Estimating distribution of sedimentary benthic habitats and species on the eastern Pacific shelf

AND

Detecting effects of device deployment

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BOEM
Bureau of Ocean Energy Management

Regional Survey

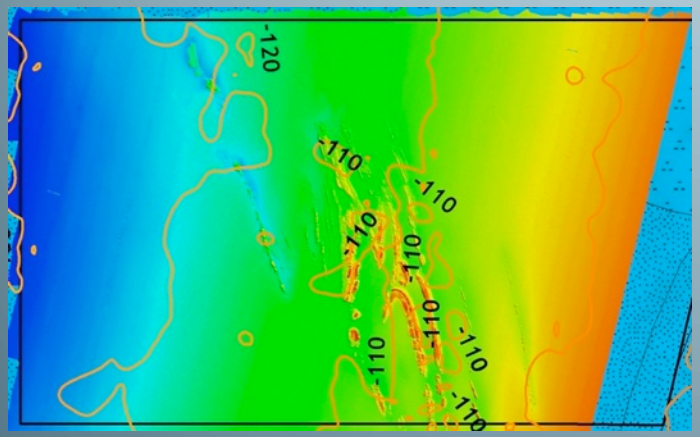
- High resolution mapping (5.5 sites)
- Sediment ground-truthing (6 sites)
- Invertebrate surveys
  - Infauna (box core): 8 sites, 153 grabs
  - Epifauna (ROV): 3 sites, 36 stations
- Objectives:
  - Map habitat, not just geology
  - Develop predictive capabilities of where to find high priority habitat or species

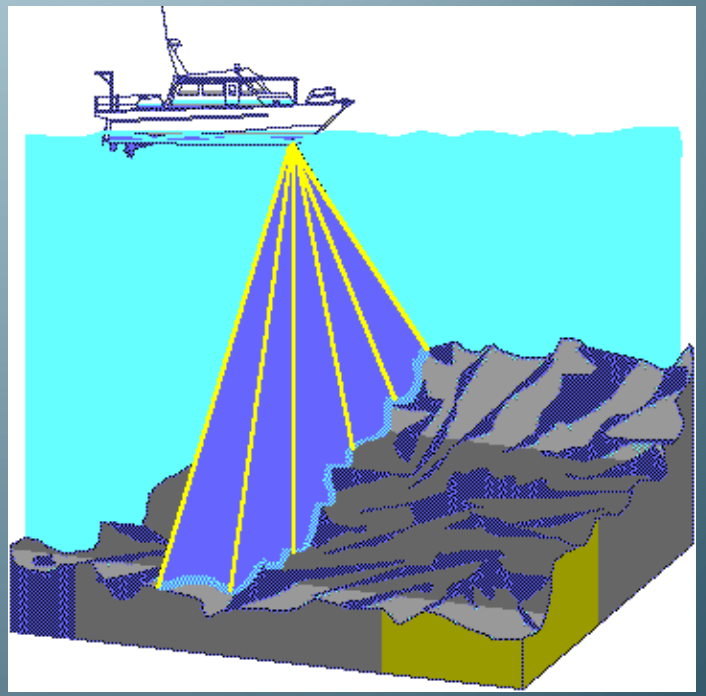
Part 1: Distribution of Habitats and Species

High Resolution Mapping

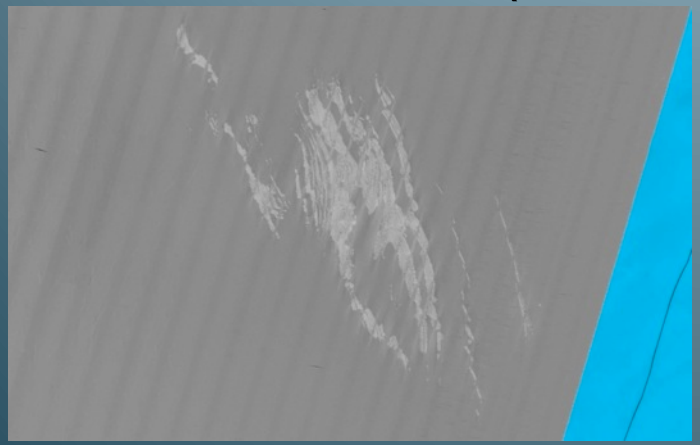
Conducted by C. Goldfinger lab (OSU-CEOAS)

Multi-beam sonar mapping (bathymetry)



