Acoustic Tracking Of Marine Mammals Around a Tidal Turbine

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Project History

Phase 1. Review and Research

McConnell, B., Gillespie, D., Gordon, J., Hastie, G.D., Johnson, M. & Macaulay J (2013). Methods for tracking fine scale movements of marine mammals around marine tidal devices. Edinburgh: Scottish Government.

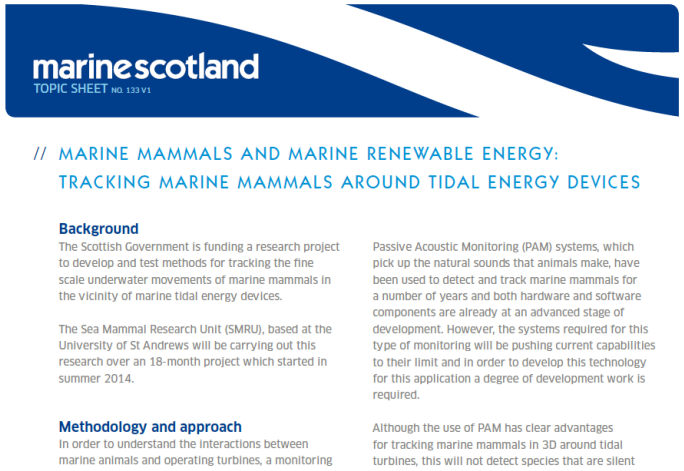
Recommended a combination of Active Sonar and Passive Acoustic Monitoring. Also considered video and tagging seals with acoustic transponders so that they could be tracked with the PAM system

Cabled to turbine for power and data transfer

Methods for tracking fine scale underwater movements of marine mammals around marine tidal devices

	Seals	Cetaceans	Species Id
Active Sonar	✓	✓	✗
Passive Acoustics	✗	✓	✓
Video	?	?	?

Phase 2 (2014 – 2015). Equipment Preparation


marinescotland
TOPIC SHEET NO. 133 V1

// MARINE MAMMALS AND MARINE RENEWABLE ENERGY:
TRACKING MARINE MAMMALS AROUND TIDAL ENERGY DEVICES

Background

The Scottish Government is funding a research project to develop and test methods for tracking the fine scale underwater movements of marine mammals in the vicinity of marine tidal energy devices.

The Sea Mammal Research Unit (SMRU), based at the University of St Andrews will be carrying out this research over an 18-month project which started in summer 2014.

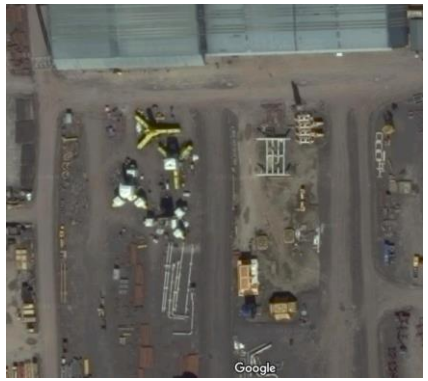
Methodology and approach

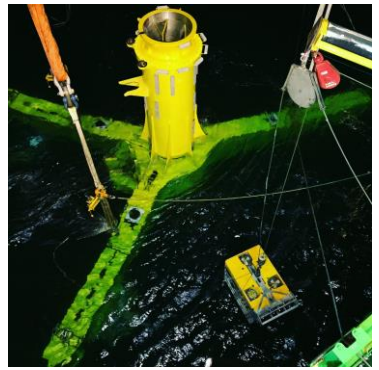
In order to understand the interactions between marine animals and operating turbines, a monitoring

Passive Acoustic Monitoring (PAM) systems, which pick up the natural sounds that animals make, have been used to detect and track marine mammals for a number of years and both hardware and software components are already at an advanced stage of development. However, the systems required for this type of monitoring will be pushing current capabilities to their limit and in order to develop this technology for this application a degree of development work is required.

