Characterizing Biological Communities at Marine Renewable Energy Sites







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Evolution of the Monitoring Perspective

Impact **on** devices vs impact **of** devices

Open Hydro

General Challenges for Biological Monitoring

High flow environments

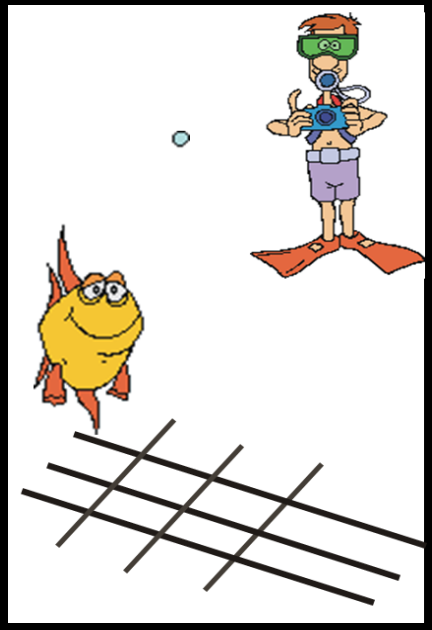
Choice of sampling instruments and survey design

Detecting change and causes of change

Scaling up

High Flow Environments

- Eularian or Lagrangian reference frame?
- Separating turbulence from biology
- Constraints of direct samples
- Lack of previous sampling, knowledge



Instruments & Survey Design

- Baseline or Monitoring?
- Choice of sampling gear(s): direct, indirect

  Nets: target species/length range?, midwater vs bottom

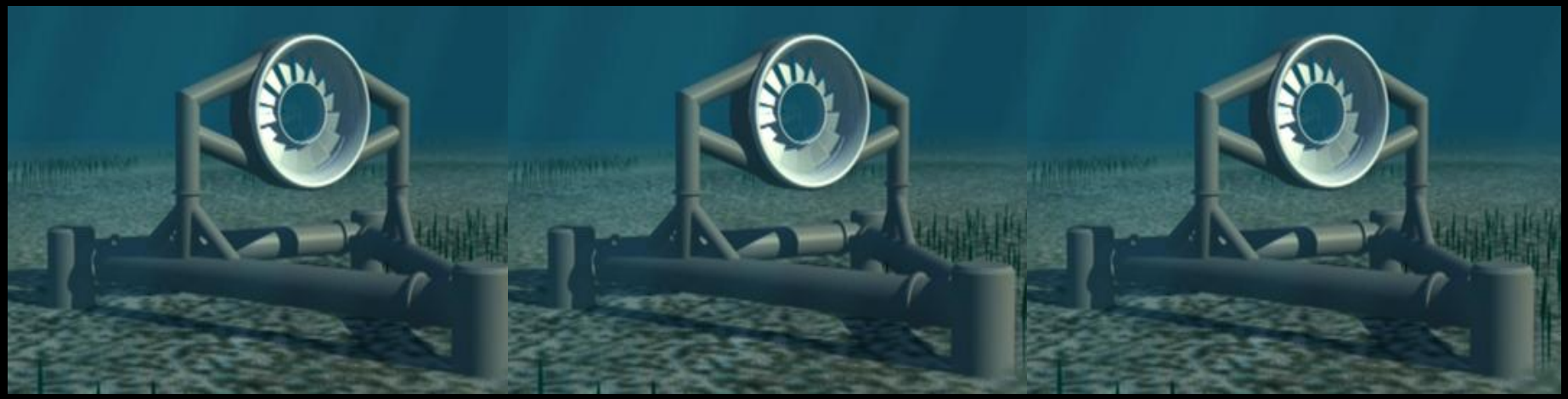
  Remote sensors: optics vs acoustics, long to short range
- Temporally or Spatially indexed data?
- Allocation of effort
- Transect/Station layout

Detecting Change

- Potential impacts: distributions, aggregation, avoidance, strike, impingment
- Detect, discriminate, classify, identify(?)
- Pattern or process study?
- What constitutes change?

