FAST: The Fundy Advanced Sensor Technology Program

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www.fundyforce.ca

FORCE OVERVIEW

- Not-for-profit organization (est. 2009)
  - hub for in-stream tidal power research & development
  - determine whether in-stream tidal power can be a part of Canada's MRE future

- Fulfills mandate through two concurrent roles:
  I.   Host - onshore/offshore infrastructure for testing tidal turbine technology
  II. Steward - environmental monitoring, research and engagement activities

- FORCE is Canada's leading research center for the demonstration and evaluation of in-stream tidal energy technology
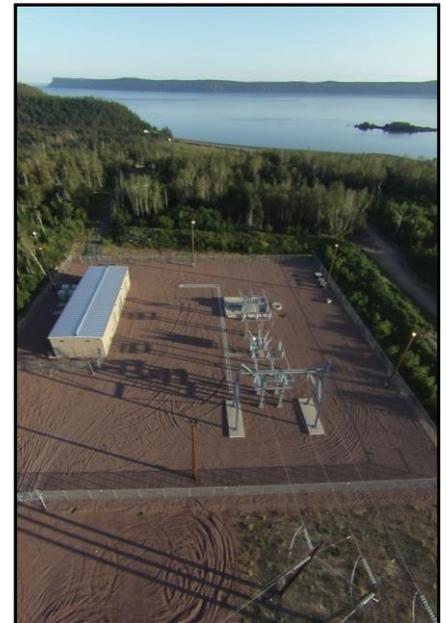
FUNDY ADVANCED SENSOR TECHNOLOGY PROGRAM

- Onshore assets and subsea instrument platforms:
  - advancing site characterization capabilities
  - establishing environmental monitoring standards and technologies
  - developing marine operating methodologies

- Onshore assets:
  - x-band marine radar - wave, surface currents, oceanographic modelling
  - weather station - high-res imagery, web-enabled
  - tide gauge - real time, web-enabled
  - FORCE data dashboard: https://fundyforcelive.ca

FUNDY ADVANCED SENSOR TECHNOLOGY PROGRAM

- Subsea instrument platforms:
    - FAST-1 (autonomous)
        - Vectron – measures turbulence in mid-water column

    - FAST-2 (autonomous; site characterization)
        - ADCP, CTD, DO
   - fish tag receiver, subsea camera, light

FUNDY ADVANCED SENSOR TECHNOLOGY PROGRAM

- FAST-EMS (cabled – real time data; R&D stage)
  - directional sensors, ADCP
  - Gemini multibeam with dynamic mount (pan/tilt)
  - Scuplin subsea camera
  - icListen hydrophones
  - multiplexer and termination canister
    - Viehman et al. (2018) – Test of Gemini and SeaTec software

- FAST-3 (autonomous) – used for a variety of projects
  - flexibility to accommodate various sensor suites

FAST-3 – Comparative Hydroacoustics

- Collaboration with Haley Viehman (Echoview) (Viehman et al. 2019)

- Compare mobile (EK80) vs. stationary monitoring (WBAT/AZFP) to resolve variability in fish distribution and determine optimal monitoring approach

- Results:
  - strong effects of tidal/diel period on fish density estimates
  - greater variation over short time frames than over the course of a year
  - reinforces importance of 24-hr data collection – allows diel and tidal variability to be quantified and isolated from long term trends in fish density and distribution that need to be monitored for testing effects of tidal turbines
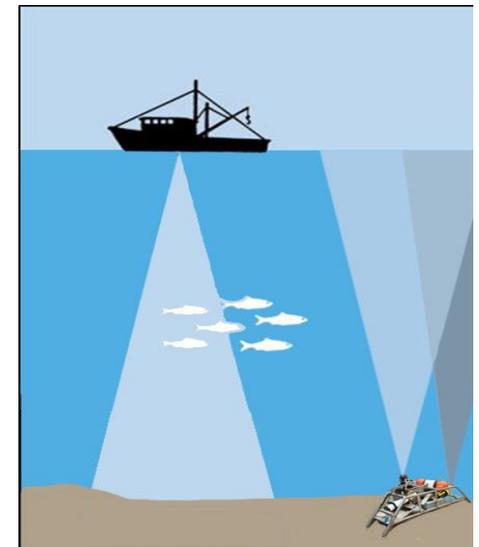
FAST-3 – THE PATHWAY PROGRAM