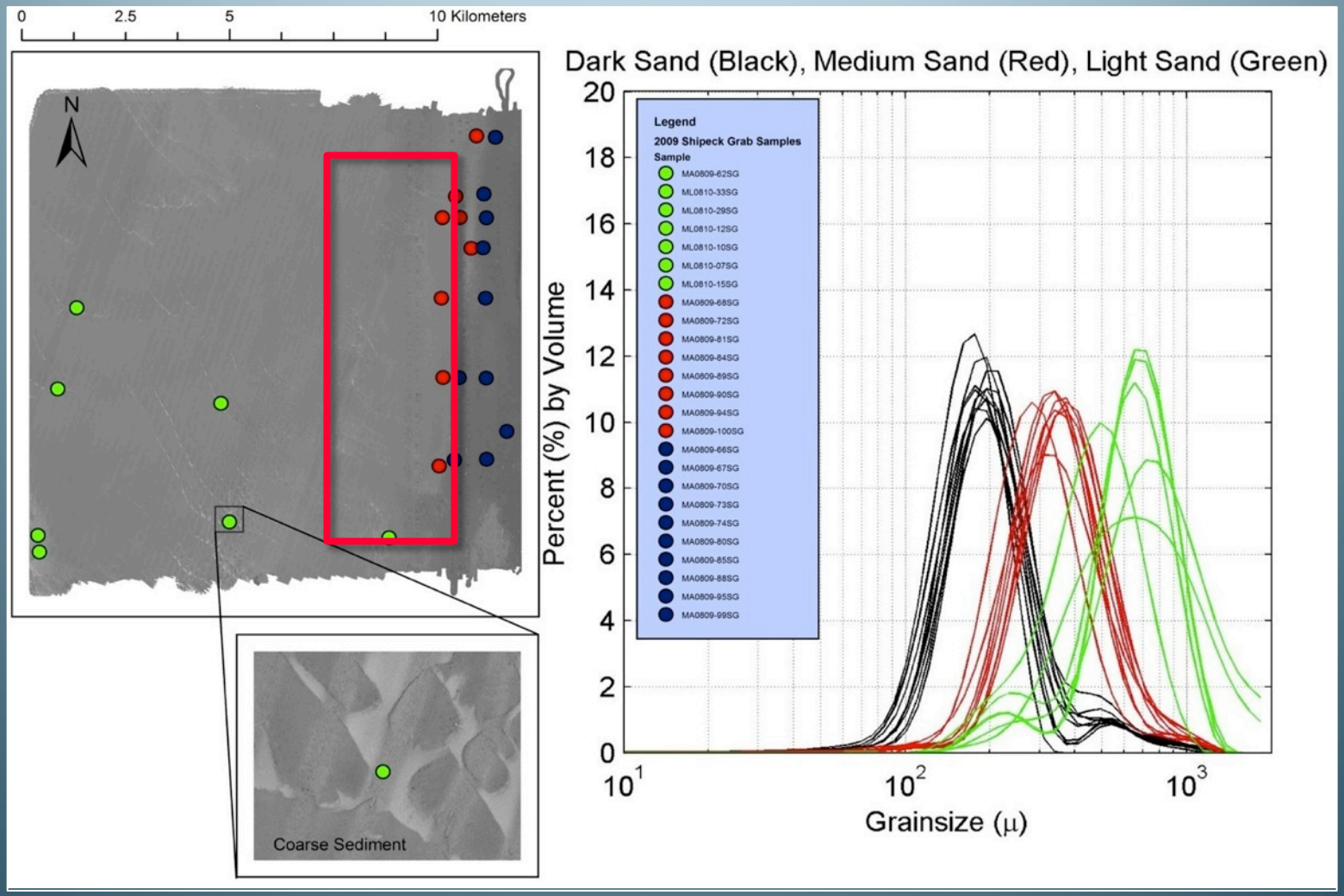


Acoustic backscatter (substrate type)



Groundtruth with Grab Samples

Conducted by C. Goldfinger lab (OSU-CEOAS)

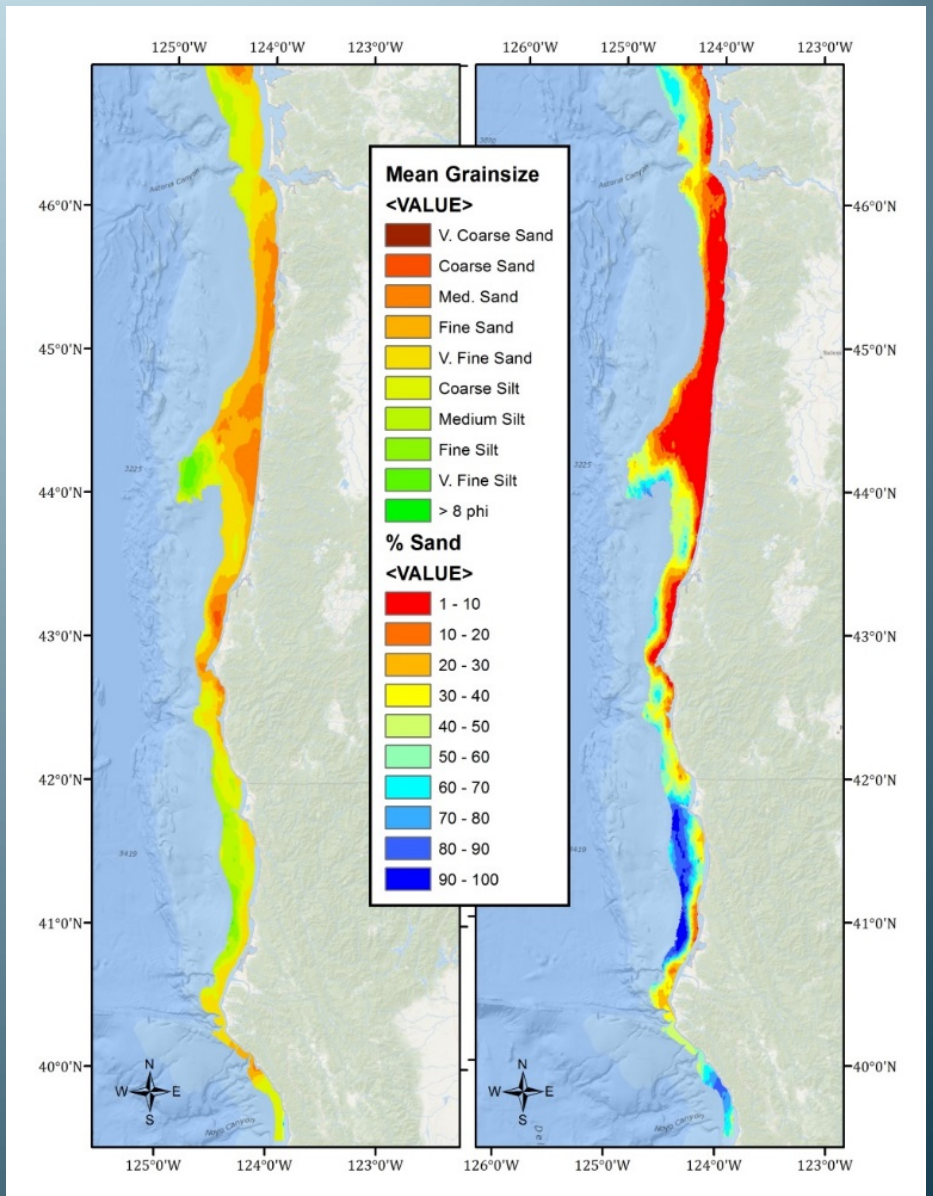


Part 1: Distribution of Habitats and Species

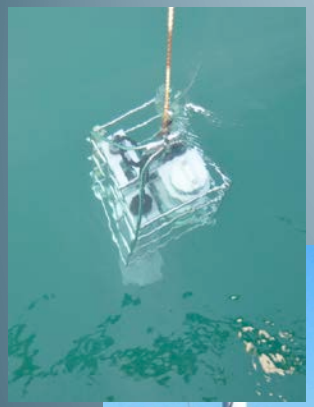
"Habitat" Maps based on Lithology

Created by C. Goldfinger lab (OSU-CEOAS)

- Mean Grain Size Map:
  - 3,360 samples selected from usSEABED, OSU, and BOEM databases; Inverse Distance Weighted Method: Error 8.15%
- % Sand Map:
  - 3,455 samples from usSEABED, OSU, BOEM, and EPA; Inverse Distance Weighted Method: RMS Error = 14.03%



