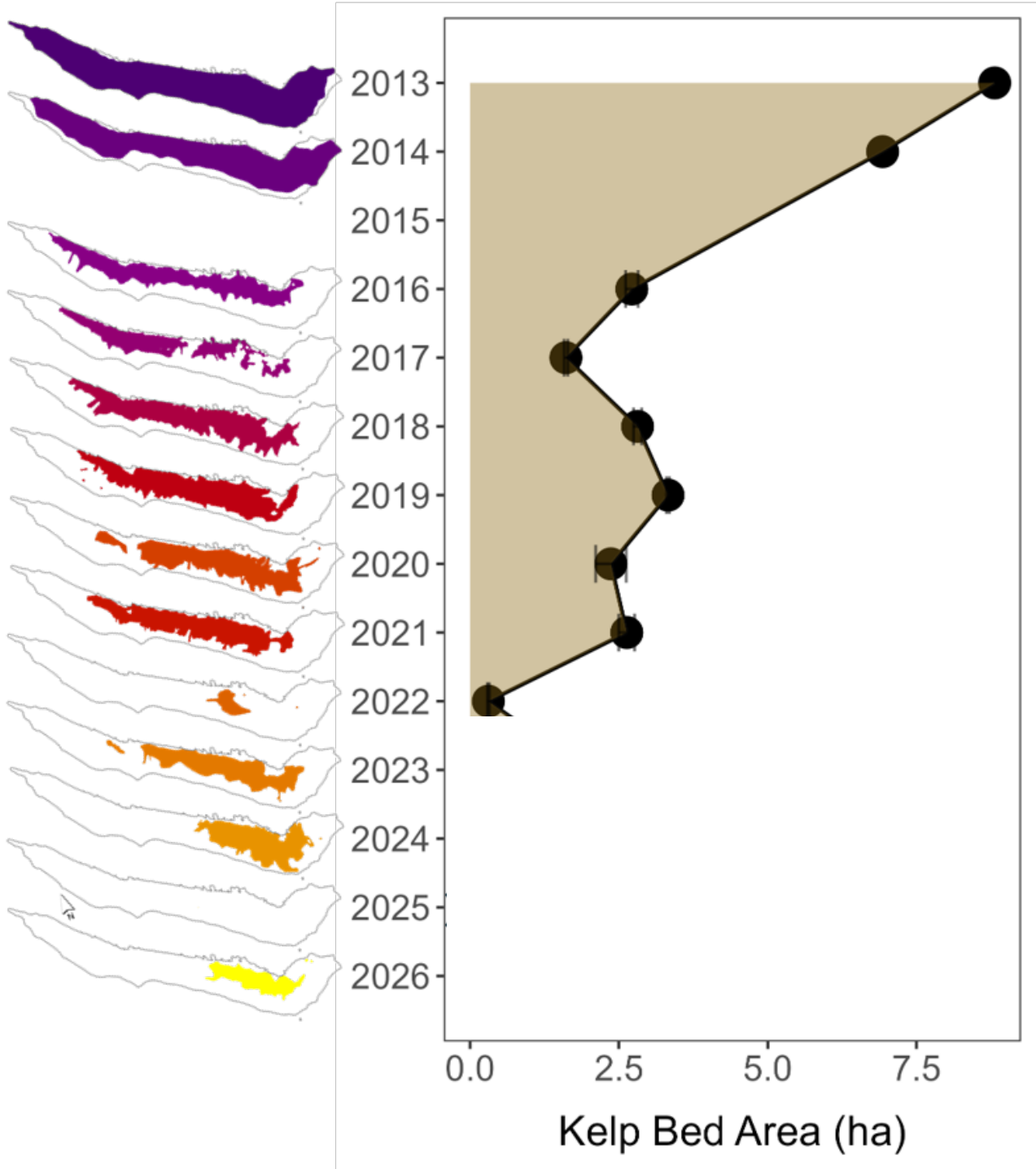
UAS surveys:

- Started in 2021
- Multispectral imagery used to calculate bed area and canopy area

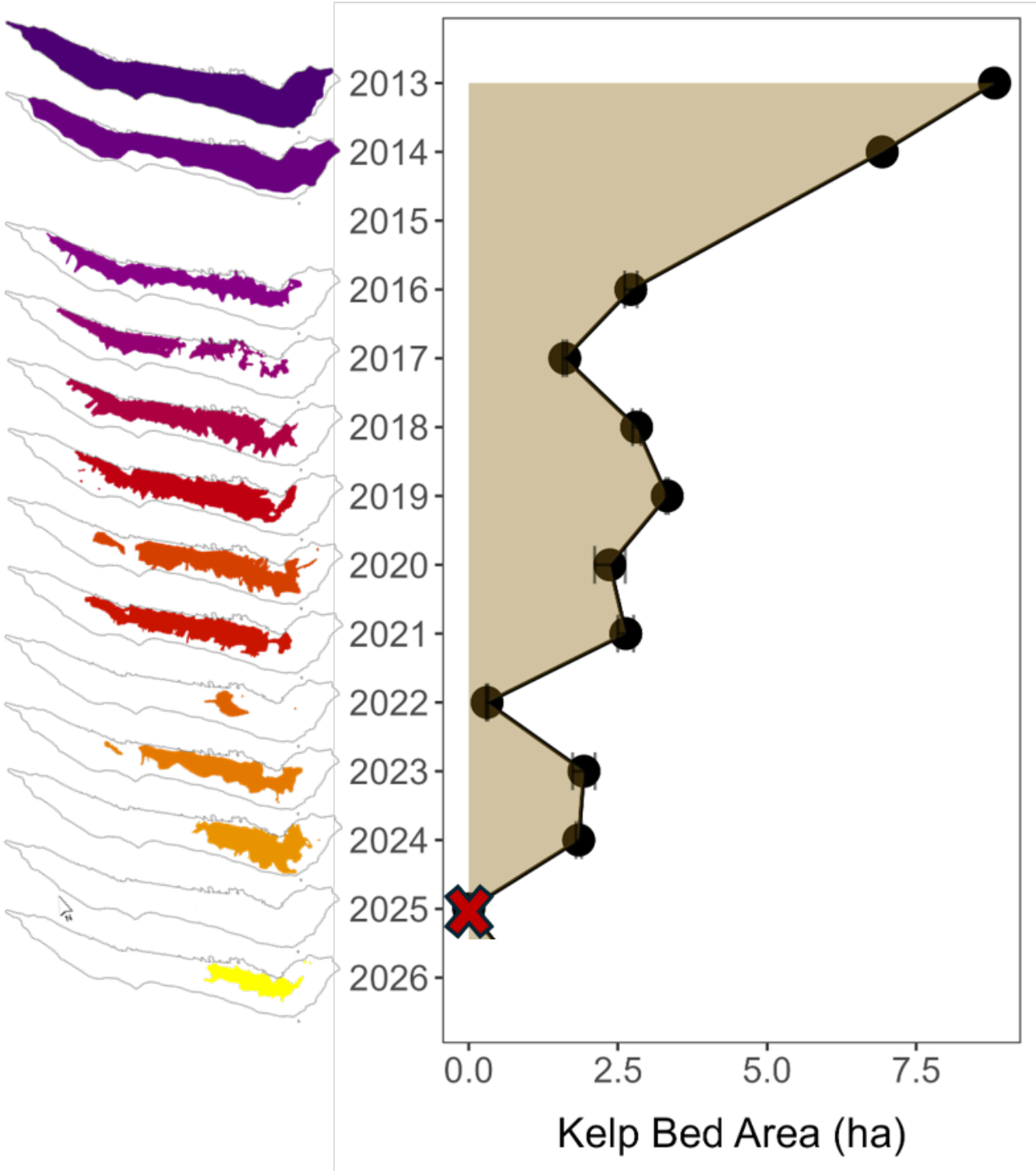
Bed declined 81% between 2013 and 2017



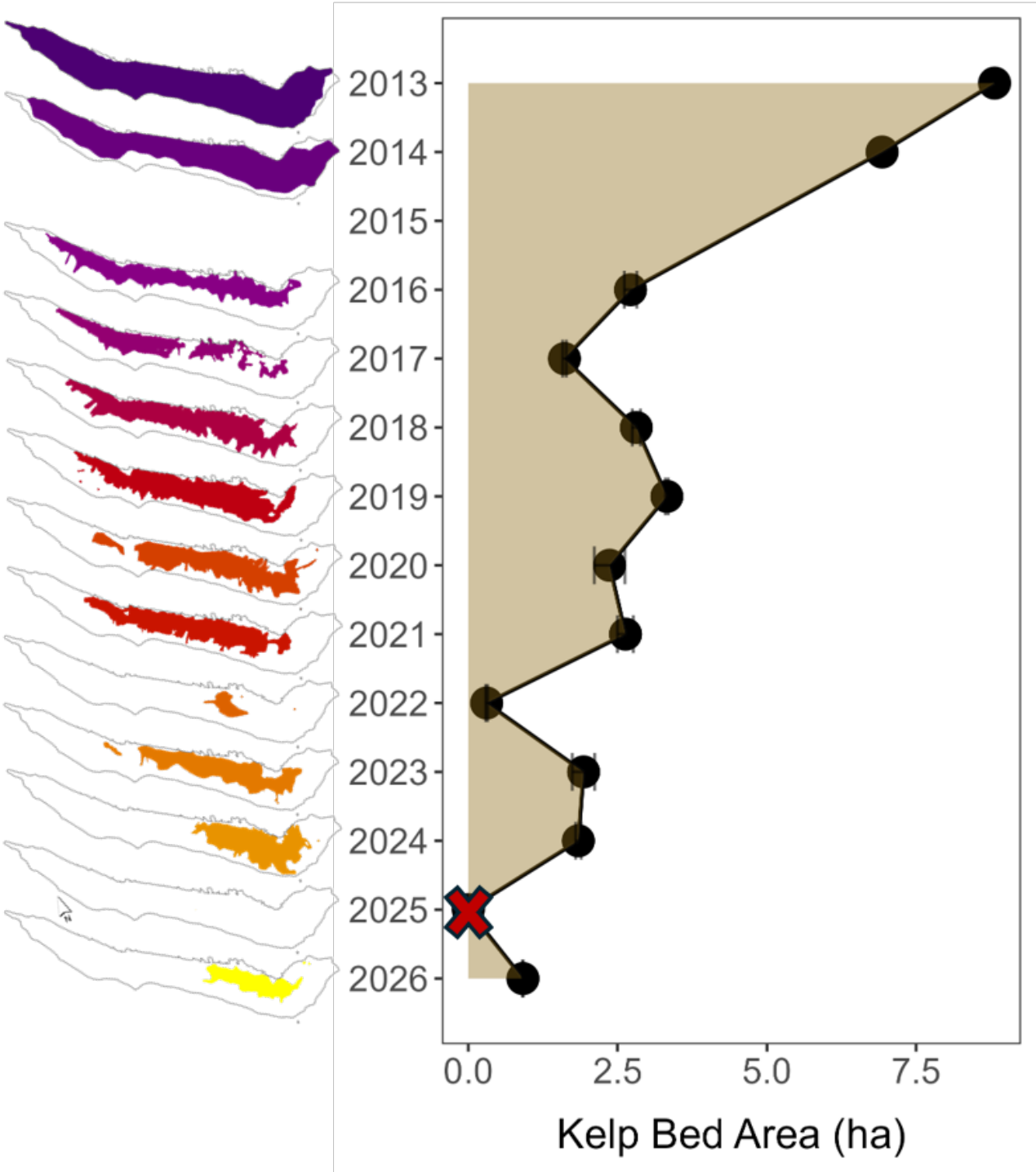
By 2022, bed had declined 97% compared to 2013