Although the use of PAM has clear advantages for tracking marine mammals in 3D around tidal turbines, this will not detect species that are silent

Phase 3 (2016 to 2020)
Deployment and Operation





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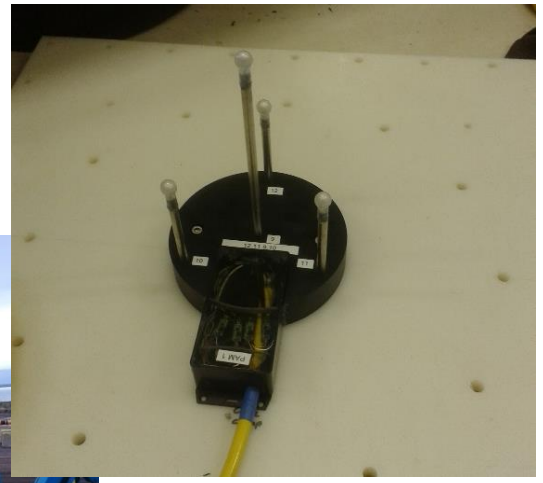
Installation, September 2016. Nigg energy Park

- 12 hydrophones
- 2 Gemini sonars
- 2 Video Cameras



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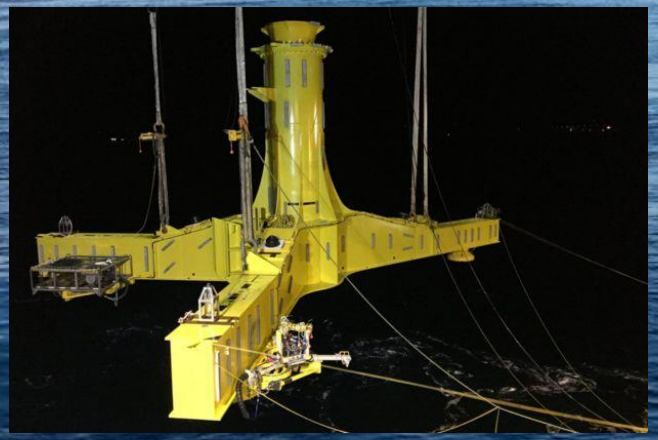


Lowered to the seafloor
October 2016

Then Nothing Happened…

Why Isn't it Working ?

Perhaps It will work tomorrow ?

Druid theatre

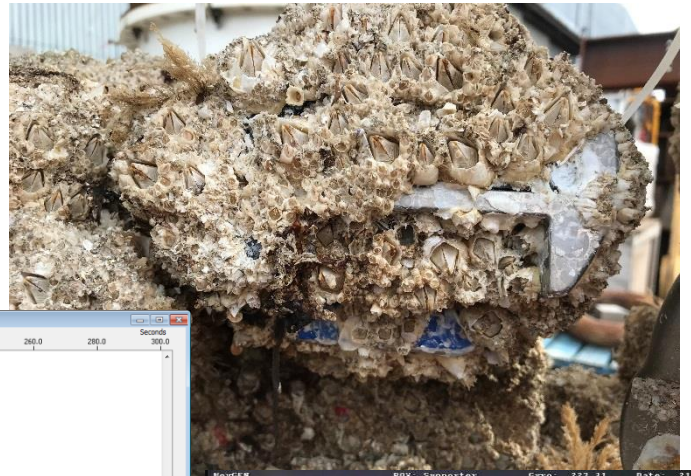
We're not getting any power from the turbine.

There's nothing we can do!

Commissioning October 2017

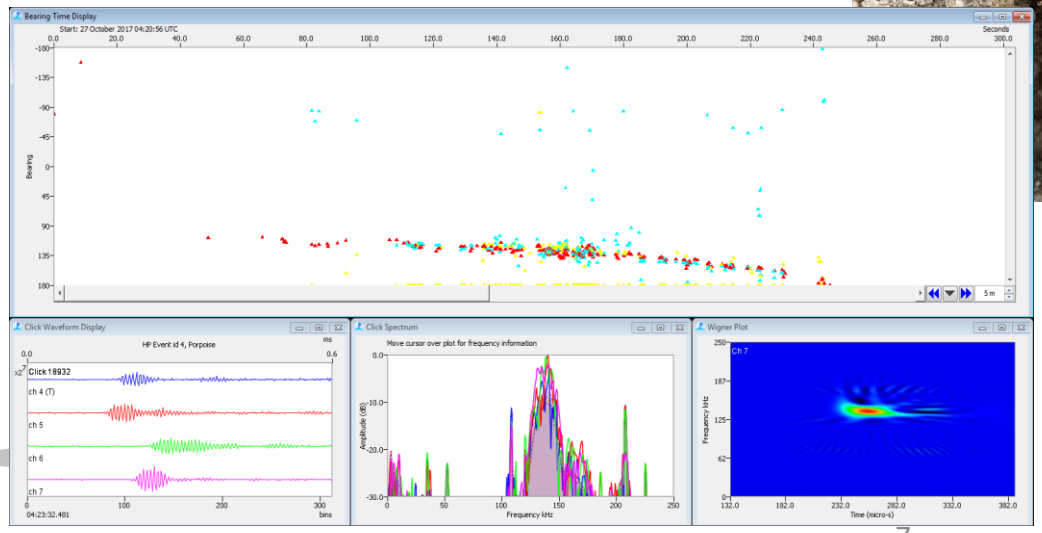
- Power problem identified and repaired when turbine removed for maintenance in summer 2017
- System finally commissioned on 19 October 2017
  - PAM system survived it's year on the bottom
  - Active sonars and camera's didn't
  - Failures caused by corrosion in connectors
- Hydrophone system till running today