Infauna and Sediment Sampling



Water quality samples

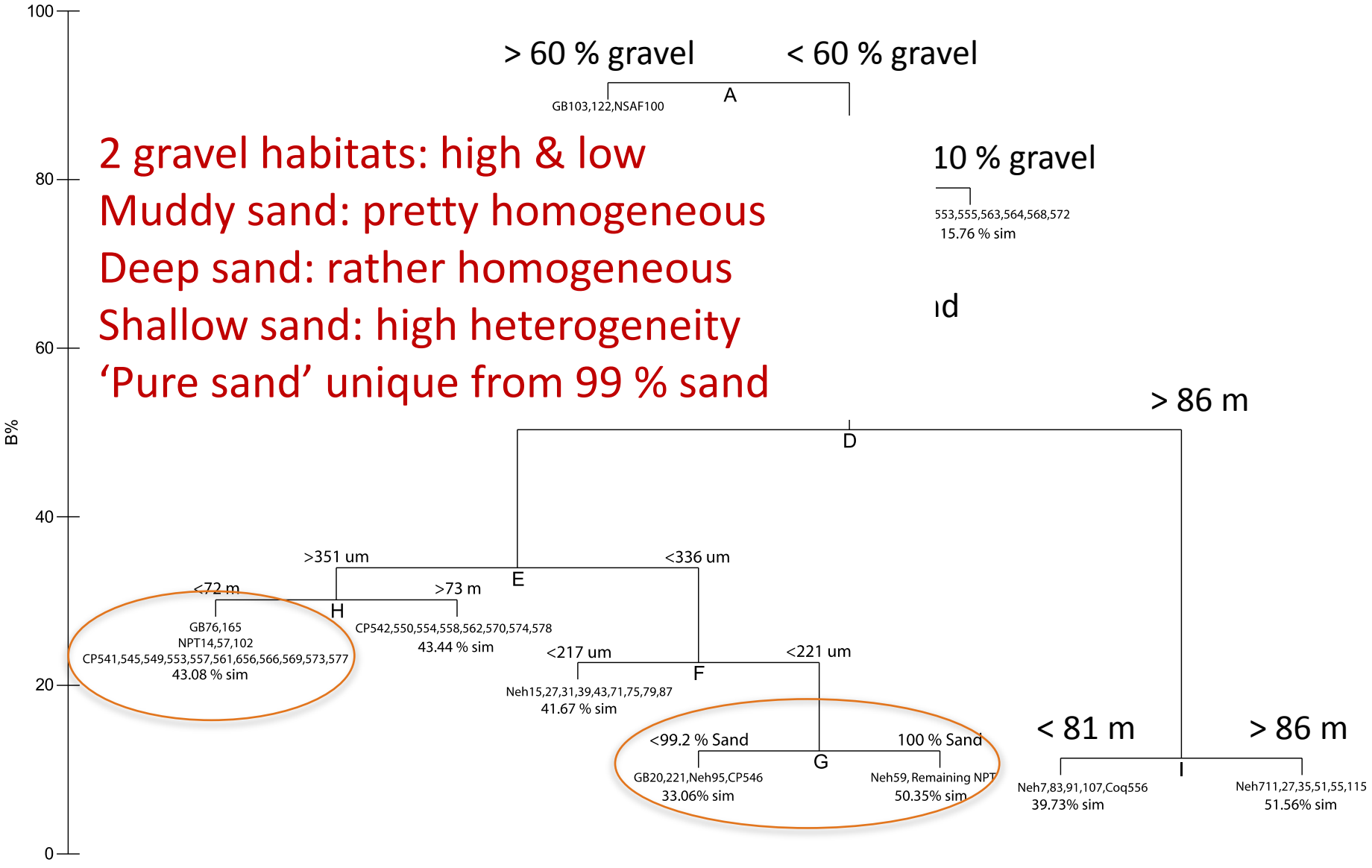
0.1 m^2 Grey-O'Hare box core

Analyze sediment for grain size, fines, TOC, TN

Sieve through 1.0 mm mesh

Identify infauna in the lab

LINKTREE Analysis



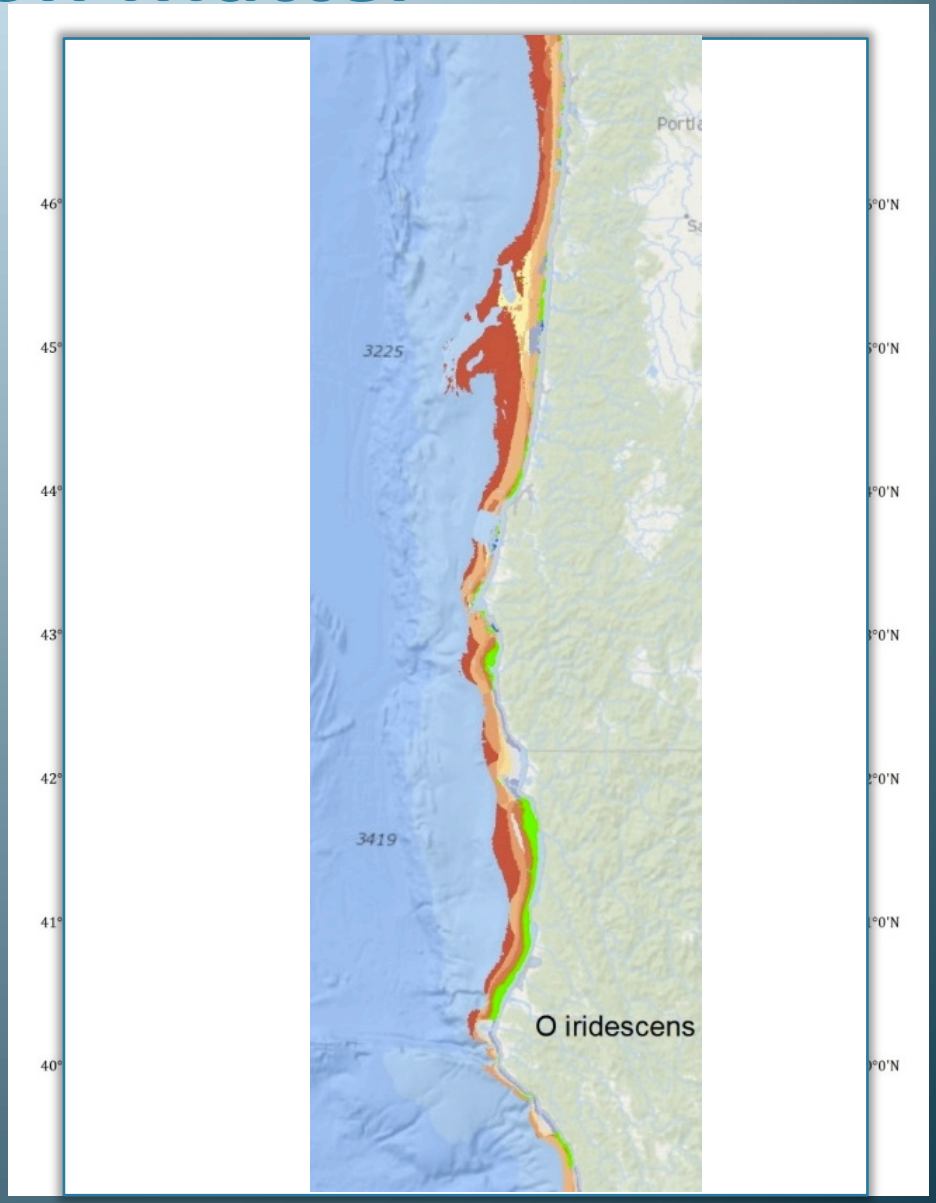
Routine in PRIMER 6 – come talk to me if you want details

Subtle Differences in Sediment Composition Matter

- Species assemblages within the study zone primarily shaped by % sand. Secondary differentiation based on depth and grain size.