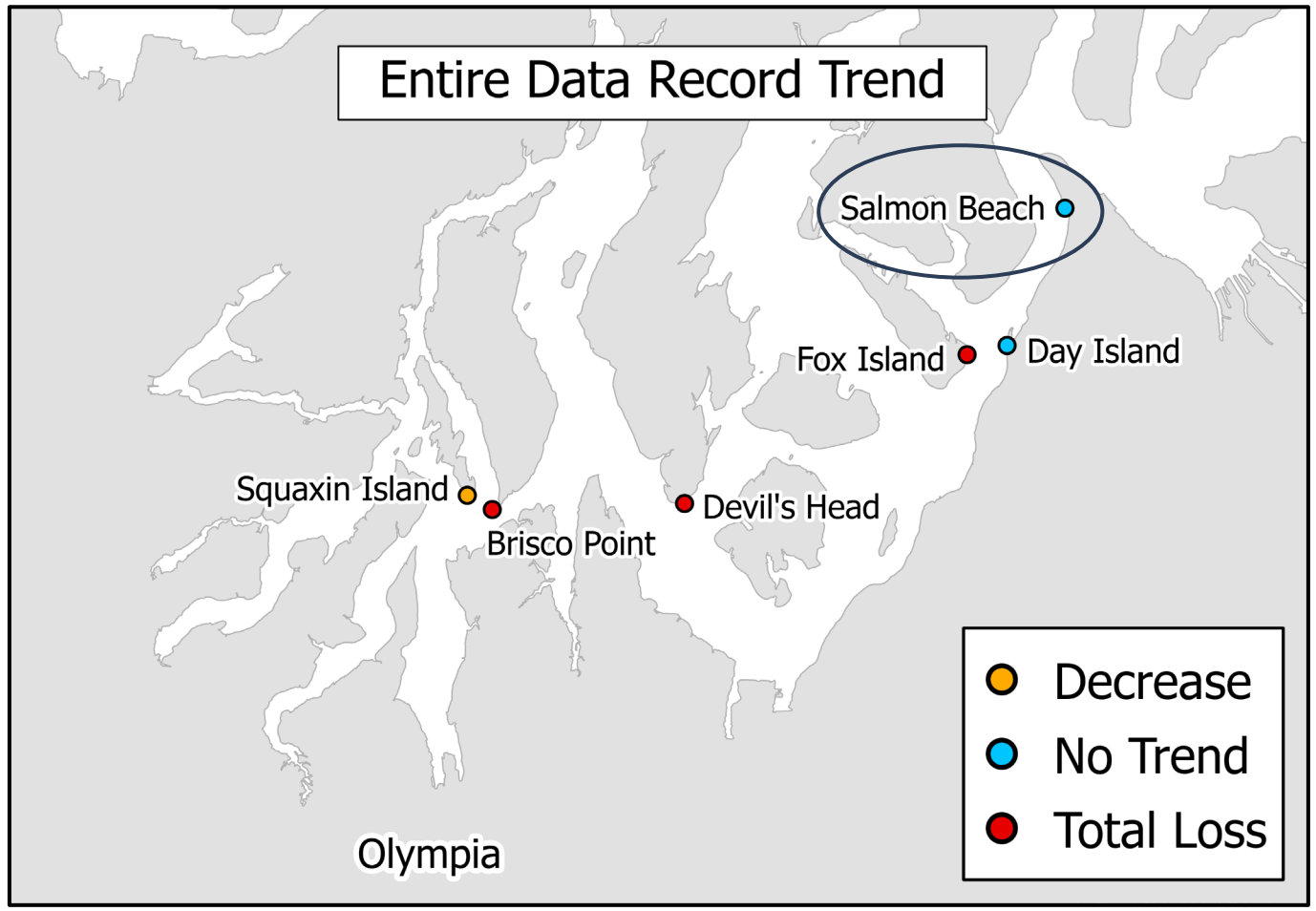
After partial recovery, kelp bed was lost in 2025



Recovery of a small kelp bed in 2026!

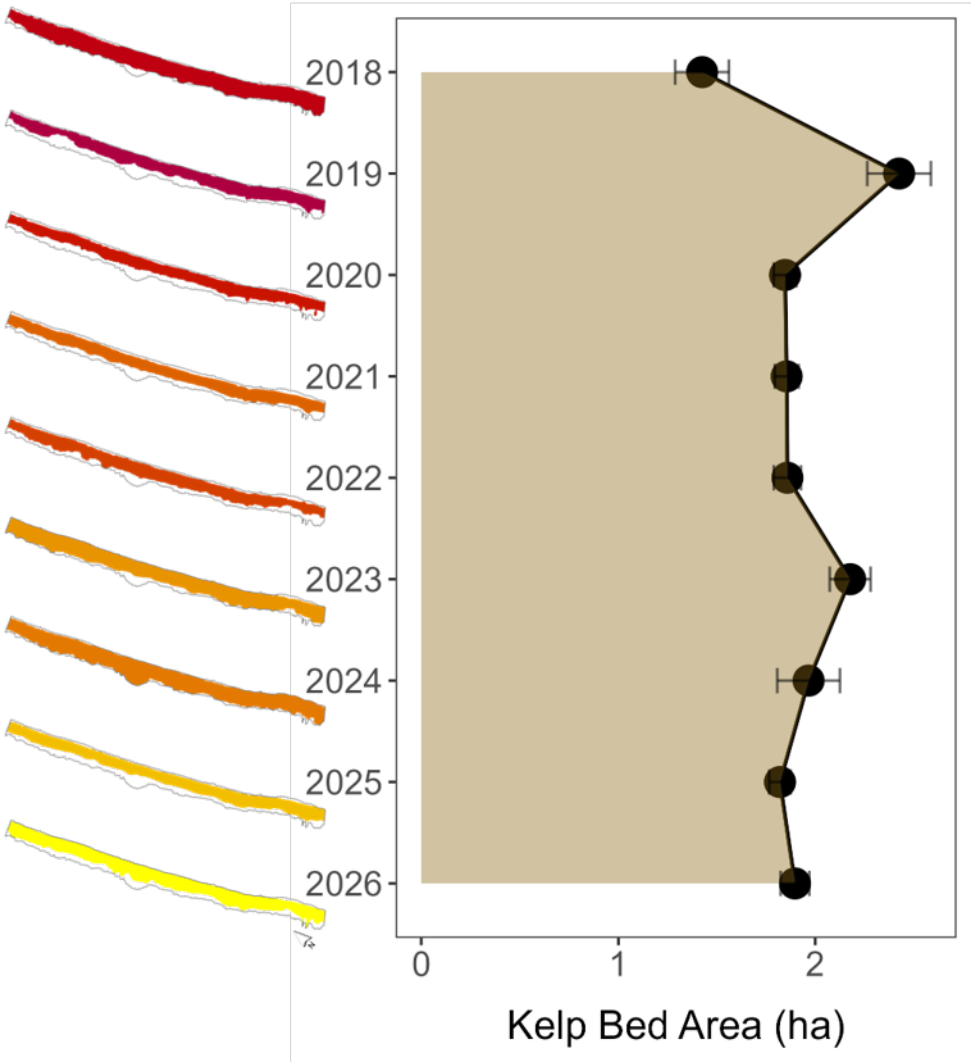


Focus on: Tacoma Narrows



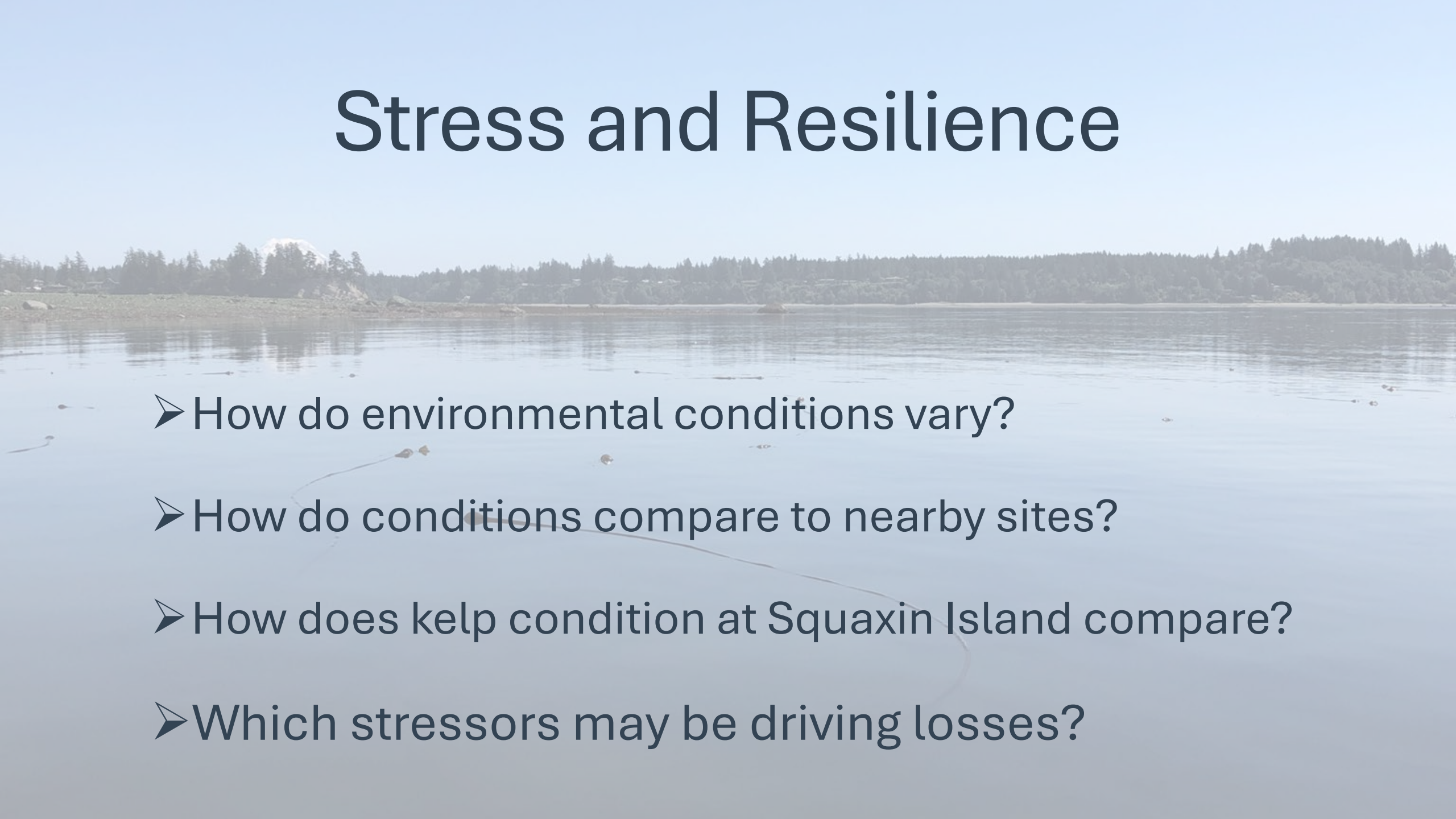


Focus on: Tacoma Narrows





Stress and Resilience



- How do environmental conditions vary?
- How do conditions compare to nearby sites?
- How does kelp condition at Squaxin Island compare?
- Which stressors may be driving losses?