Biofouling



Connector Corrosion

Porpoise Track in PAM software



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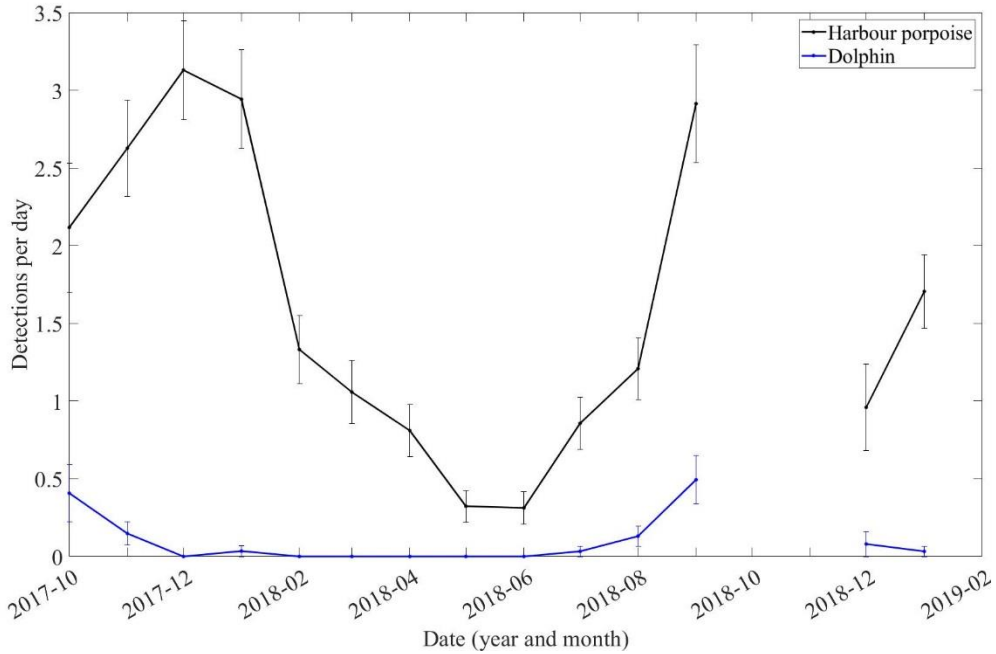
Project Status

- Year 1 Data Collection 19 October 2017 to 22 September 2018
  - Turbine then removed for maintenance
  - Data collection continued 19 December 2019 (Year 2)
  - Data collection for 322 of 338 days.
    - 4 lost days due to software failures
    - 12 due to power off at turbine
  - >550 confirmed porpoise encounters
  - 25 Dolphin encounters