- Objective: develop a regulator-approved integrated monitoring systems that supports environmental permitting

- Technology validation (Phase III)
  - staged approach to sensor utility demonstration in high-flow environments:
    - Passive Acoustic Monitoring technology
    - echosounders
    - imaging sonars
   - sensor integration

FAST-3 – Comparative PAM Assessment

- Five co-located instruments:
  - C-POD, F-POD, SoundTrap, icListen, AMAR
  - passive drifts with icTalk (synthetic clicks) over range of tidal conditions

- Preliminary results:
  - icListen most sensitive (elevated false-positive detections)
  - efforts underway to develop new detector/classifier

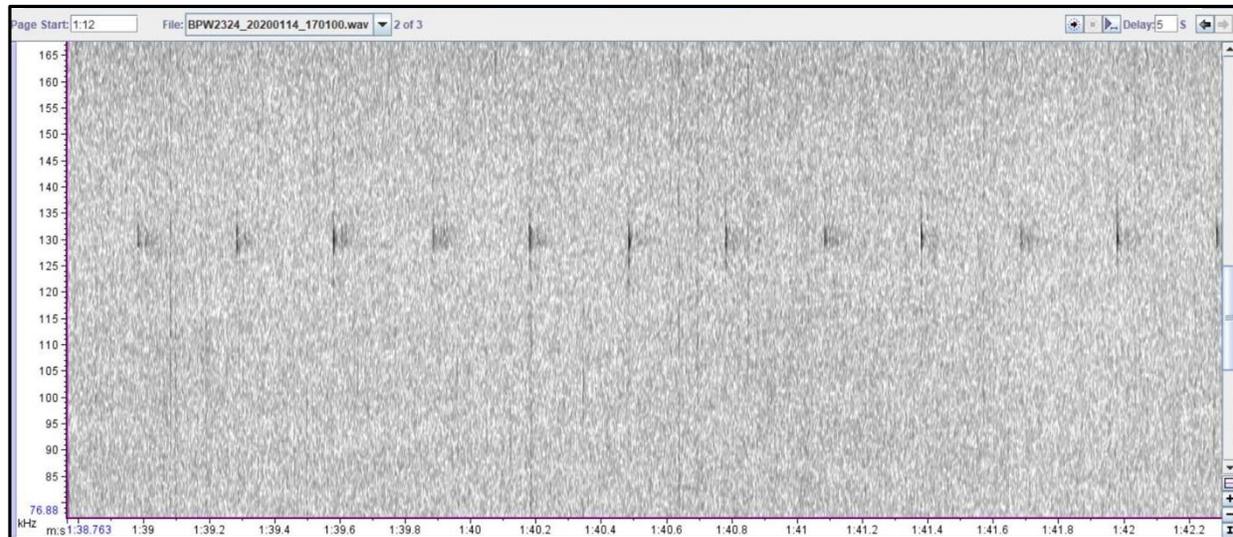# FAST-3 – PAM Relative Performance

- Collaboration between FORCE and SMEC (Grand Passage)

- Relative performance at surface vs. bottom
  - Where should hydrophones be deployed?
  - trial run fall 2019 – full study to be executed spring 2020
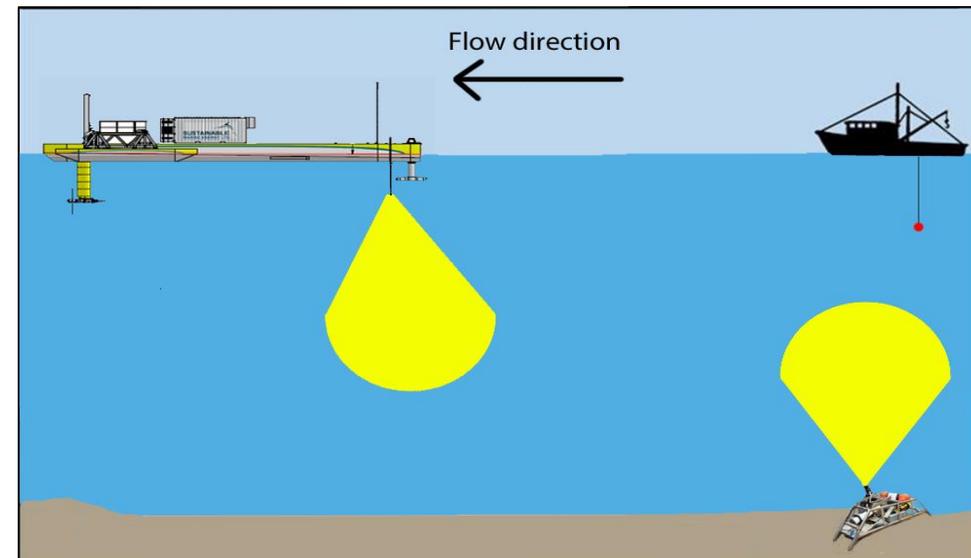
FAST-3 – PAM Relative Performance