Stress and Resilience

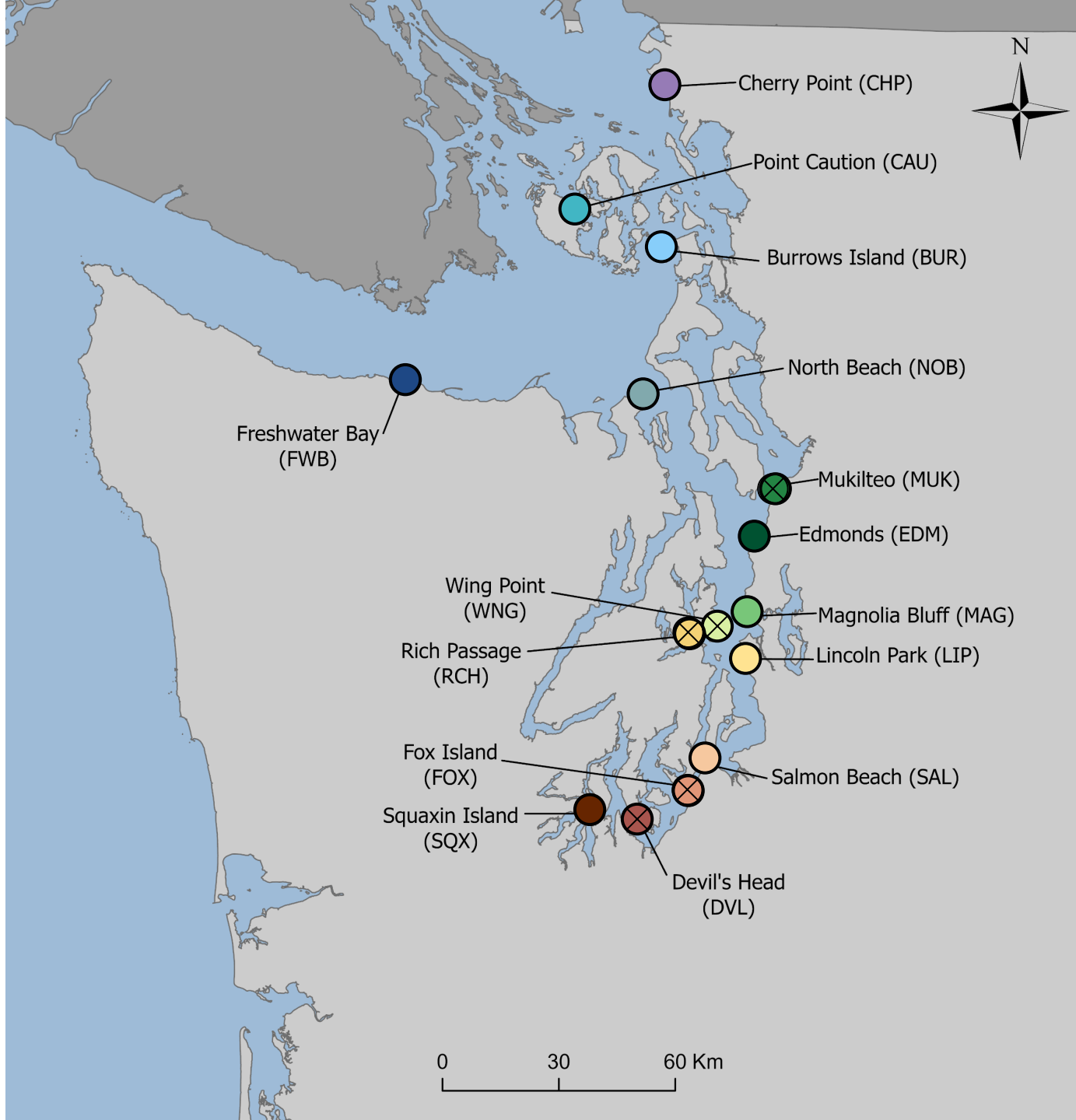


Field site locations

15 ecologically distinct sites

- 10 with kelp beds (stable / declining)
- 5 where kelp has been lost


Photo: Samantha Linhardt, WA DNR



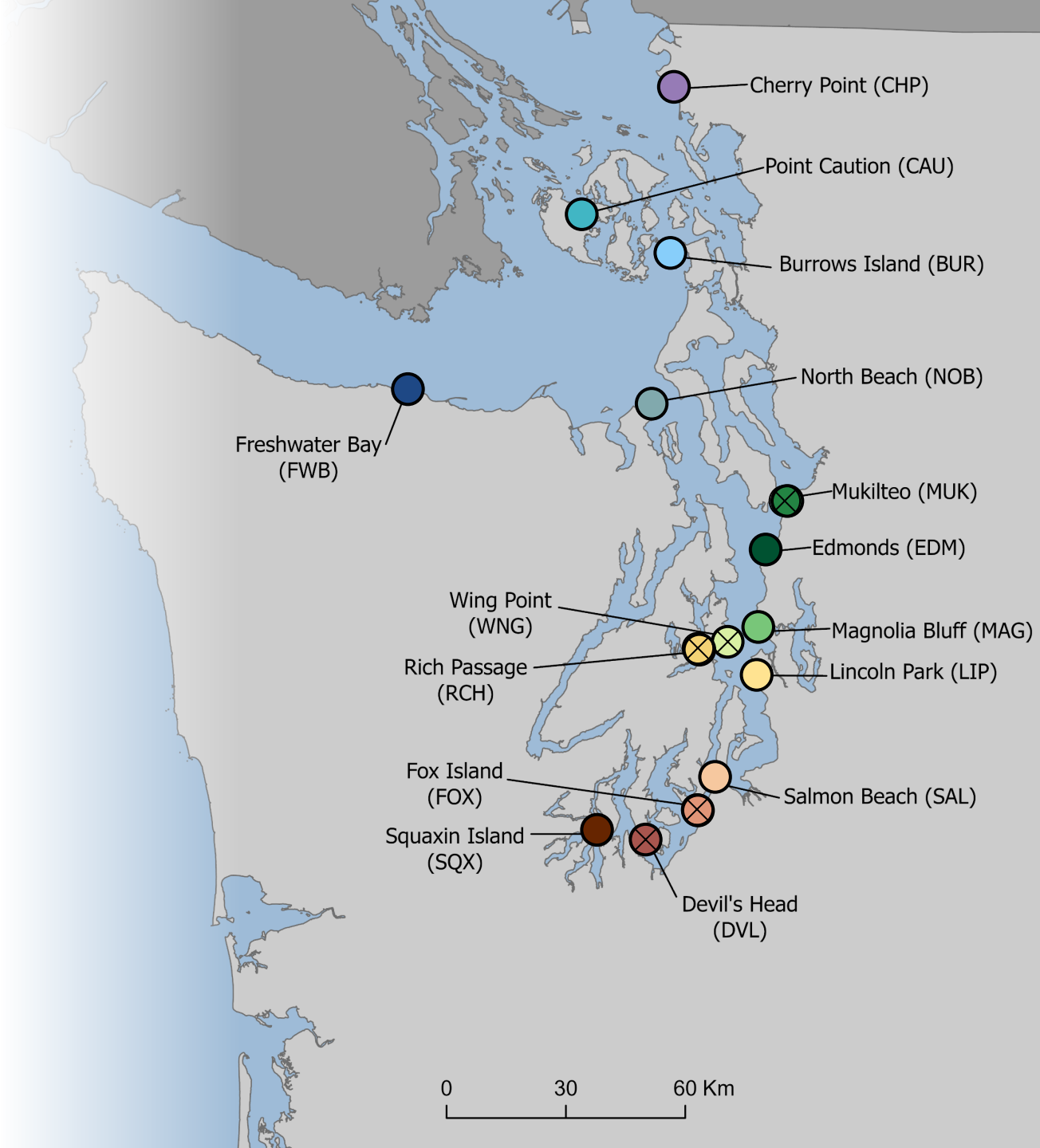
Environmental data

Monthly water sampling

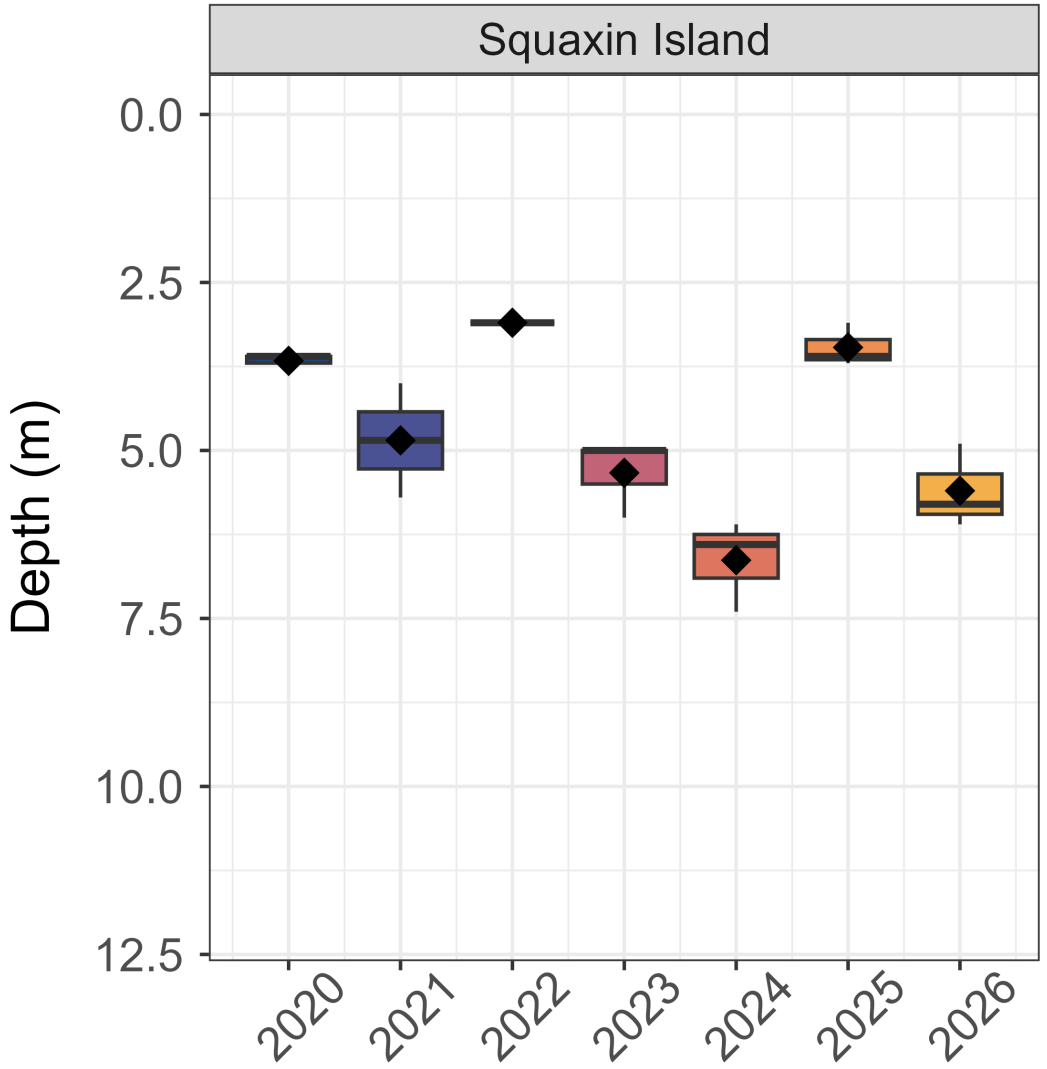
- Temperature
- Salinity
- Light availability
- Total suspended solids
- Particulate organic matter
- Nutrients

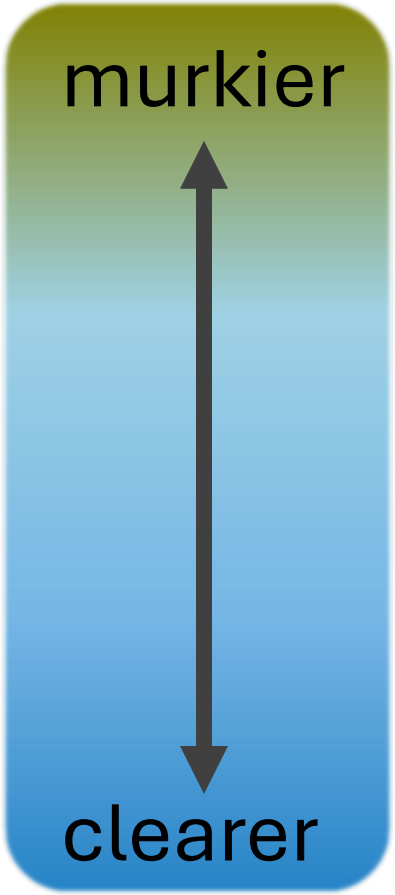
Continuous, benthic sensors

- Temperature
- Salinity
- Light availability (PAR)



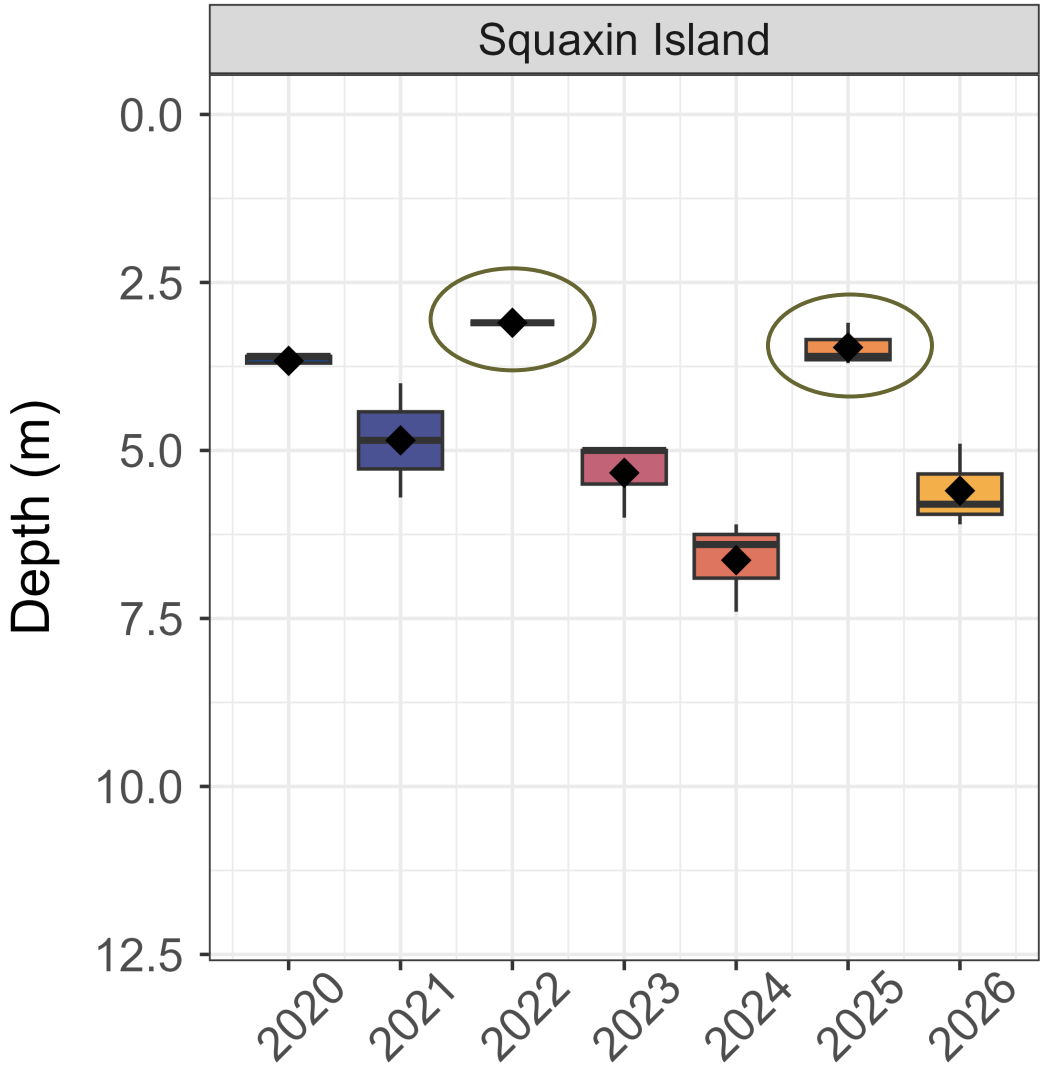
Summer water clarity varies year-to-year