Next steps: adjust bins to reflect species preferences rather than equal splitting:

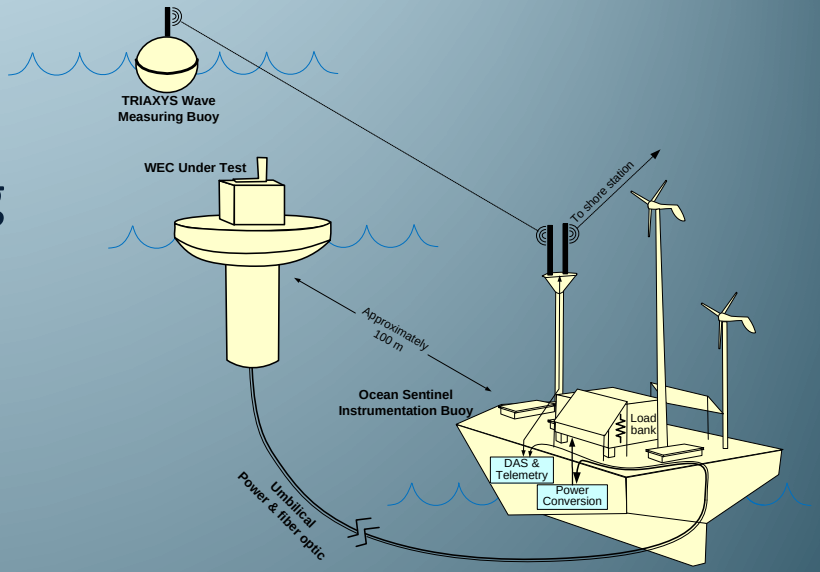
- 99 – 100 % sand
- 85 – 99 % sand
- < 84 % sand
- 60 – 100 % gravel
- 10 – 60 % gravel

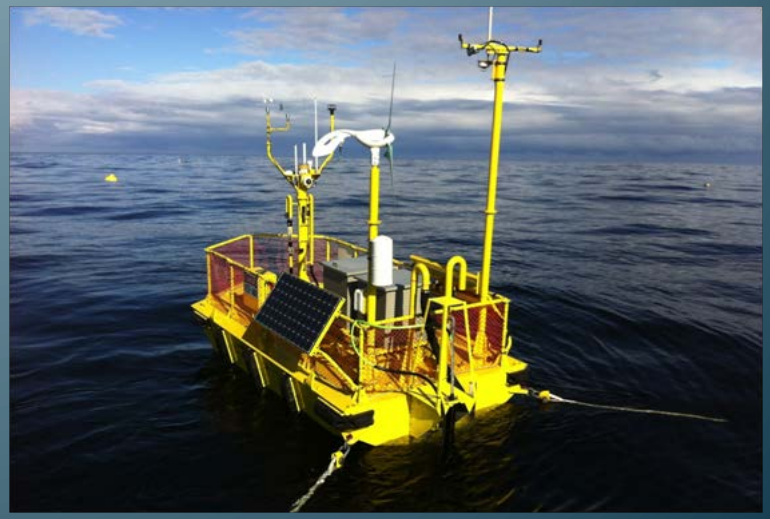


Pacific Marine Energy Center
North Energy Test Site

Ocean Sentinel

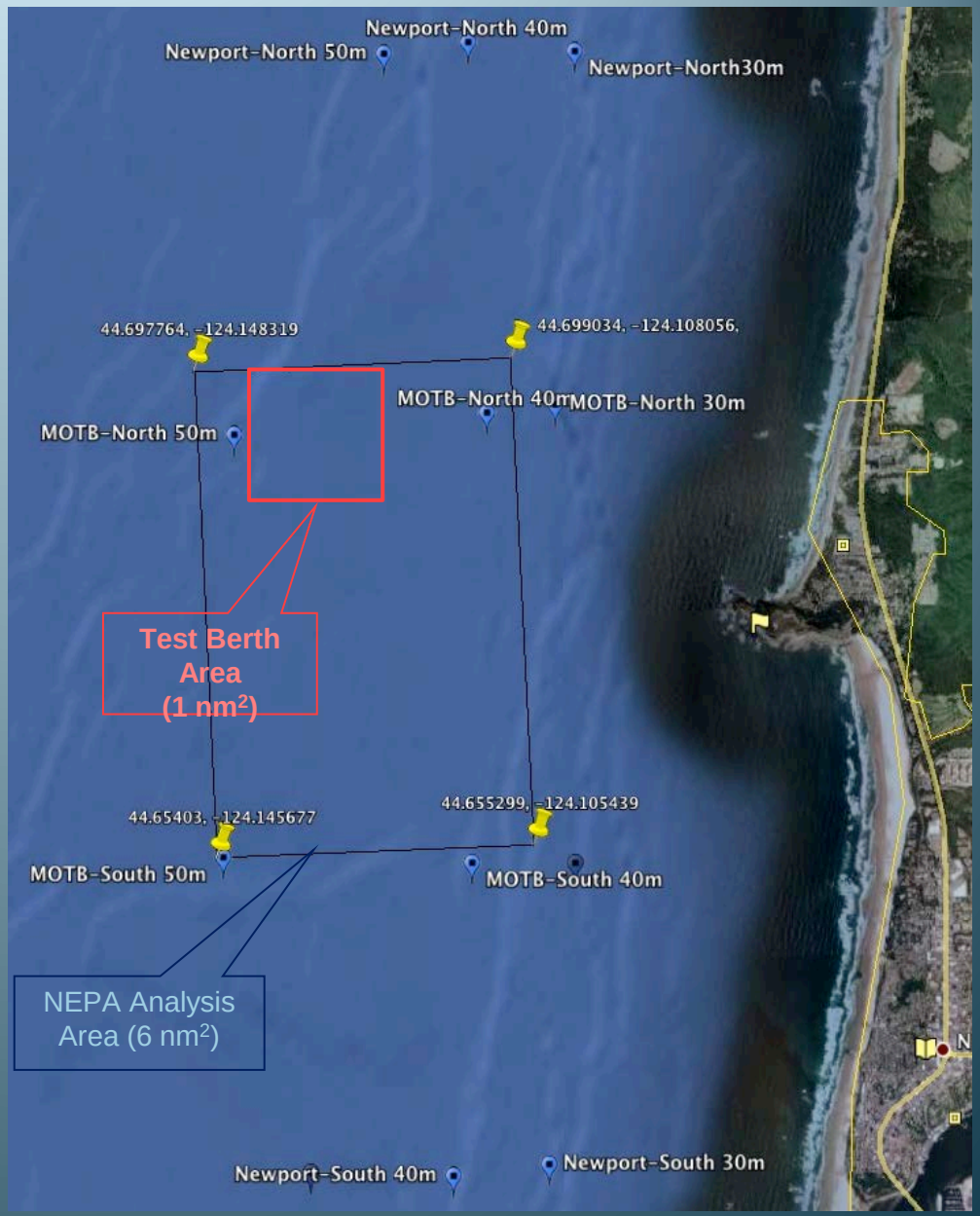
- Provide stand-alone electrical loading and power conversion for test WEC
- Measure and record WEC power output
- Collect and store data transmitted from the WEC under test and nearby wave-measuring instrument
- Transmit collected data to shore via wireless telemetry system