Bottom-mounted hydrophone
- icTalk clearly detected

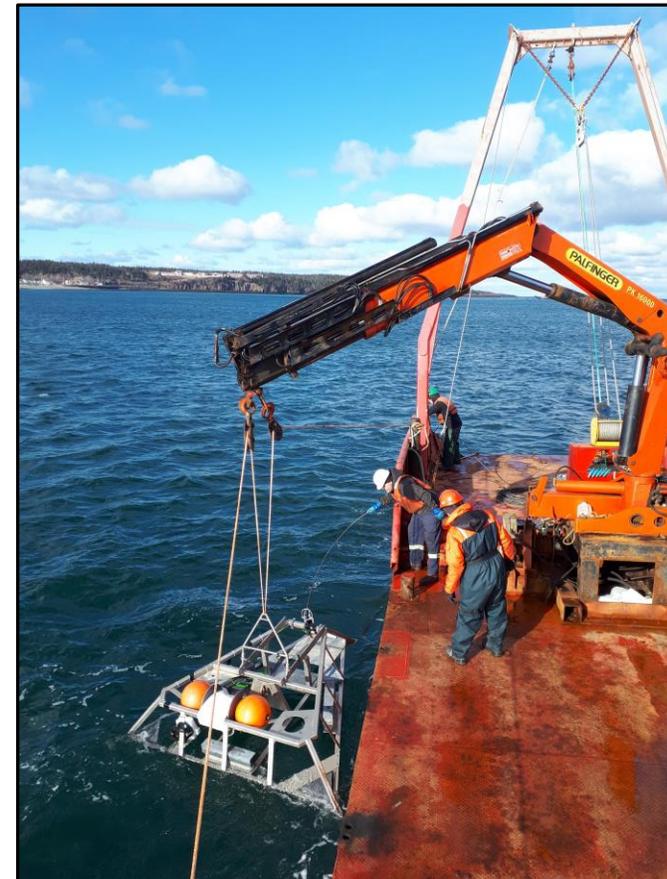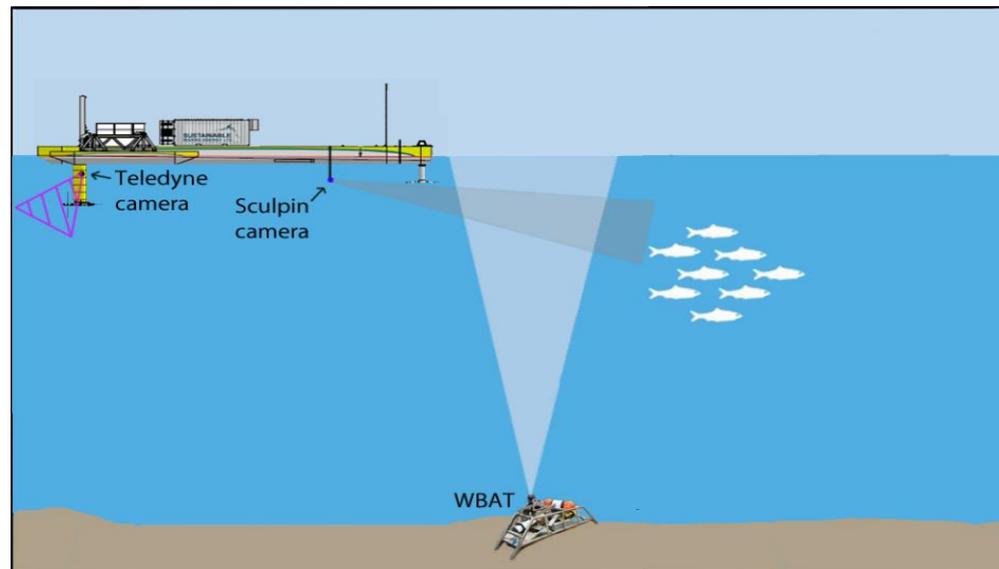Surface-deployed