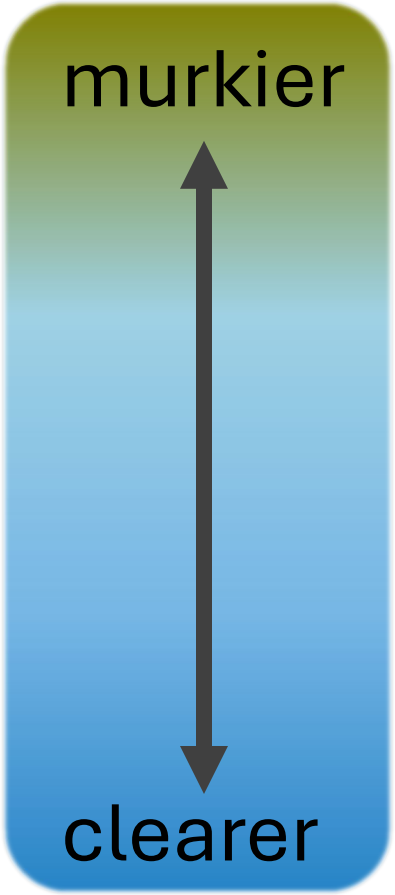






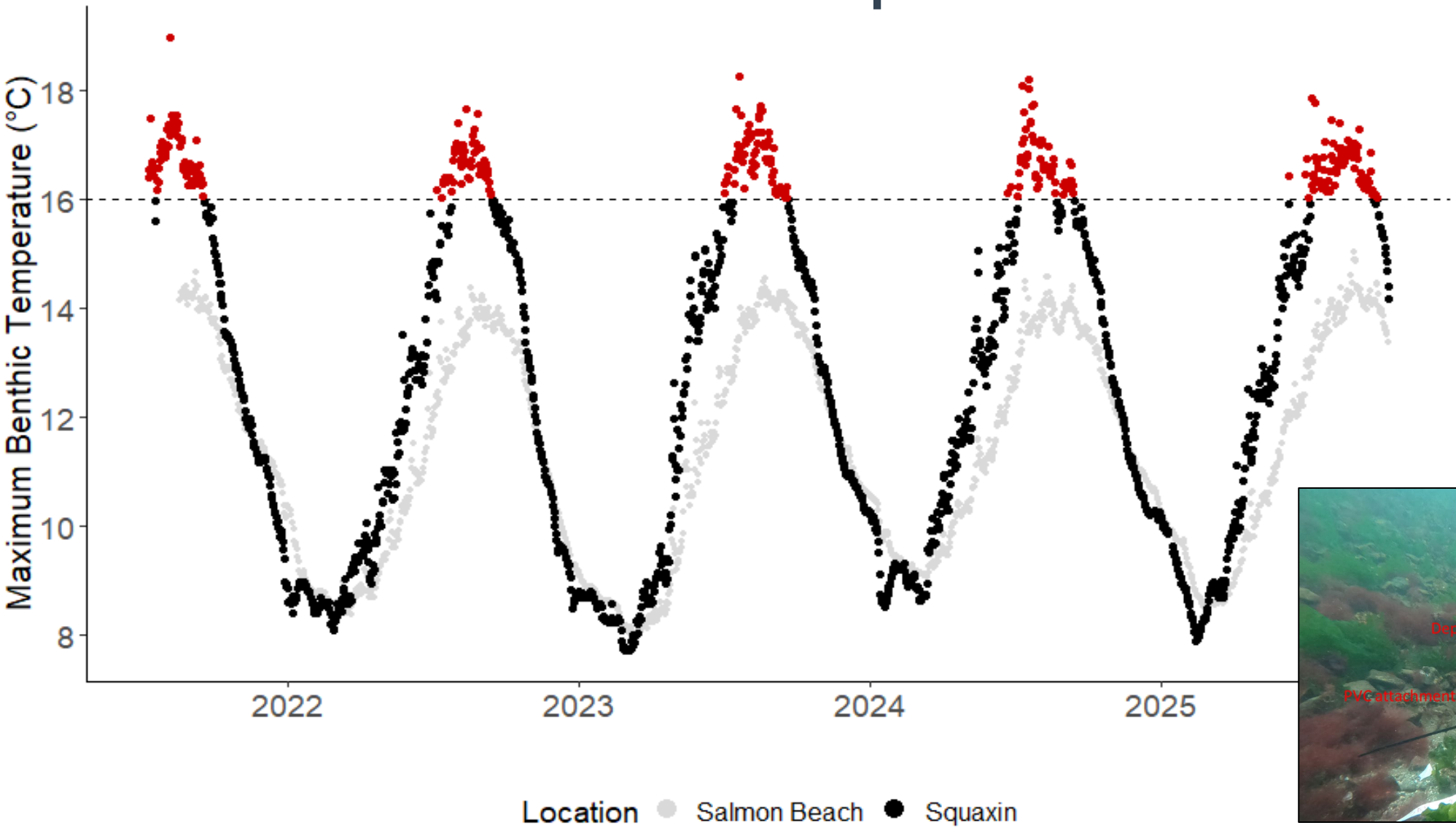
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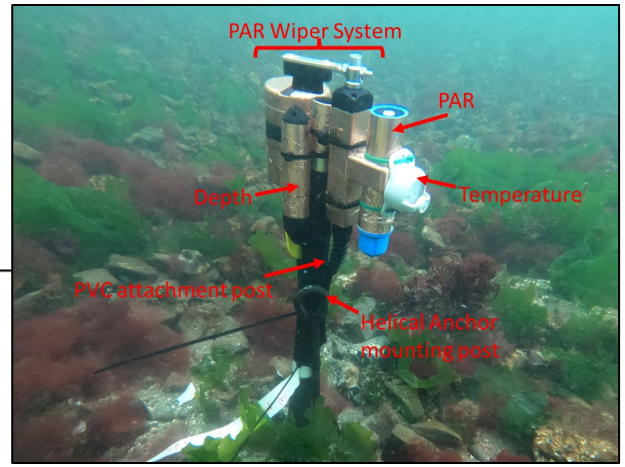




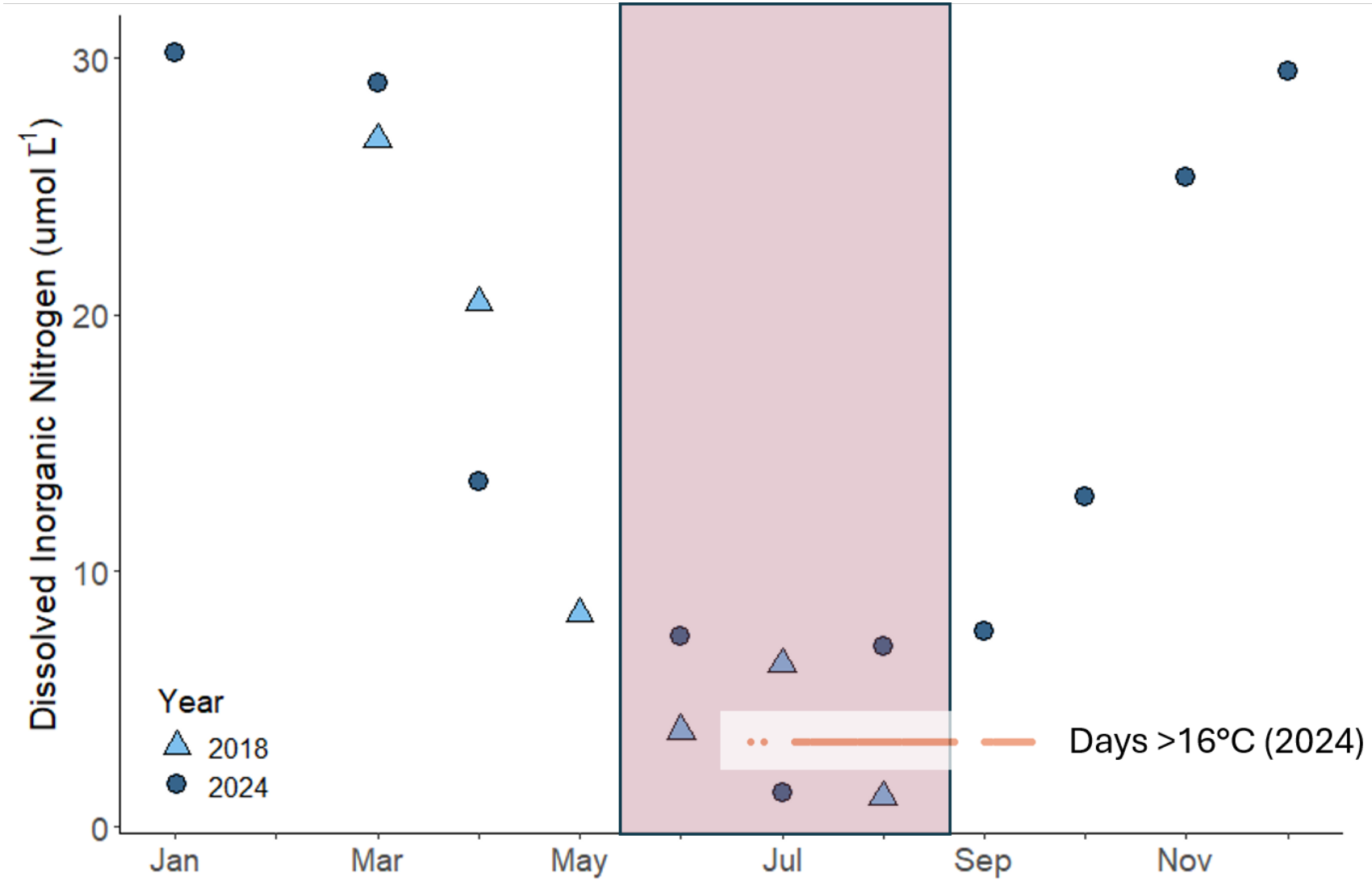


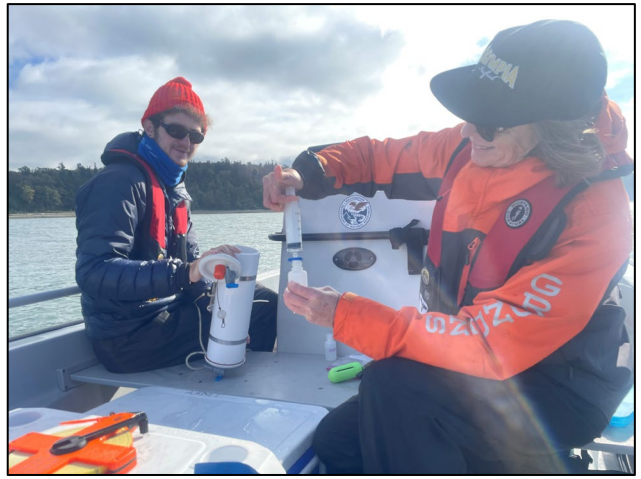
Benthic temperature exceeds 16°C each summer at Squaxin Island