Scaling Up

- No devices
- Proof of concept (1, 2, a few)
- Commercial production (10’s, lots)



Evaluating acoustic technologies to monitor aquatic organisms at renewable energy sites

- Choose acoustic technologies to monitor nekton at hydrokinetic sites
- Collect baseline data on animal distributions and densities through tidal cycles
- Quantify what stationary deployment acoustic data represent
- Formulate metrics to index biomass distribution, size, and flux

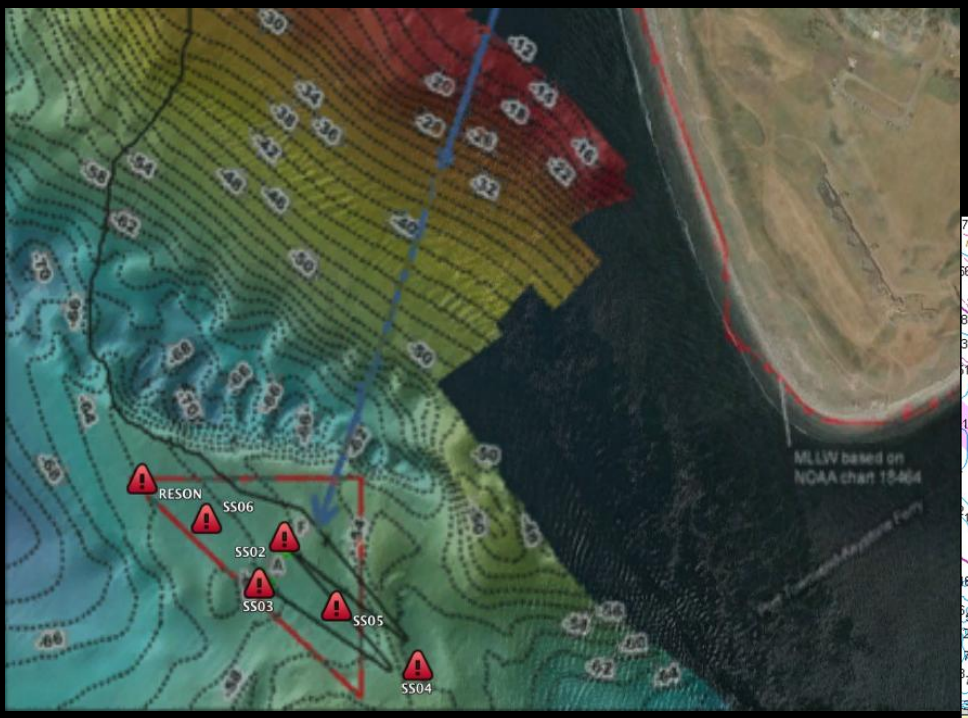
Joint NOAA NMFS, UW, BioSonics, Reson, Sound Metrics, and Simrad project funded by DOE and BOEMRE under the NOPP

Survey Objectives

- quantify the species composition, distribution, and abundance of pelagic fish and macro-invertebrates.
- compare temporally-indexed to spatially-indexed data sets
- recommend methods for future monitoring