hydrophone
- electrical interference (inverter)
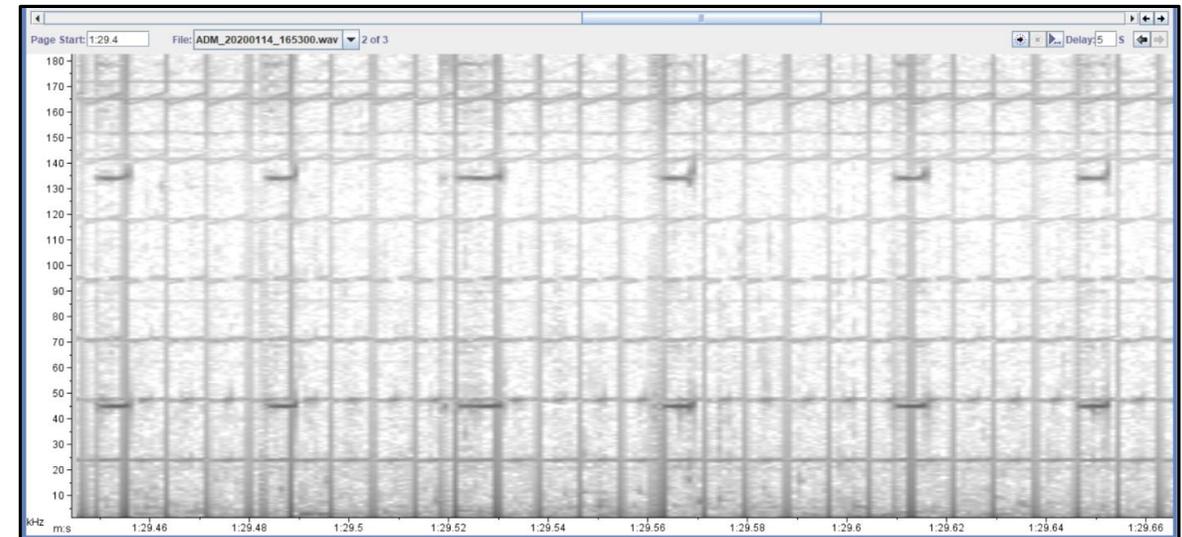
FAST-3 – Echosounder Assessments