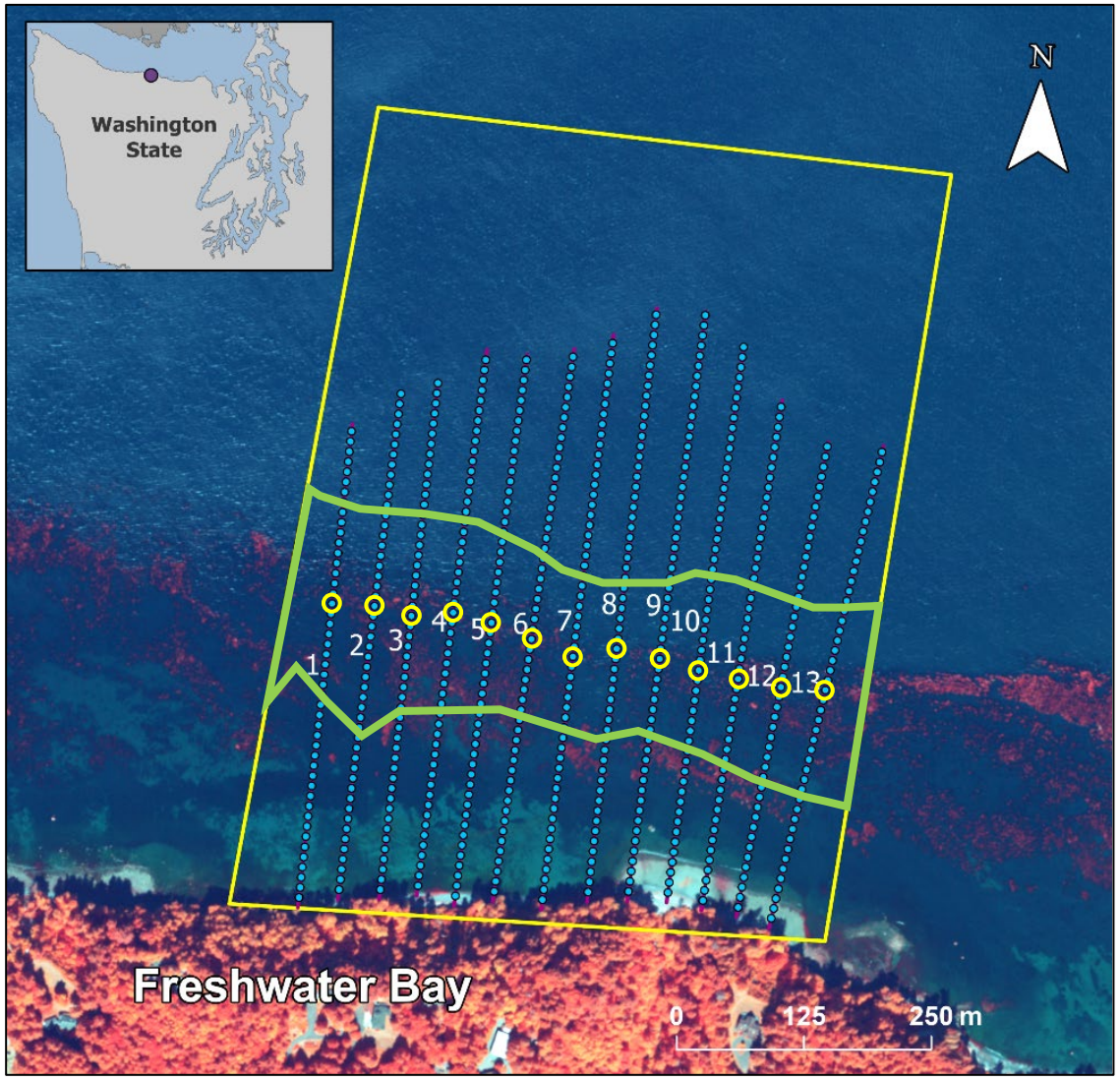


High temperatures co-occur with low nutrient availability

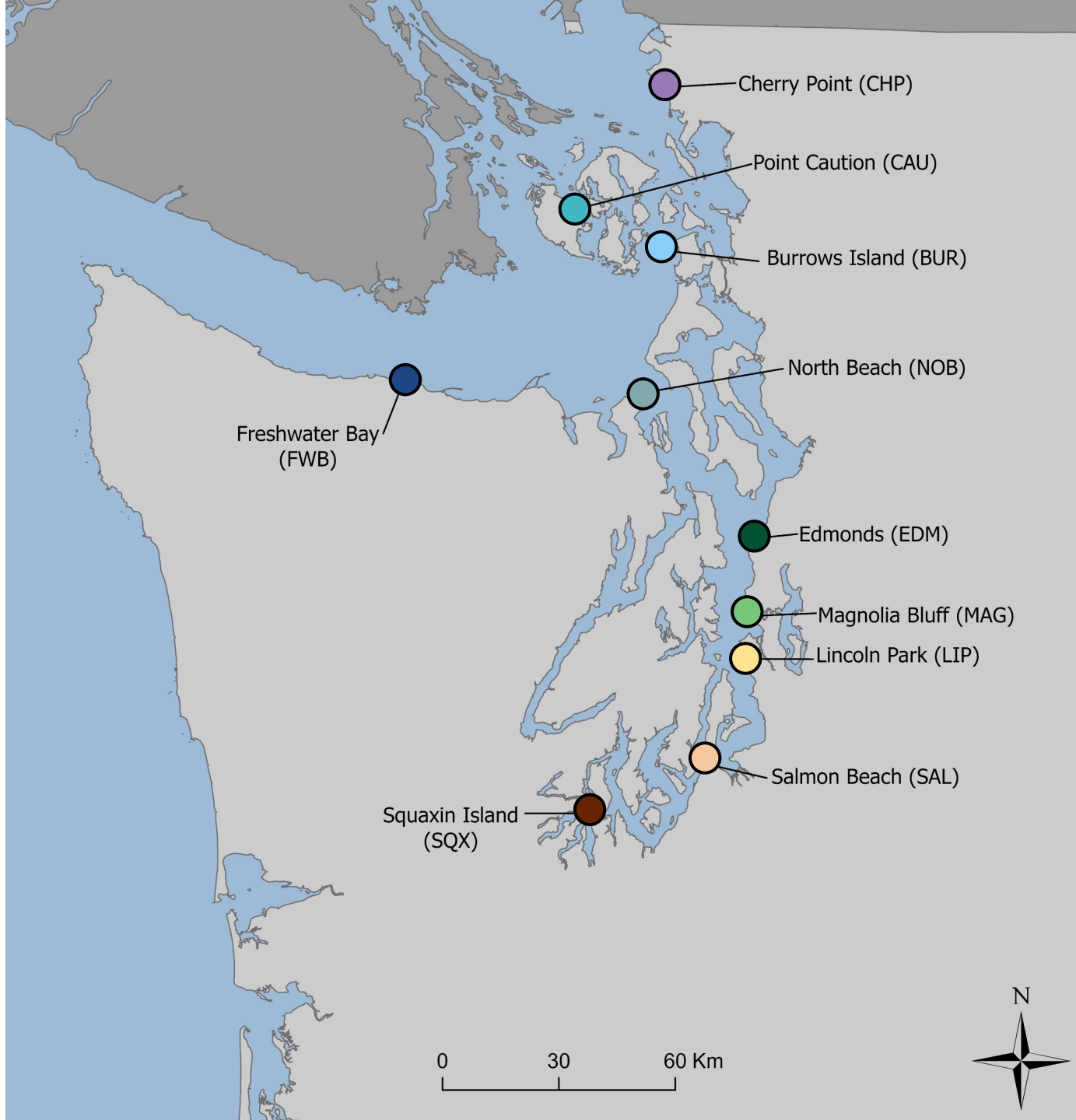




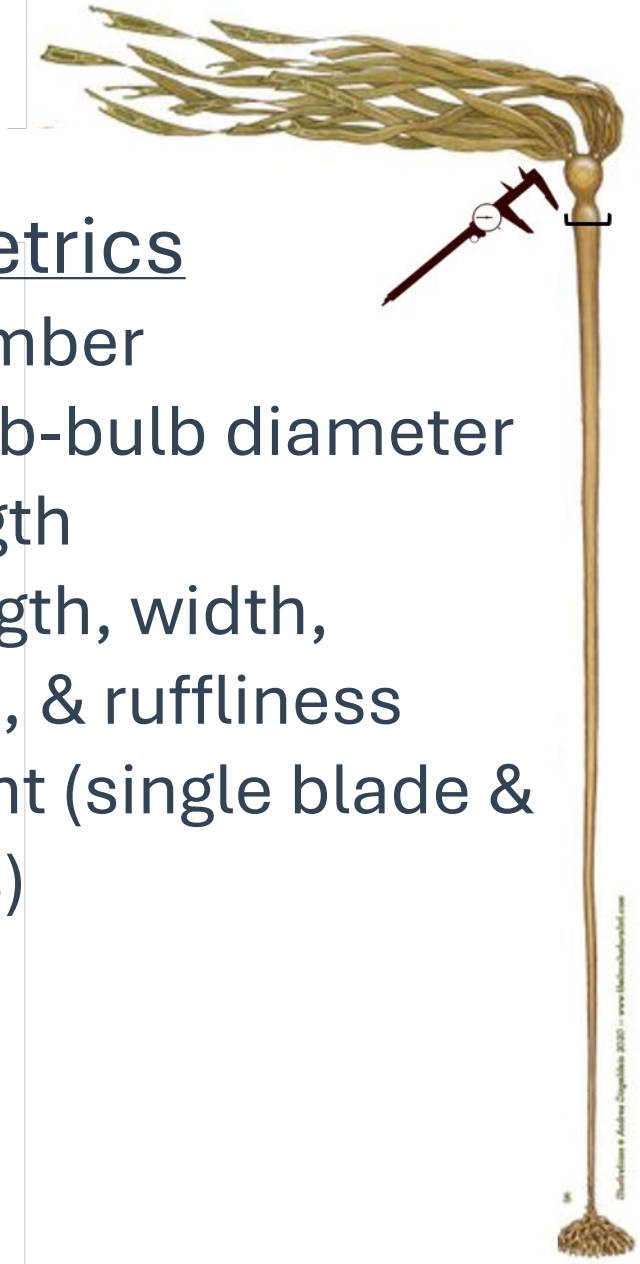

What did the kelp look like?



- Bed area and min/max depth
- Mid-point of each transect
- ~13 kelp sporophytes per site