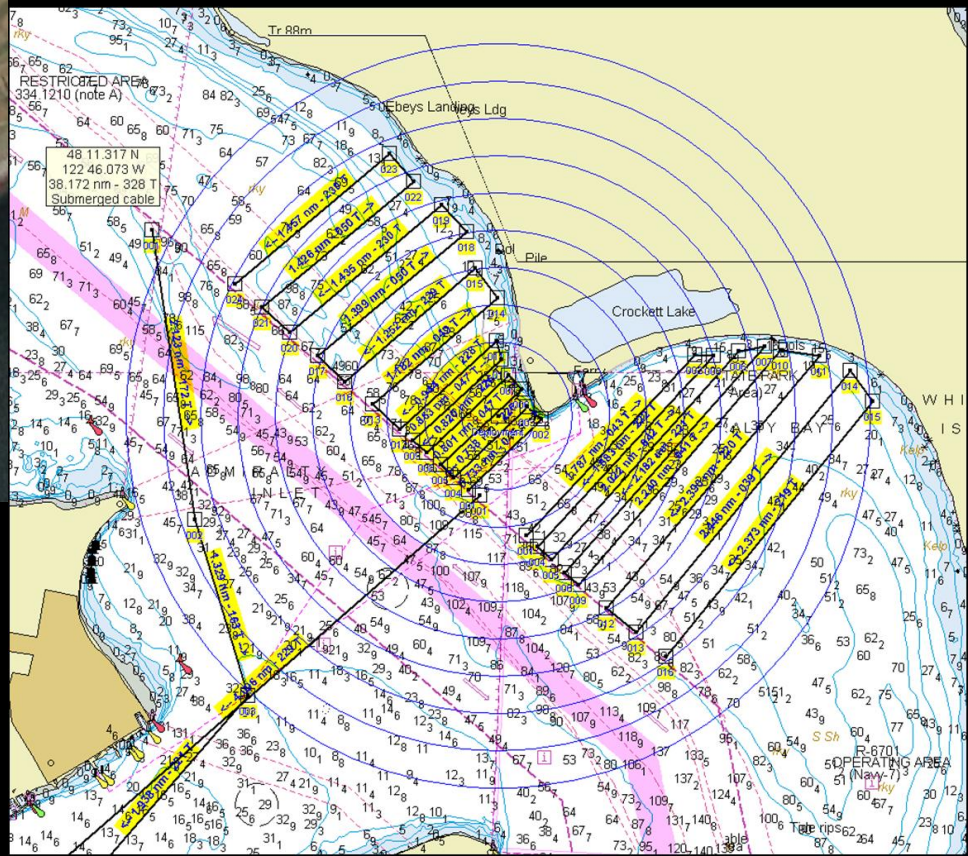
Survey Design

Bottom Acoustic Instrument Packages



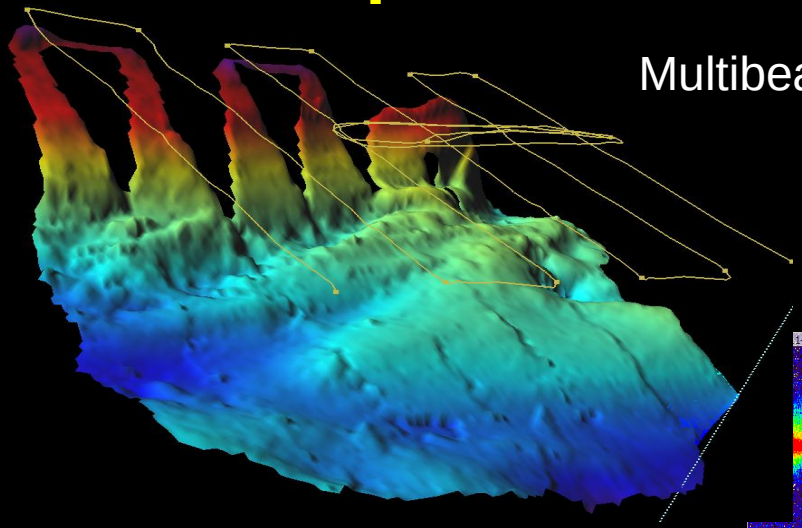
Multibeam sonar, echosounder, acoustic camera, water current profilers

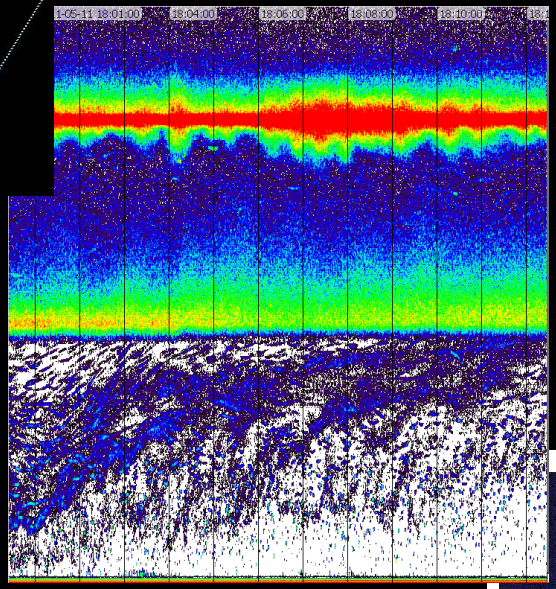
Acoustic, Midwater Trawl, Seabird, Mammal Survey