NETS Benthic Surveys

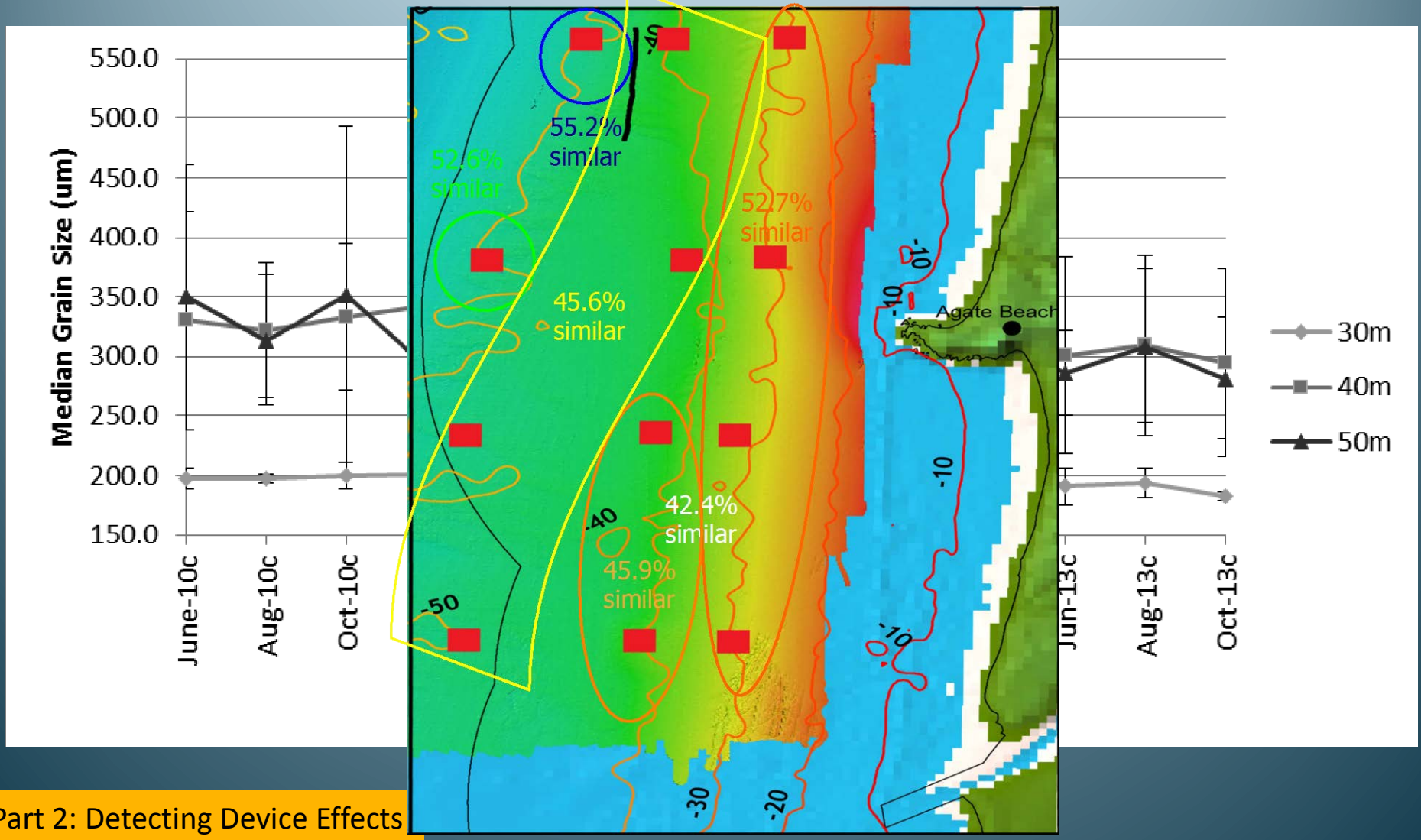
	Core	Trawl	Video
May 2010			✔
June 2010	✔	✔	
August 2010	✔	✔	✔
October 2010	✔	✔	
February 2011		✔	✔
April/May 2011	✔	✔	✔
June 2011	✔	✔	✔
August 2011	✔	✔	✔
October 2011	✔	✔	✔
December 2011	✔	✔	
June 2012	✔	✔	
Aug/Sept 2012	✔	✔	✔
Oct/Nov 2012	✔	✔	
April 2013		✔	
June 2013	✔	✔	
Aug/Sept 2013	✔	✔	✔
October 2013	✔*	✔	✔
December 2013		✔	
February 2014		✔	
April/May 2014	✔*	Today?	