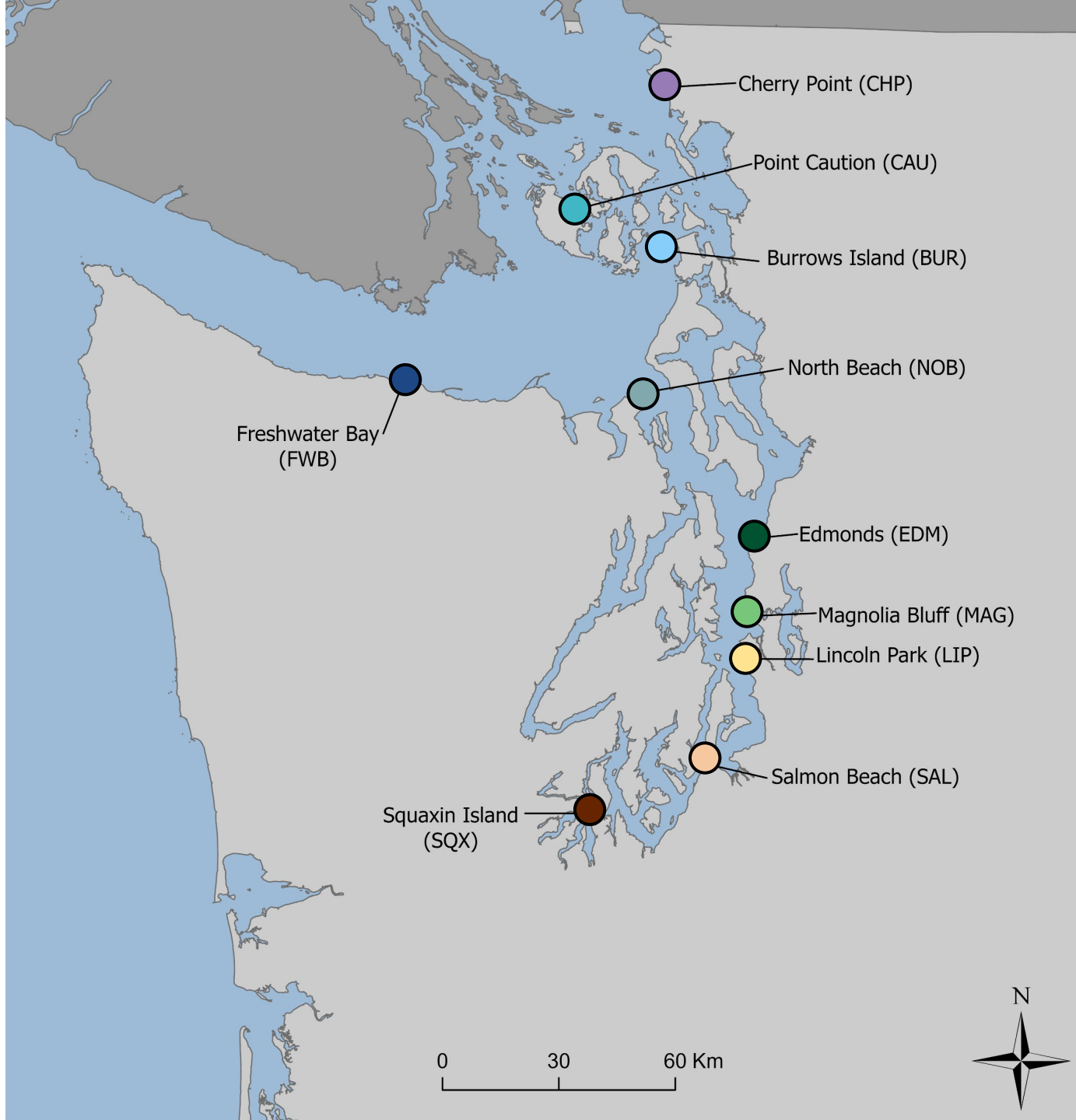


Bull kelp canopy data

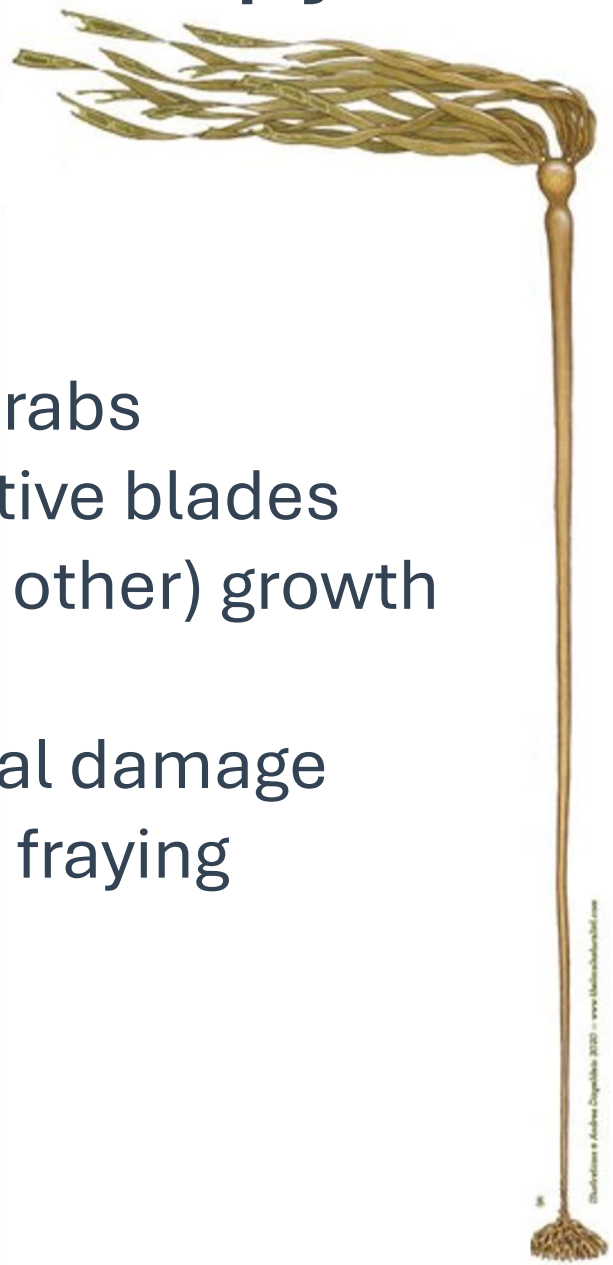


Morphometrics

- Blade number
- Bulb & sub-bulb diameter
- Stipe length
- Blade length, width, thickness, & ruffliness
- Wet weight (single blade & all blades)