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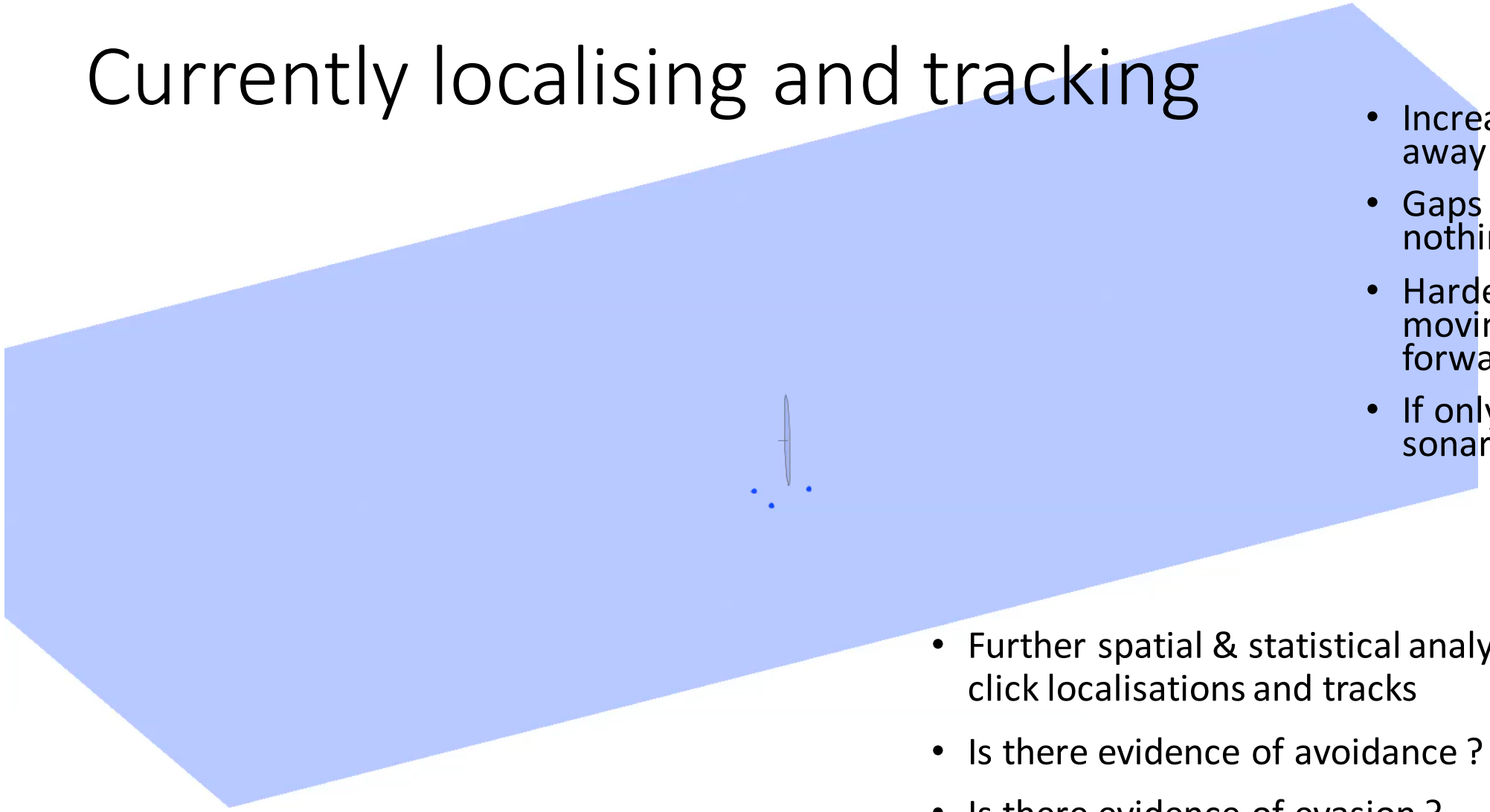
Currently localising and tracking



- Increased uncertainty away from the turbine
- Gaps where we pick up nothing
- Harder to track an animal moving away due to forward facing beam
- If only we had that active sonar data !

- Further spatial & statistical analysis of click localisations and tracks
- Is there evidence of avoidance ?
- Is there evidence of evasion ?
- Reporting end of 2019

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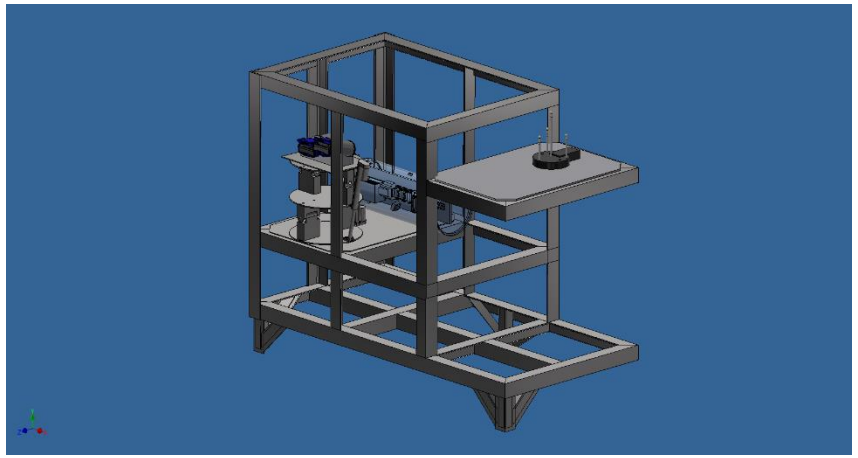
New NERC funded platform

- Similar sensors for seal and cetacean tracking
- Similar power and comms connection to turbine
- NOT mounted on turbine
- EASIER to lift for maintenance and repair
- SUITABLE for monitoring a wider range of turbine designs
- UVC to reduce biofouling
- Install late 2019

BAUER Spezialtiefbau GmbH



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The Future…

Lets take control of our own destiny.

Druid theatre

We'll still need them for data and power.

We'll be able to deal with all our problems.