Objective: Investigate target detection capabilities in surface and bottom deployments – 3 projects

1. WBAT and optical camera

- data collection complete
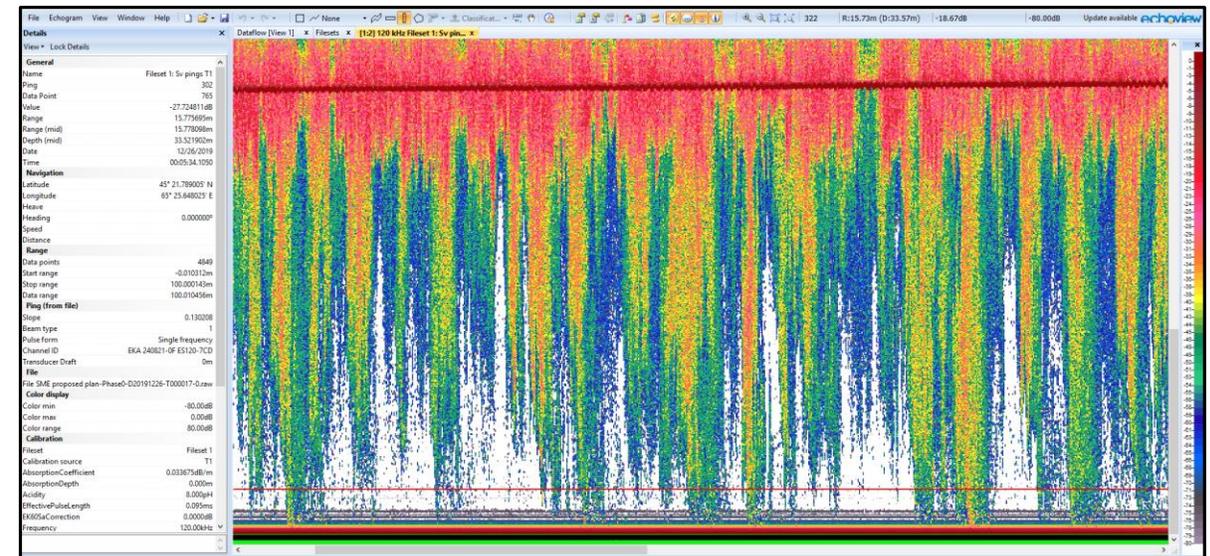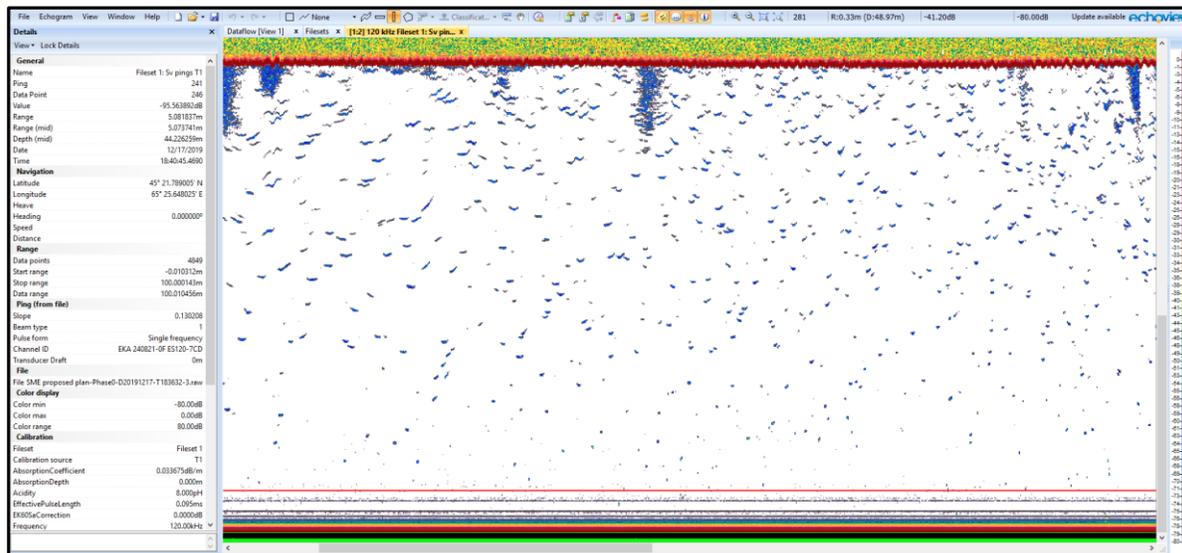- post-processing and analyses underway

FAST-3 – Echosounder Assessments

Good echograms:

- slack water
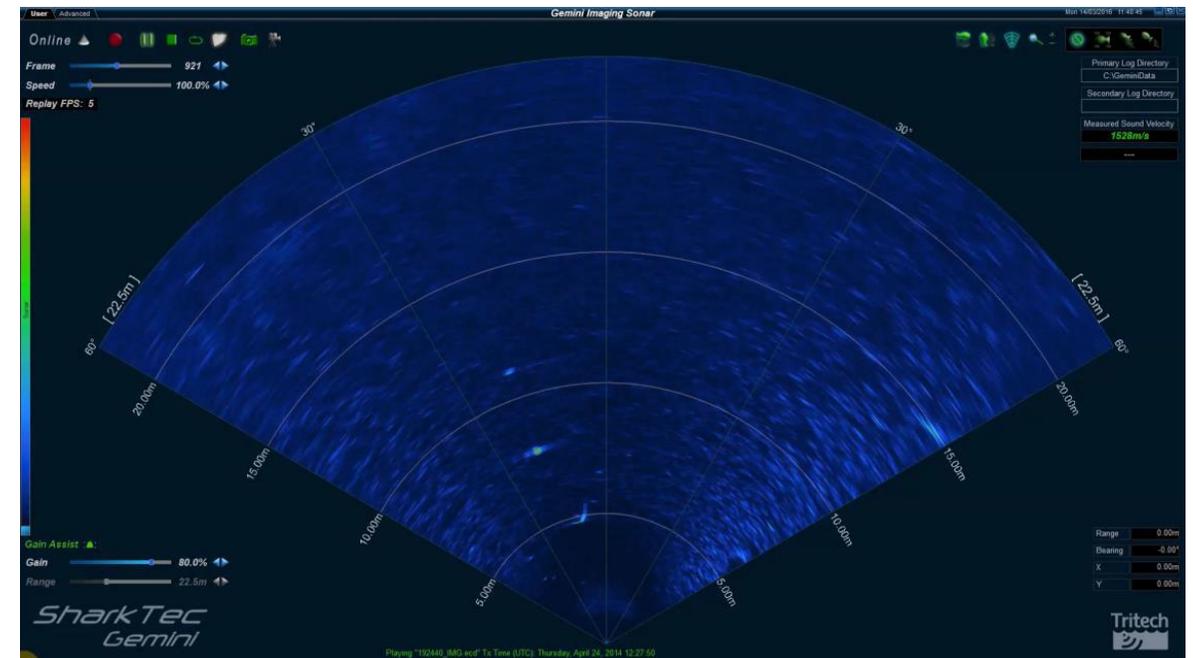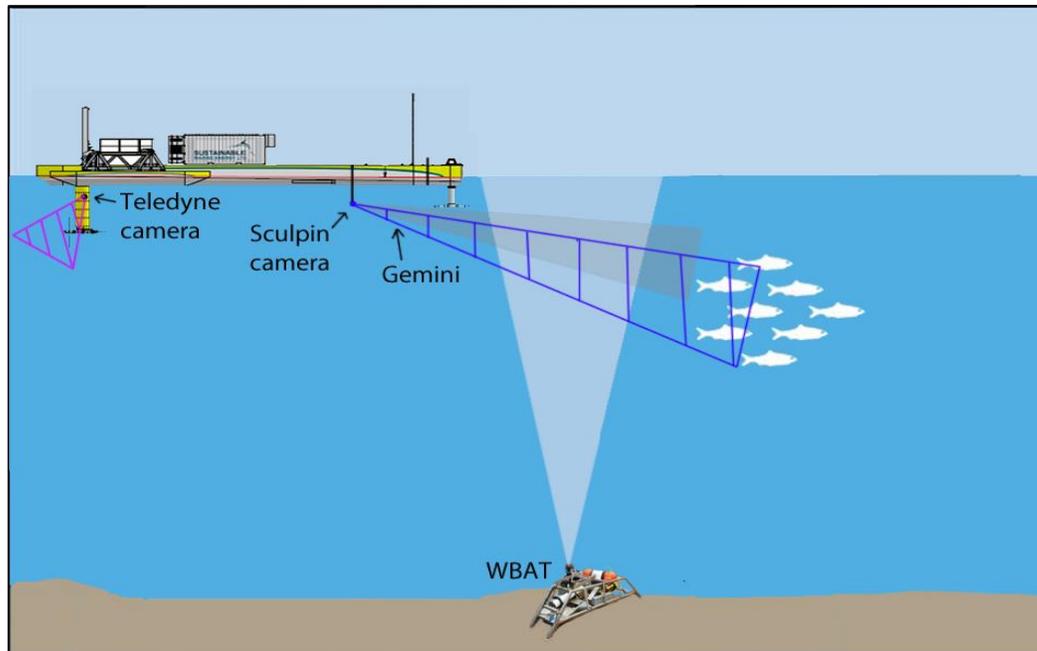- lots of 'targets' (possible fish)

Bad echograms:

- high flow
- lots of entrained air

FAST-3 – Echosounder Assessments

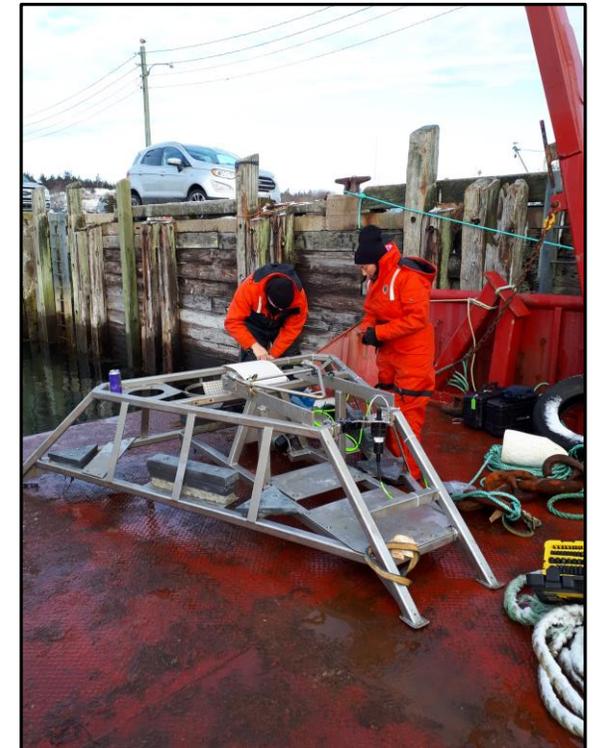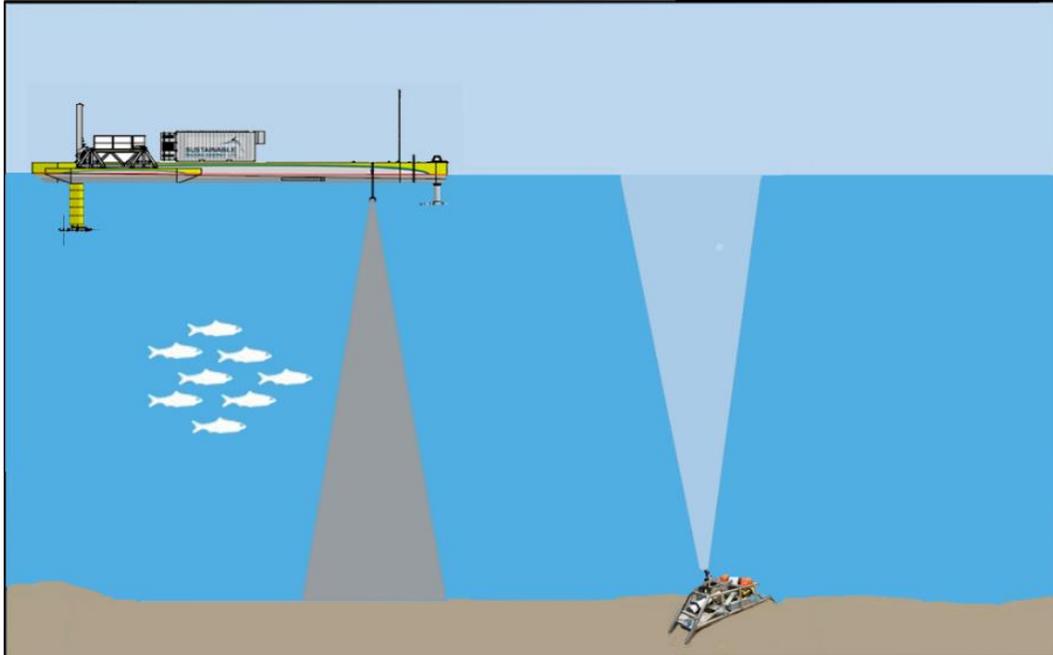## 2. WBAT, optical camera and Gemini imaging sonar

- data collection complete
- post-processing of camera footage underway
- next steps: post-processing/analyses WBAT and Gemini data

FAST-3 – ECHOSOUNDER ASSESSMENTS

3. WBAT (bottom) and EK80 (surface)

- to what extent does signal scattering influence target detections
- to be executed spring 2020

THANK YOU

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"Marine renewable energy developers, regulators, scientists, engineers, and ocean stakeholders must work together to achieve the common dual objectives of clean renewable energy and a healthy marine environment."

-George W. Boehlert and Andrew B. Gill (2010)