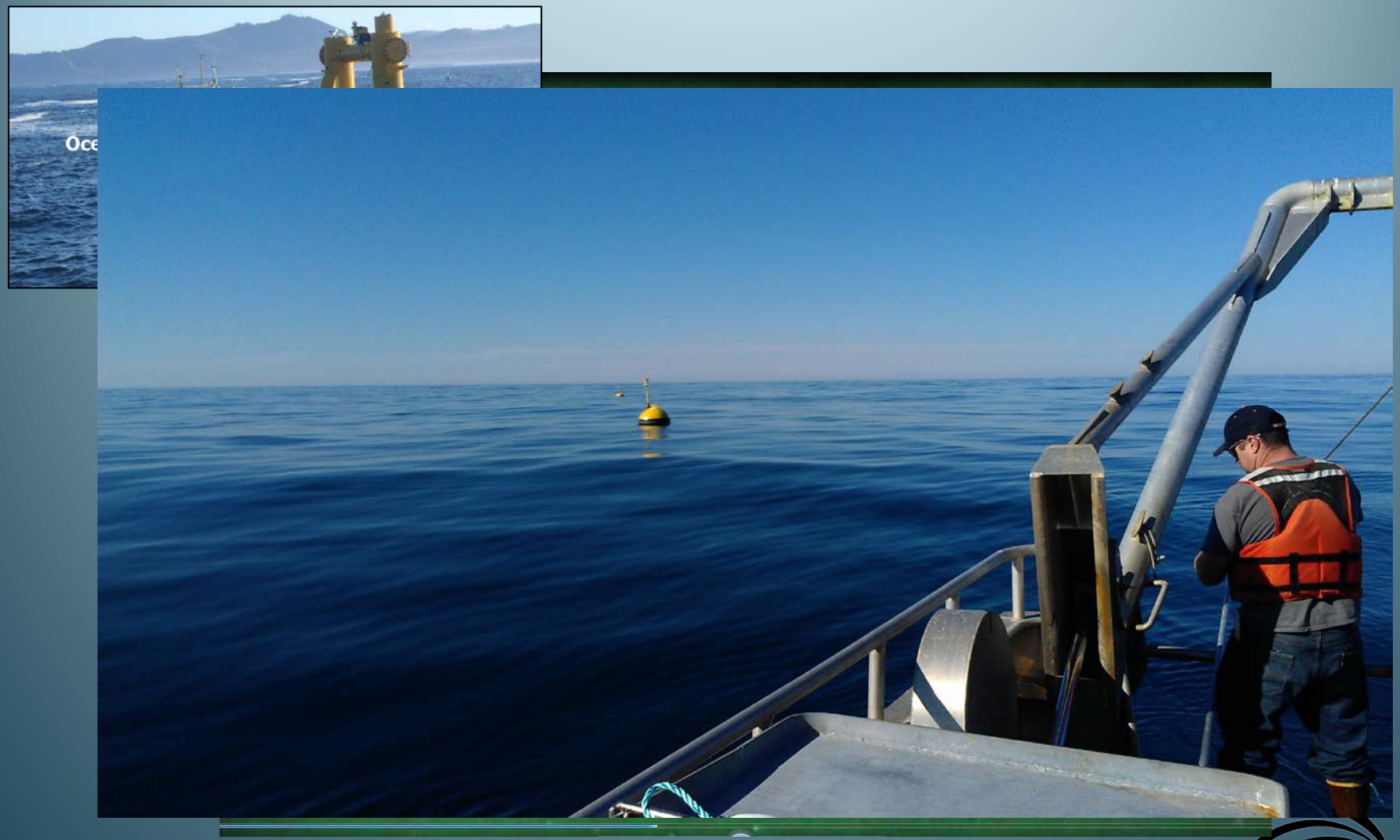
Infauna and Sediment Sampling

Sediment Composition Stable: No Seasonal or Inter-annual Variation

Infauna invertebrates: strong (but stable) spatial heterogeneity



2012 ROV Survey of Wet-NZ test



Starting in 2013, anchor grabs

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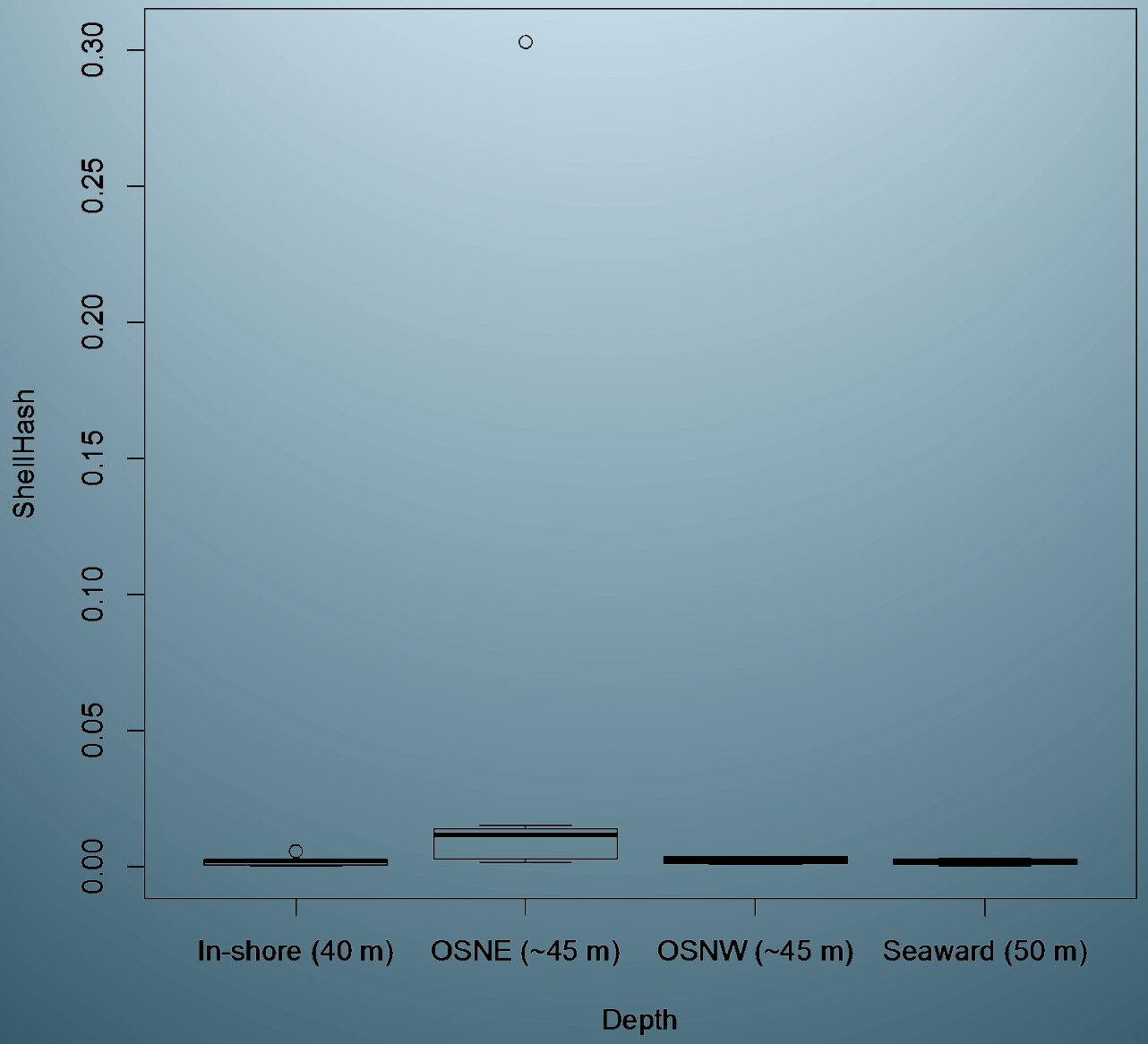
Shell Hash Proportion