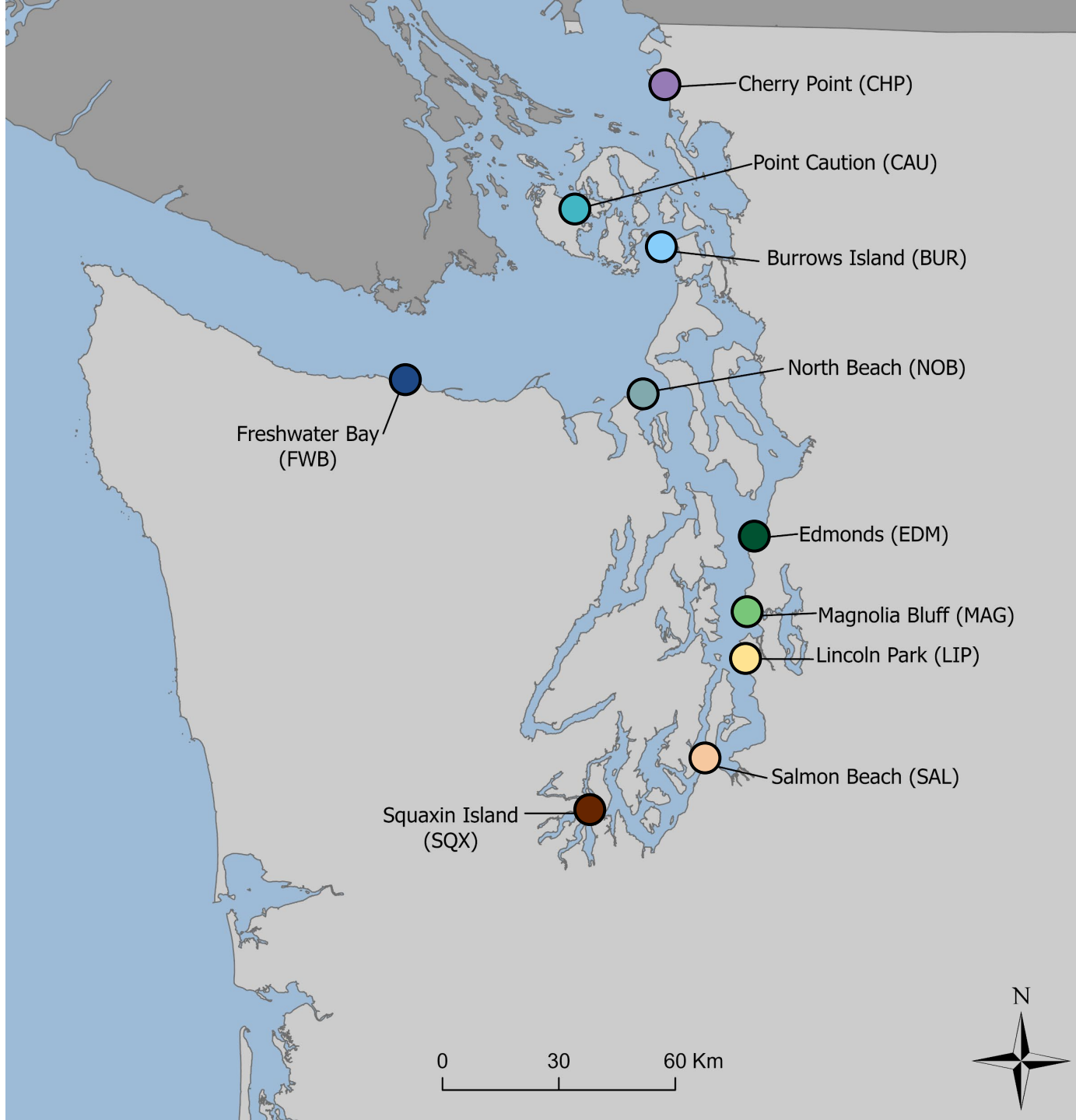


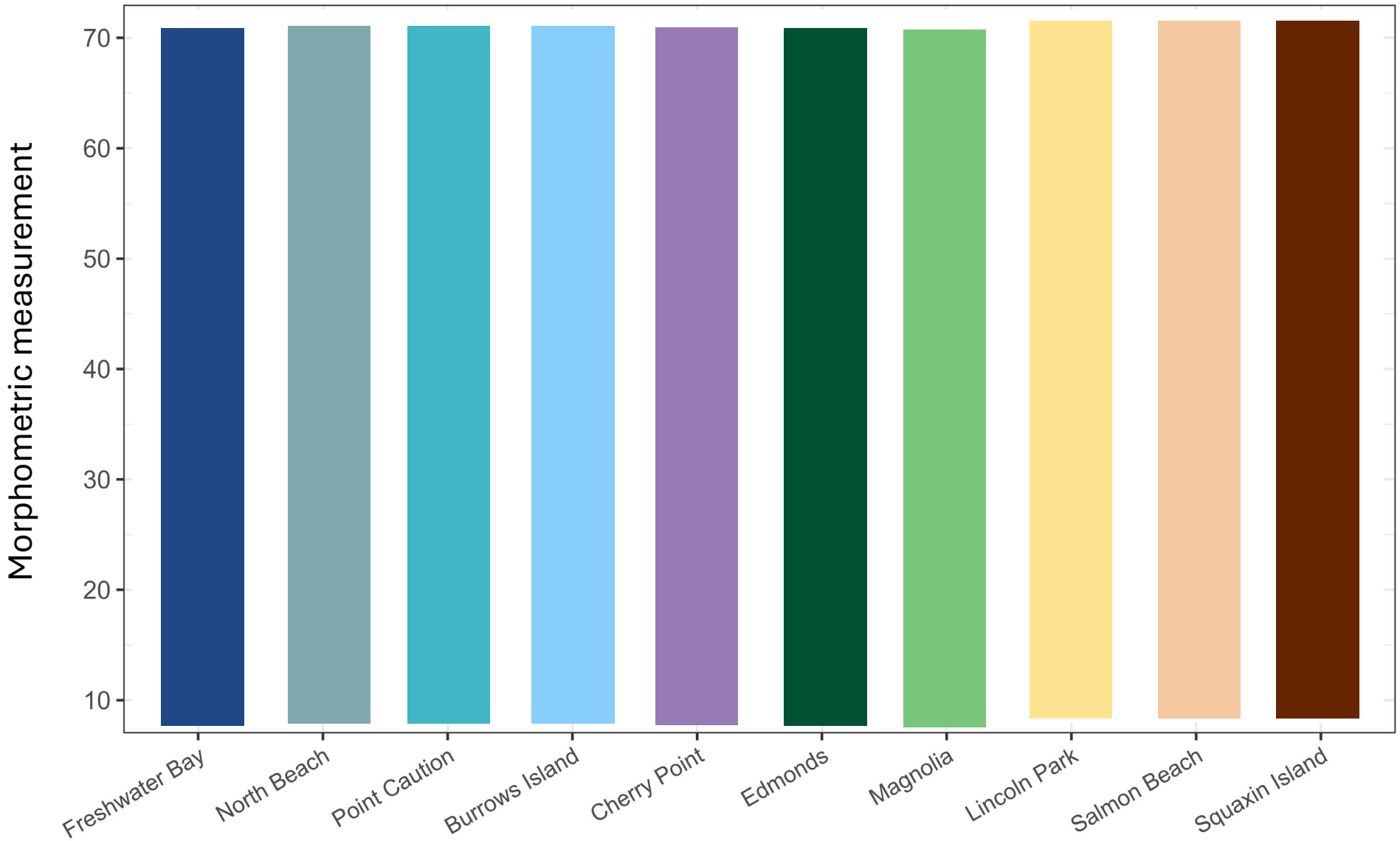
Bull kelp canopy data

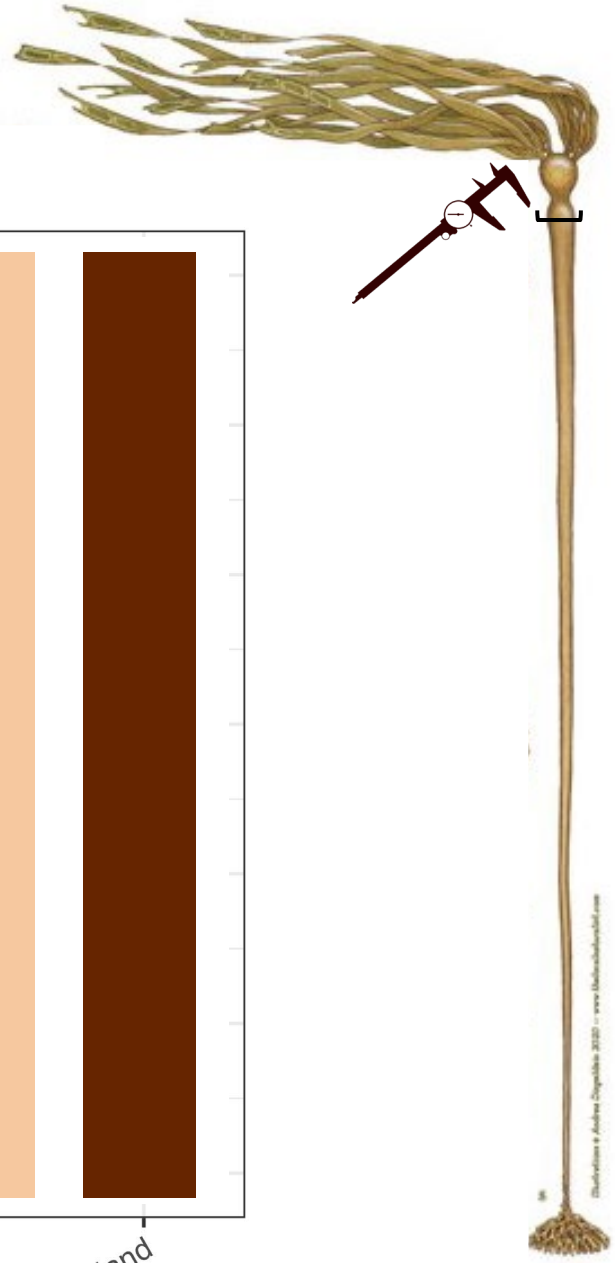


Condition

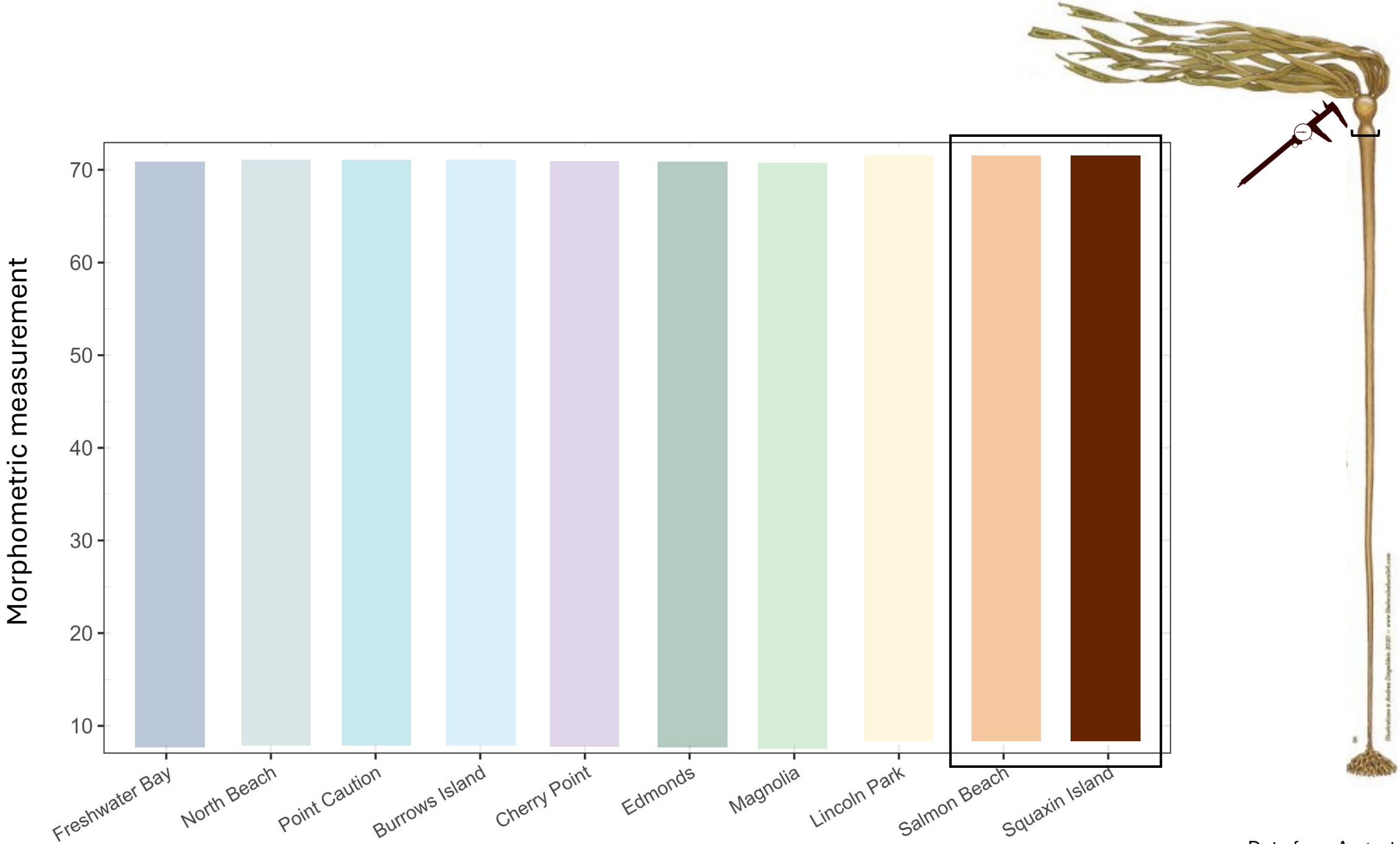
- # of kelp crabs
- Reproductive blades
- Algal (and other) growth on plants
- Mechanical damage
- Blade end fraying





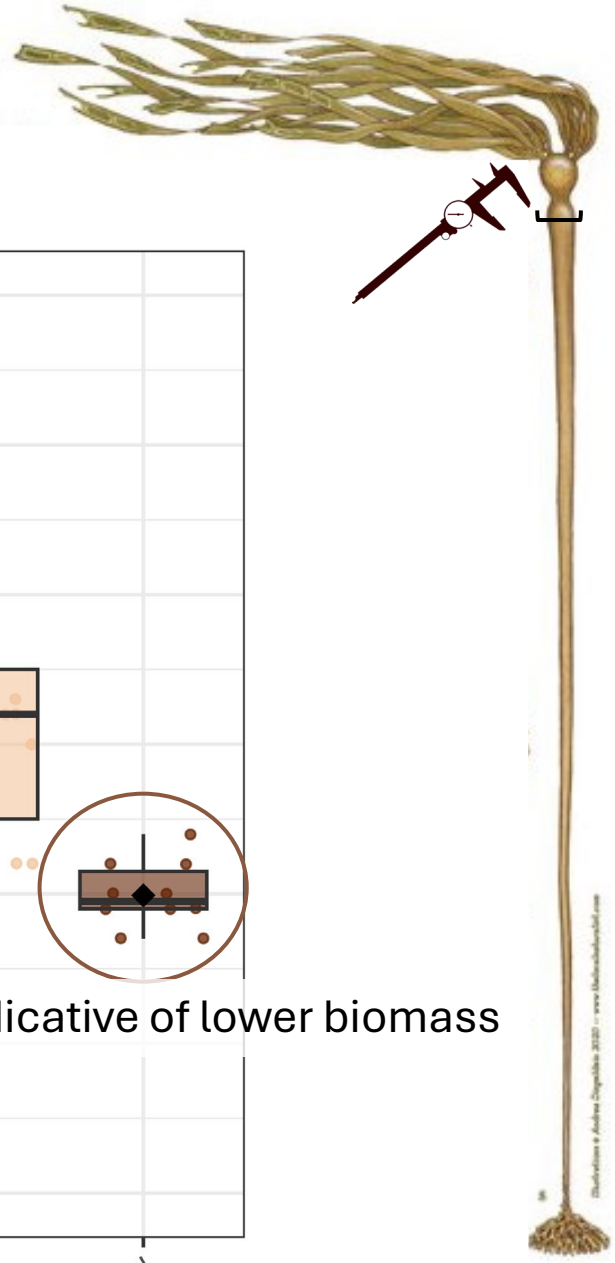


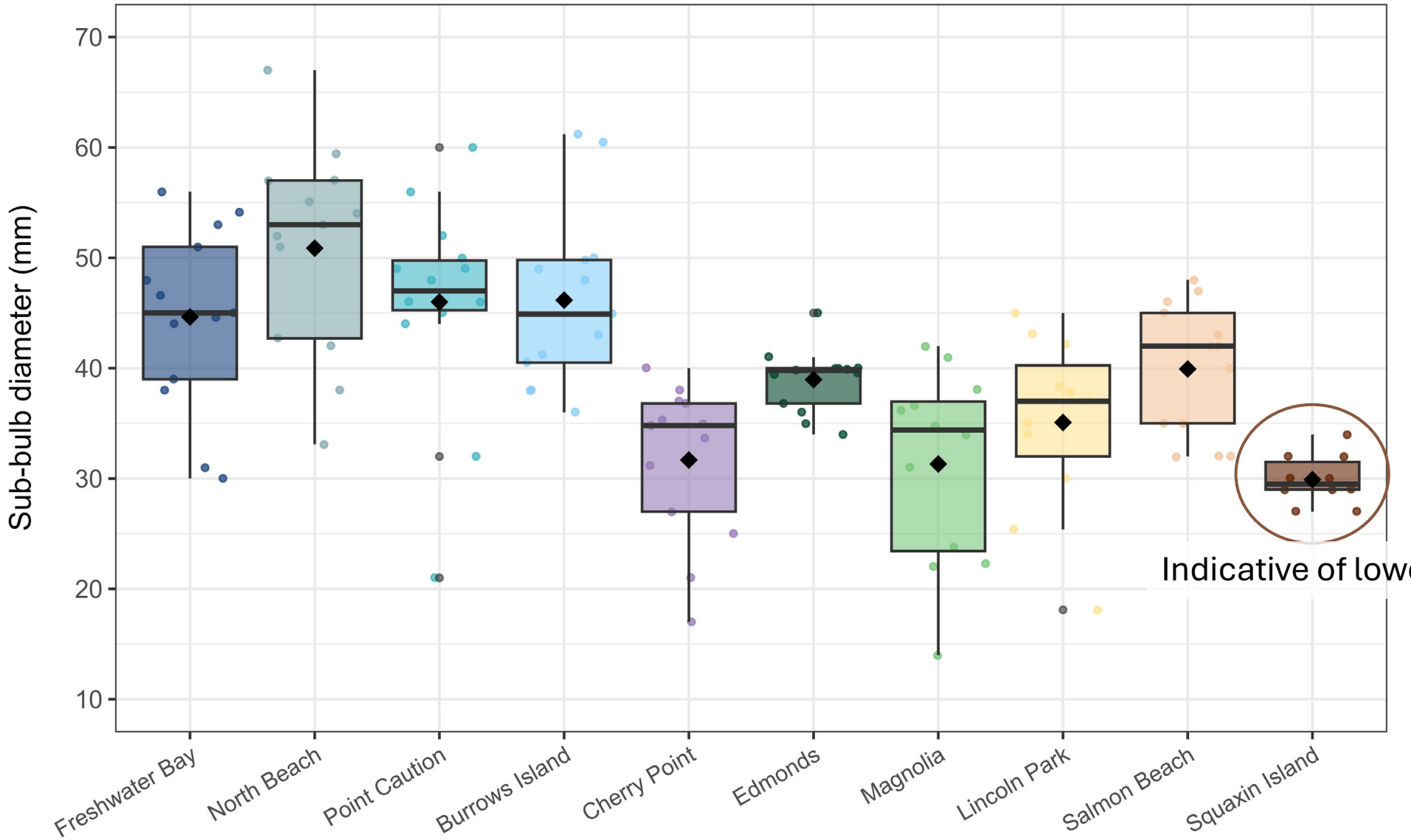
Data from August 2024



Data from August 2024

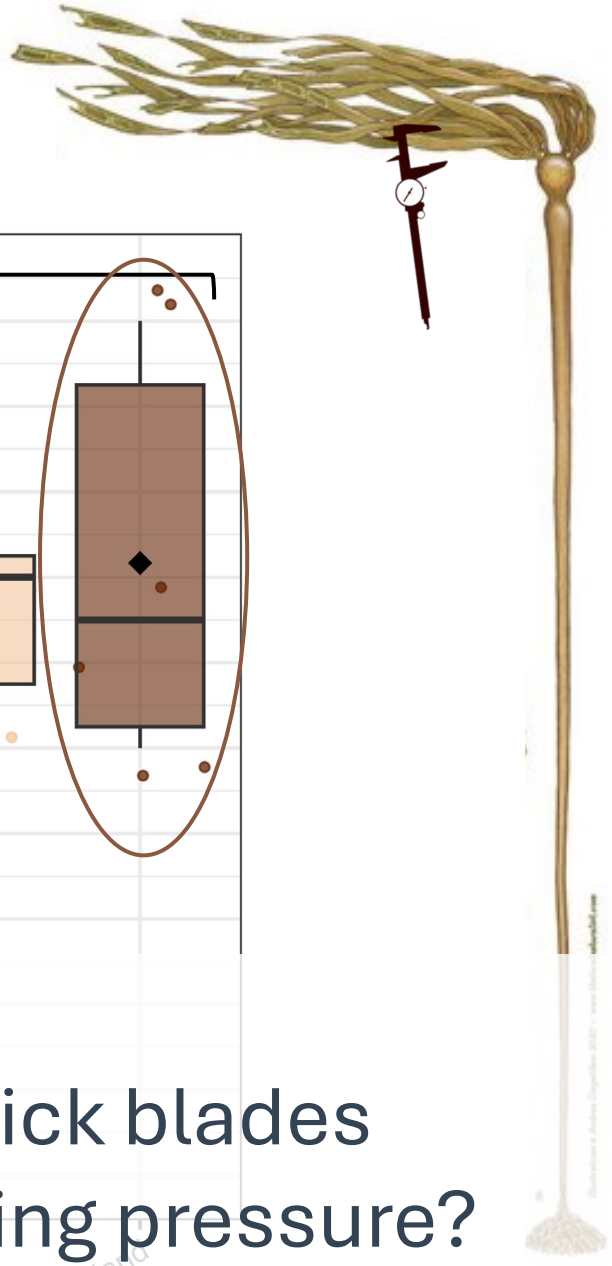
Plants at Squaxin Island had relatively small sub-bulb diameters