Example Acoustic Instrument Data

Multibeam sonar

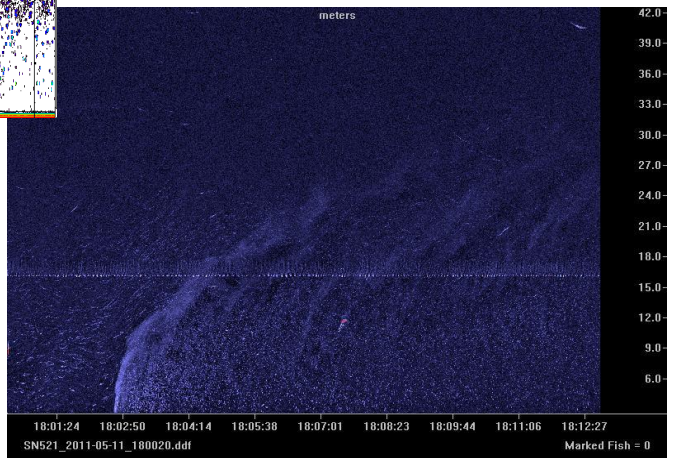




Splitbeam echosounder

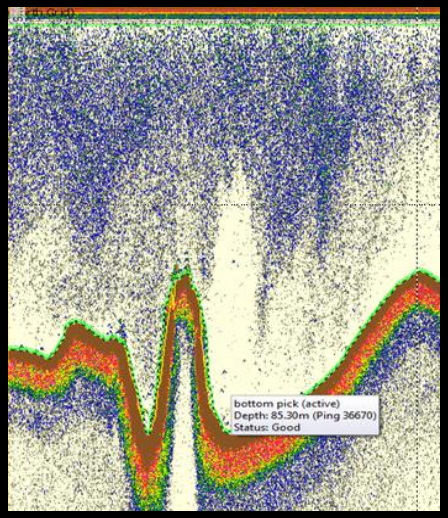
May 11, 2011
18:00 – 18:12

Acoustic camera

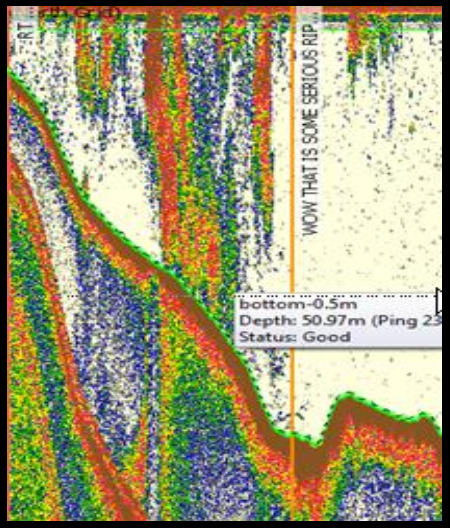


Surface Acoustic Distributions

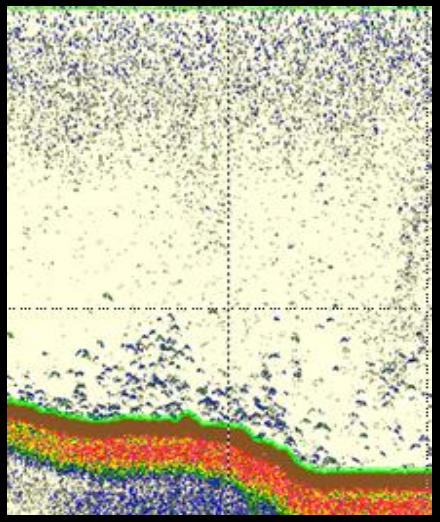
Blue fuzz cloud



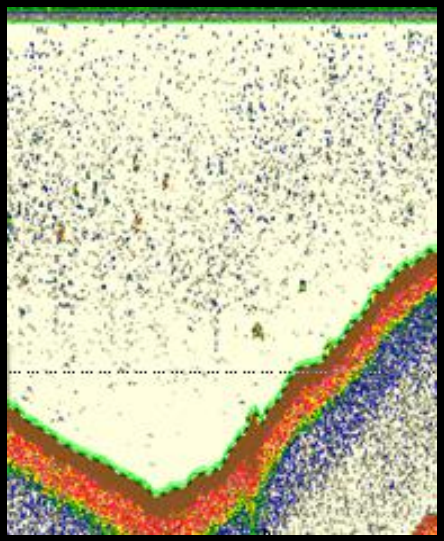
Turbulence



Bottom targets

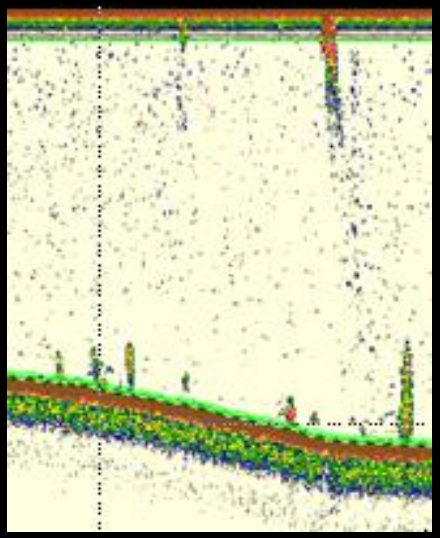


Mid-water targets



WOW THAT IS SOME SERIOUS RIP

Bottom aggregations



Things We Learned

- Autonomous deployments carry risks: no data, limited data, poor quality data, non-traditional deployments
- Autonomous deployments are typically constrained by power (data storage not a constraint)
- Direct sampling is a challenge: tidal flows (to reduce net drag: knotless, spectra)
- Determining a sample, determining change

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Challenges

Met

- - Acoustic instruments chosen are representative of technological classes
- - Field sampling design provides baseline and comparative data streams

Remaining

- - Comparison of stationary to mobile acoustic data streams
- - Formulation of metrics for monitoring hydrokinetic sites