Data pooled for October 2013 and April 2014

$p = 0.545$

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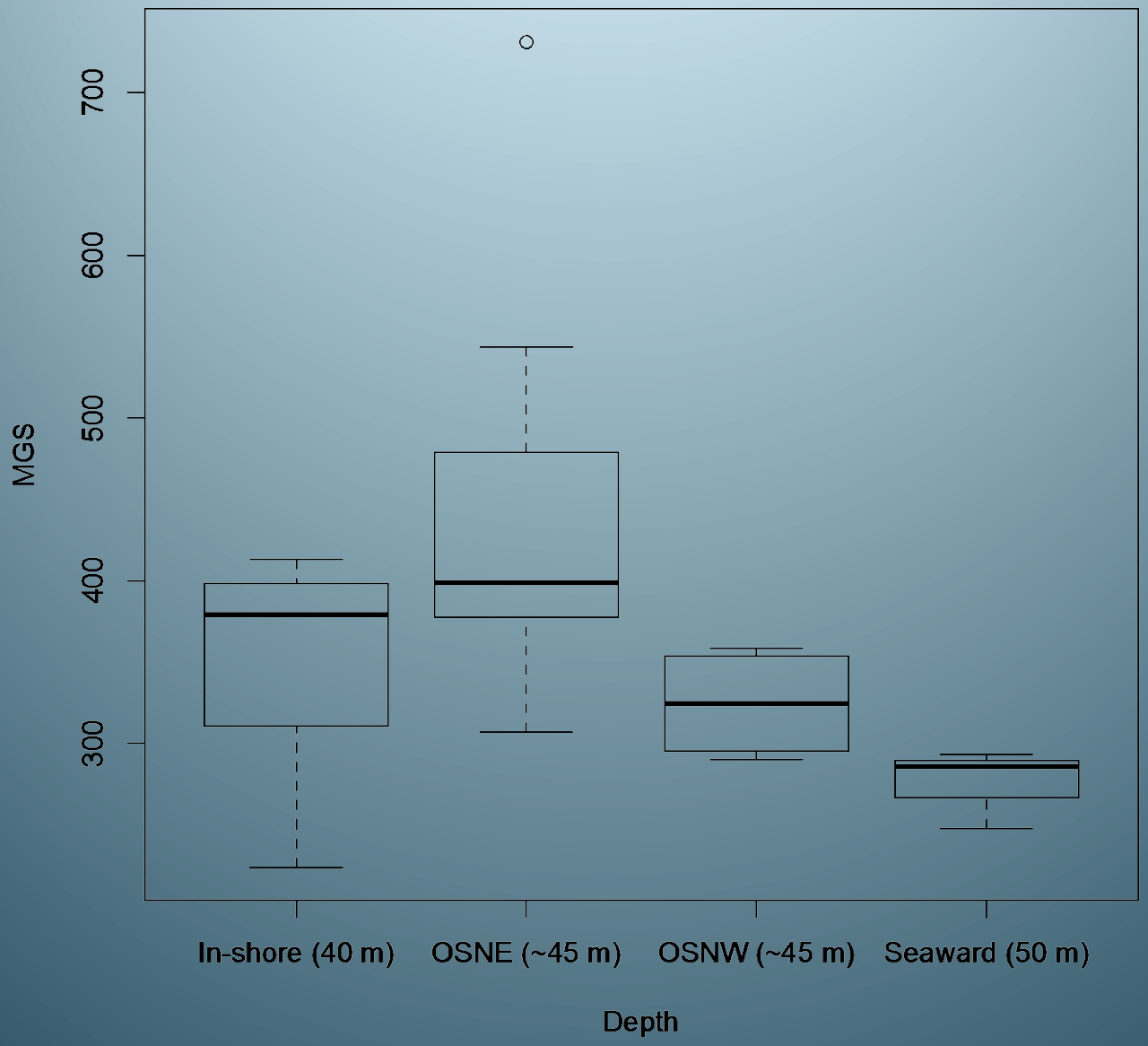
Effects on Grain Size?



Data pooled for October 2013 and April 2014

$p = 0.067$

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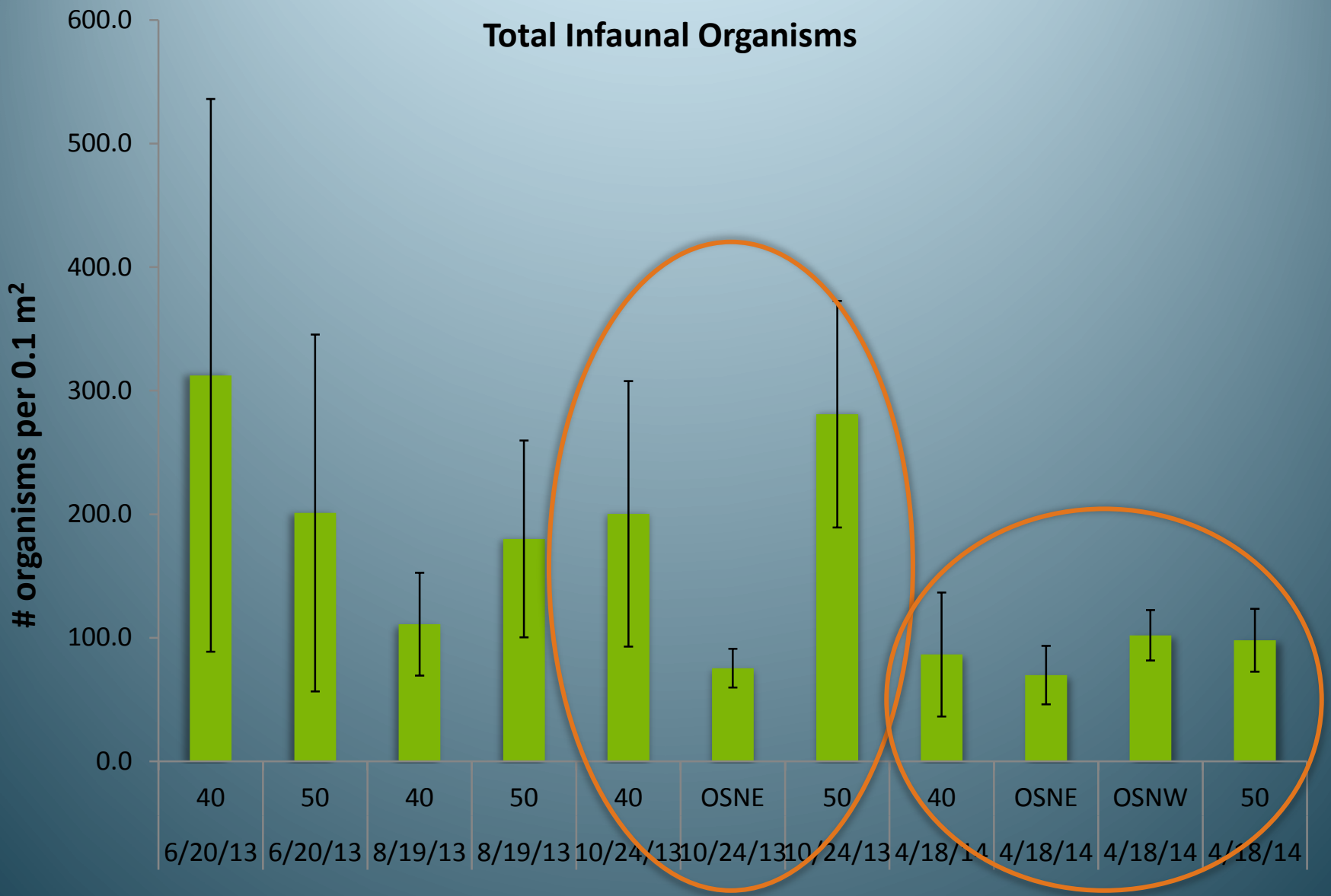
Effects on Organisms?