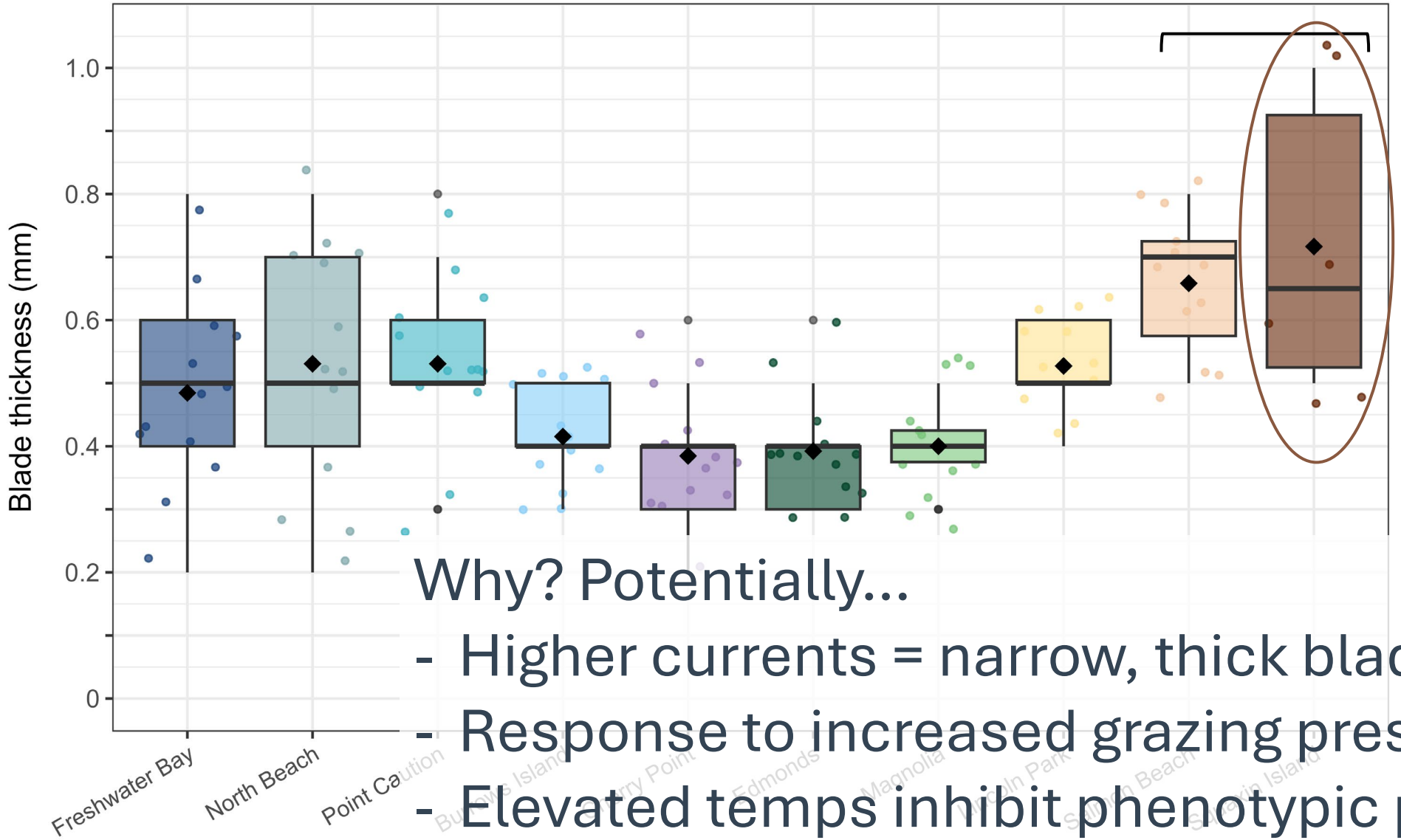




Data from August 2024

Plants at Squaxin Island & Salmon Beach had relatively thick blades



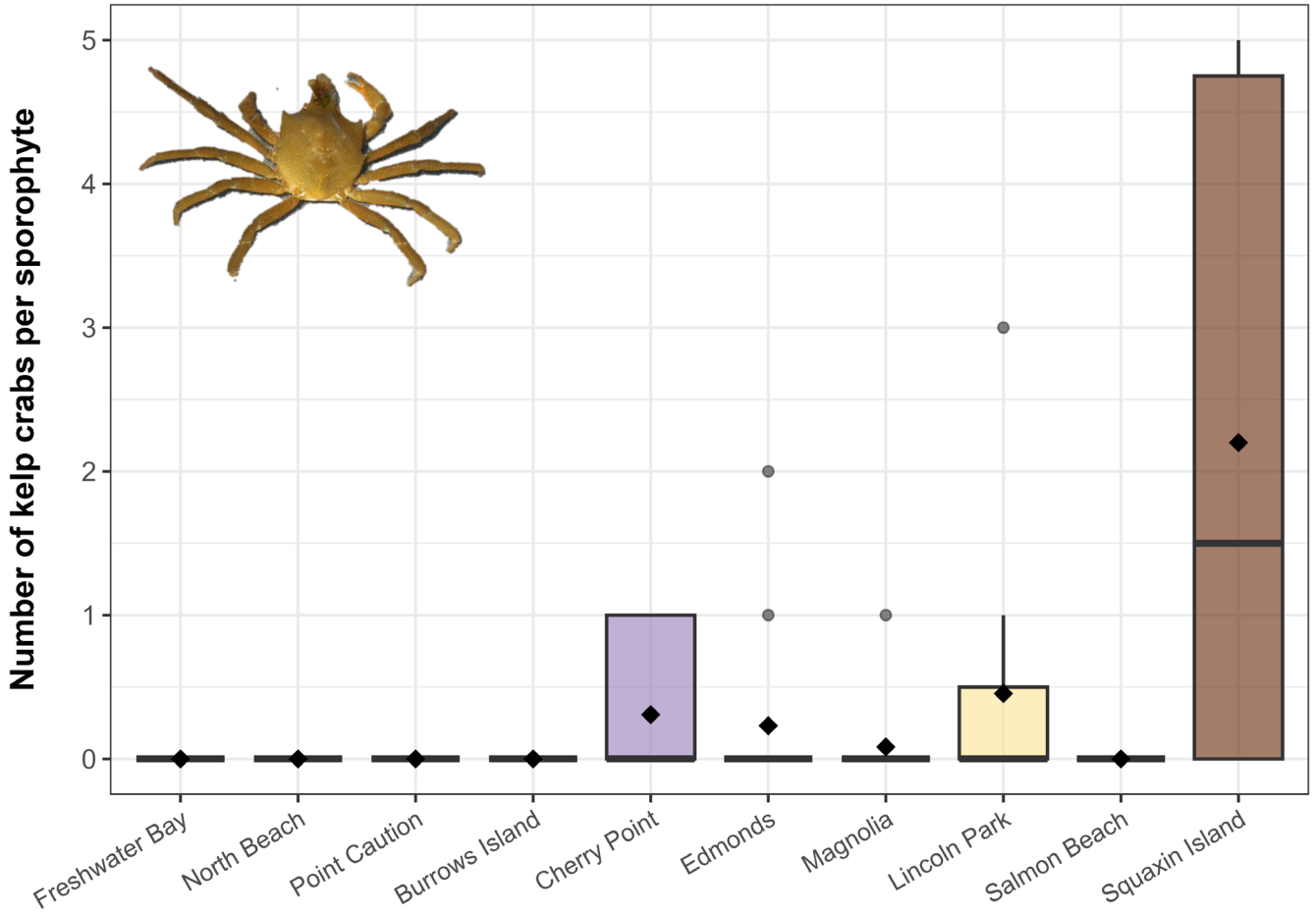


Why? Potentially…

- Higher currents = narrow, thick blades
- Response to increased grazing pressure?
- Elevated temps inhibit phenotypic plasticity

Data from August 2024

More crabs were observed at Squaxin Island than other sites

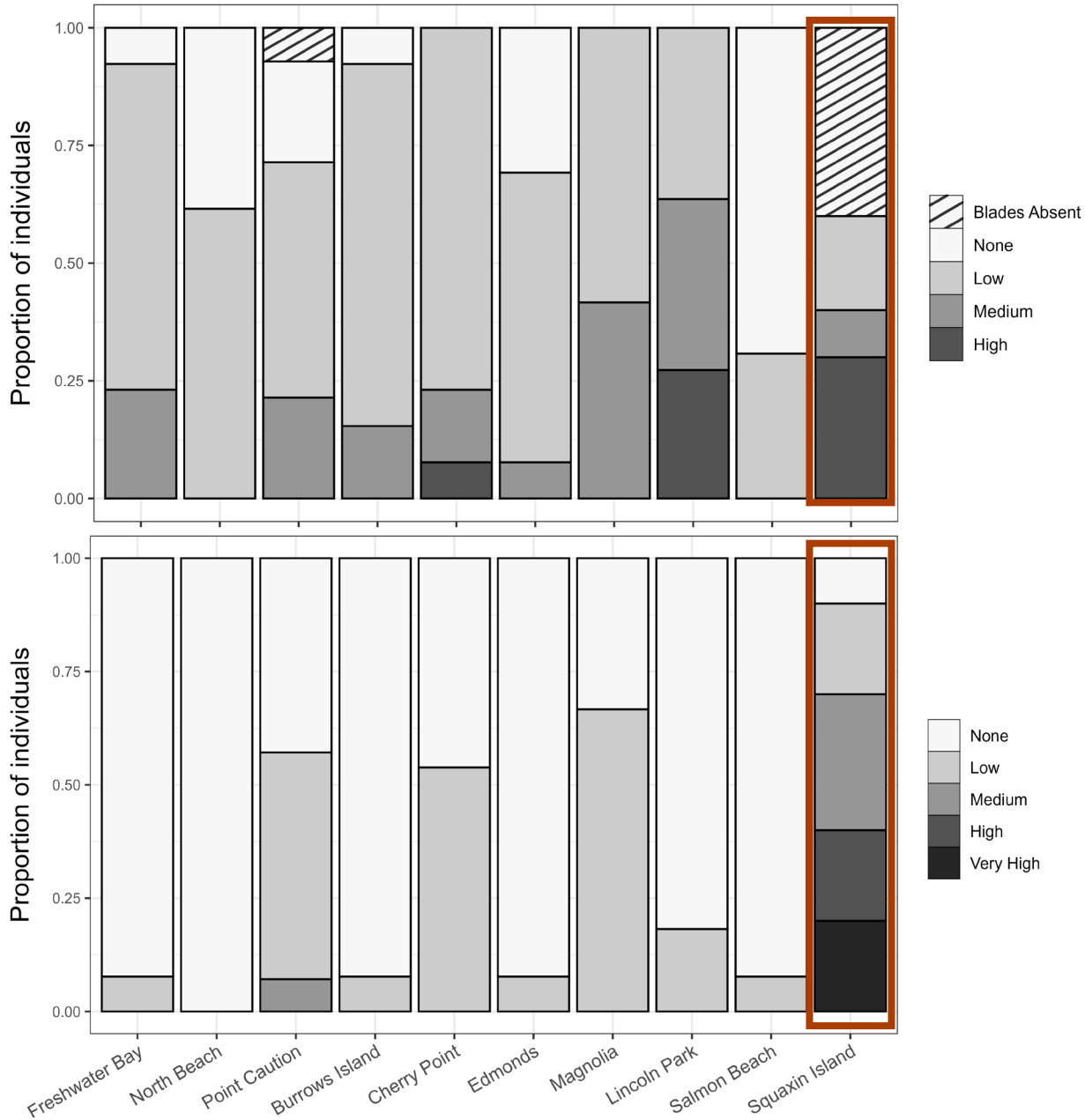


Also observed in Reef Check dive surveys

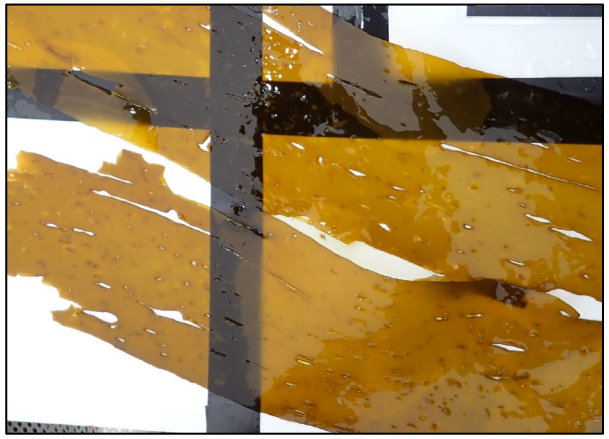
Data from August 2024



Mechanical damage was high at Squaxin Island



Mechanical damage to blades



Mechanical damage to bulbs



Data from August 2024



Important stressors at Squaxin Island?

- Increased temperatures (both pulses & sustained)
- Grazing & damage (kelp crabs)
- Algal competition (*Sargassum*/*Desmarestia*)
- Nutrient dynamics at key times



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But it came back in 2026!

Next steps for bull kelp in South Puget Sound

- Many areas experience intense stressors
- Bull kelp has persisted in South Puget Sound for the past century
- Big question: what are the mechanisms of recovery and resilience?
- Future work
  - Continued monitoring
  - Emerging questions
  - Interacting stressors
  - Genetic studies
  - DNR Kelp and Eelgrass Health and Conservation Plan

Questions?

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Photo: Julia Ledbetter, WA DNR