Part 2: Detecting Device Effects

Summary

- Species assemblages offshore within the region primarily shaped by % sand and depth, finer differentiation based on grain size.
- North Energy Test Site mostly consists of 99 – 100% medium to coarse sand, little capacity for change due to scour
- Some evidence of shell hash accumulation and scour around anchors with potential reductions in infaunal abundances at the end of the summer
- Little evidence for anchor effects at the end of winter
- Stay tuned…anchors are staying in until August
- No detectable effects > ½ km away from installation

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(464 box cores)

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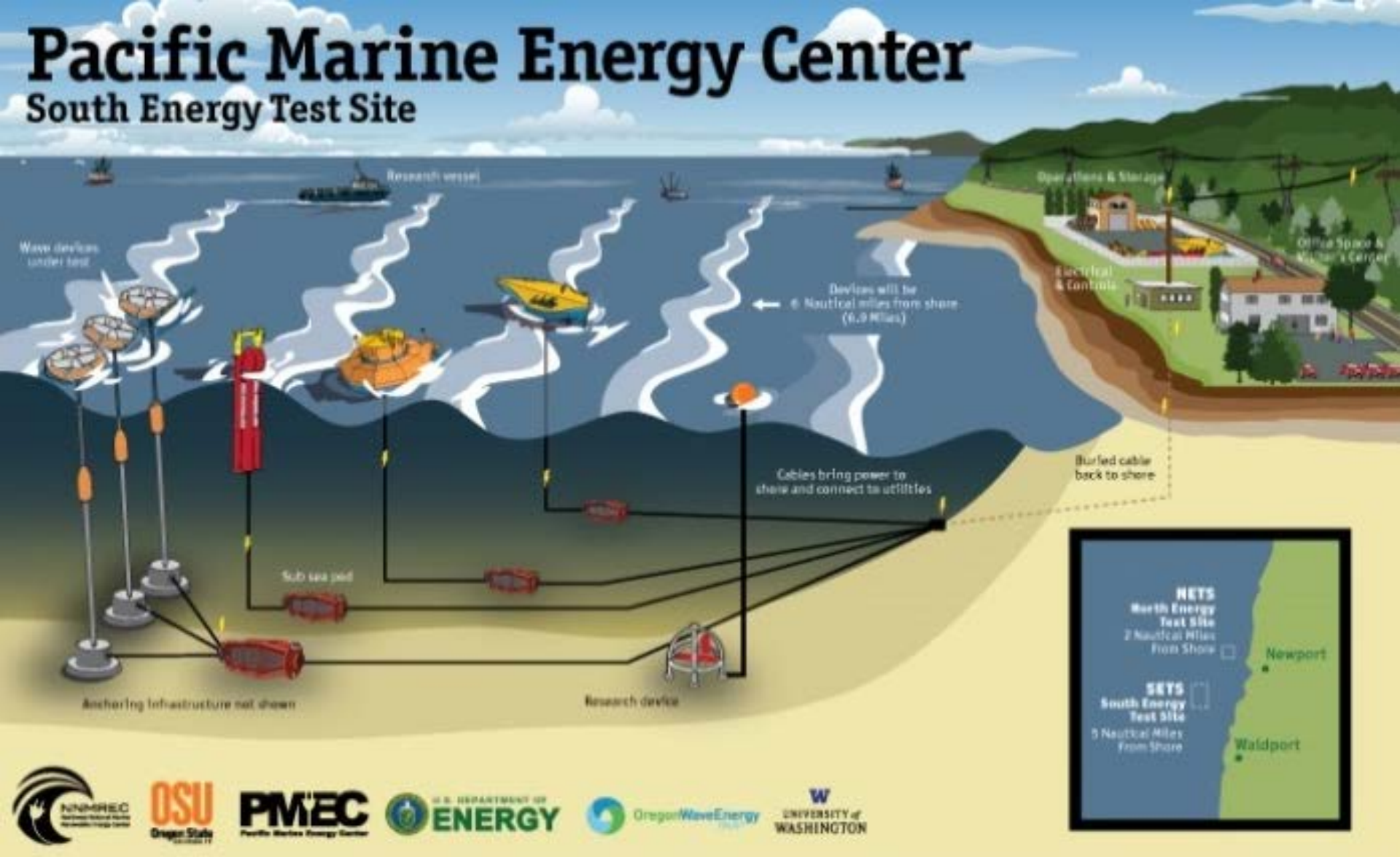
- ✧ PNNL
- ✧ Andrea Copping
- ✧ Wil Black



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Part 2: Detecting Device Effects

PMEC Surveys

- Benthic Invertebrates – grabs
  - 2010-14 @ NETS, 2013-14 @ SETS
- Groundfish (mostly flat) – trawls
  - 2010-14 @ NETS
- Dungeness Crab – pots
  - 2013-14 @ SETS
- Marine Birds and Mammals – ship-based observations
  - Suryan, Klinck (2013-14 @ NETS & SETS)
- Acoustics (Haxel, Dziak)
  - 2011-13 @ NETS
  - 2014 + @ SETS
- Electromagnetic Fields
  - Schultz