Information needs for Consenting: A regulatory perspective

The Scottish Government

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Dr George Lees (SNH)

Scottish Natural Heritage
All of nature for all of Scotland

marinescotland science

Marine Scotland's roles in renewable energy

Planning authority

Licensing authority

Science support

SNH ROLE IN RELATION TO MARINE RENEWABLES

To **facilitate marine renewables development in the right locations**, where Scottish Government's renewable energy targets and natural heritage commitments can both be met.

Achieved through:

1. Advising on Consent Applications
   - Marine Scotland
   - Developers
   - Local Authorities
2. Influencing the Location of Proposed Development
   - 'the right development in the right place'
3. Promoting / Supporting Research on Interactions with the Natural Heritage
4. Developing and Providing Guidance

SO WHAT'S THE CONCERN?

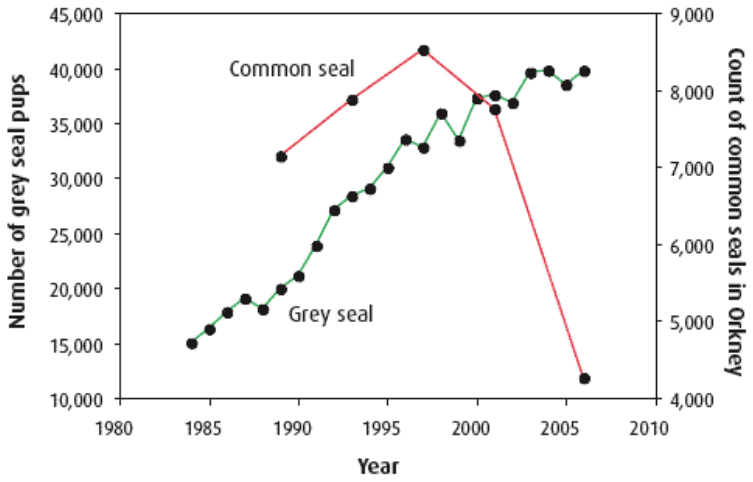
Under Habitats Regulations, the Regulator (ie Marine Scotland) **has to be assured** that proposed development will not affect, adversely, 'integrity' (eg population) of Natura sites before granting consent. Eg:

- Seabird SPAs
- Migratory fish SACs
- Marine Mammal SACs

- Harbour Seal Populations

Also:

- EPS (European Protected Species)
- Animal welfare
- Impact upon sector of injury / mortality perceived to be linked to tidal turbines



Tidal stream energy resource

(>1.5 m/s mean spring peak current)

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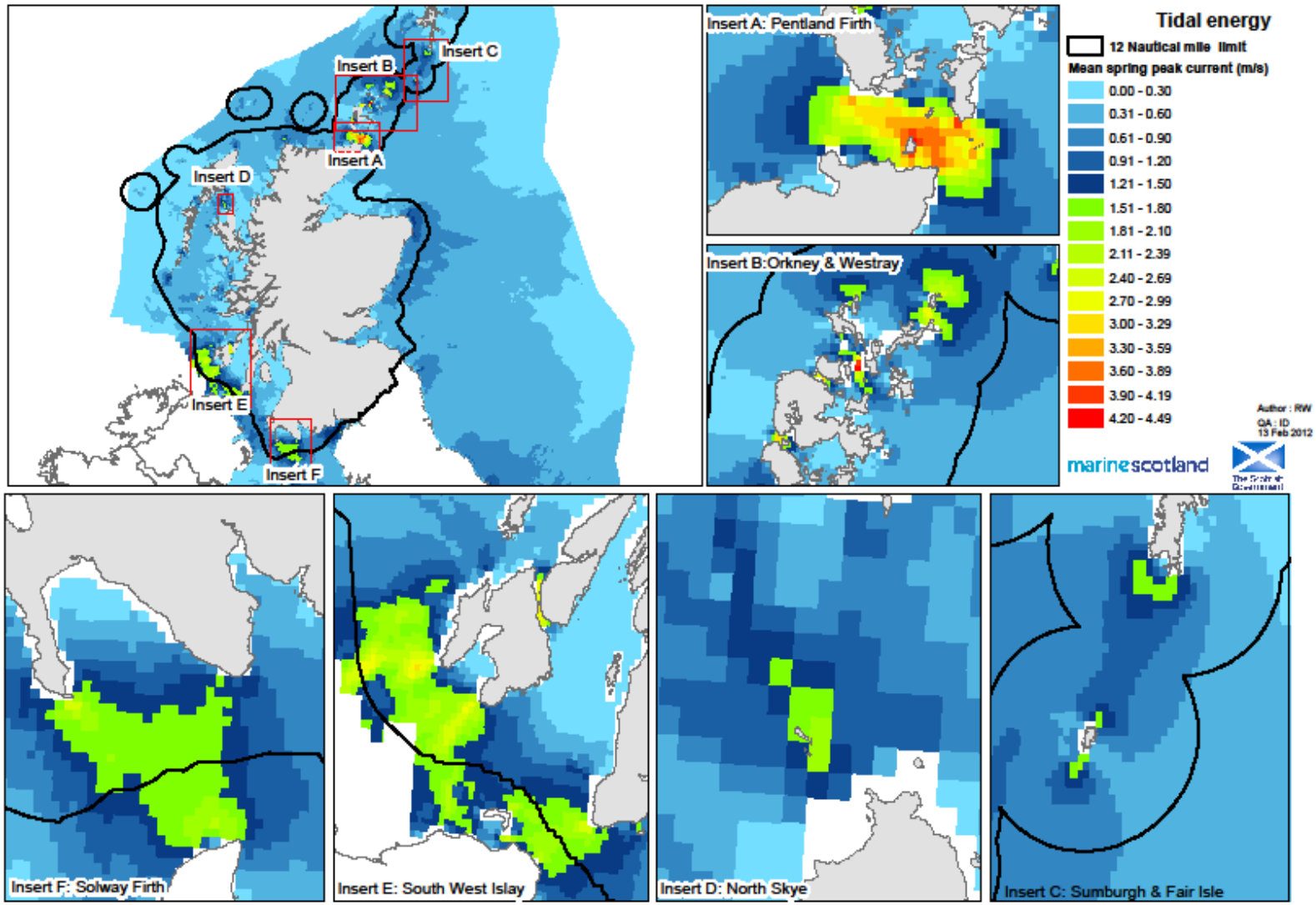

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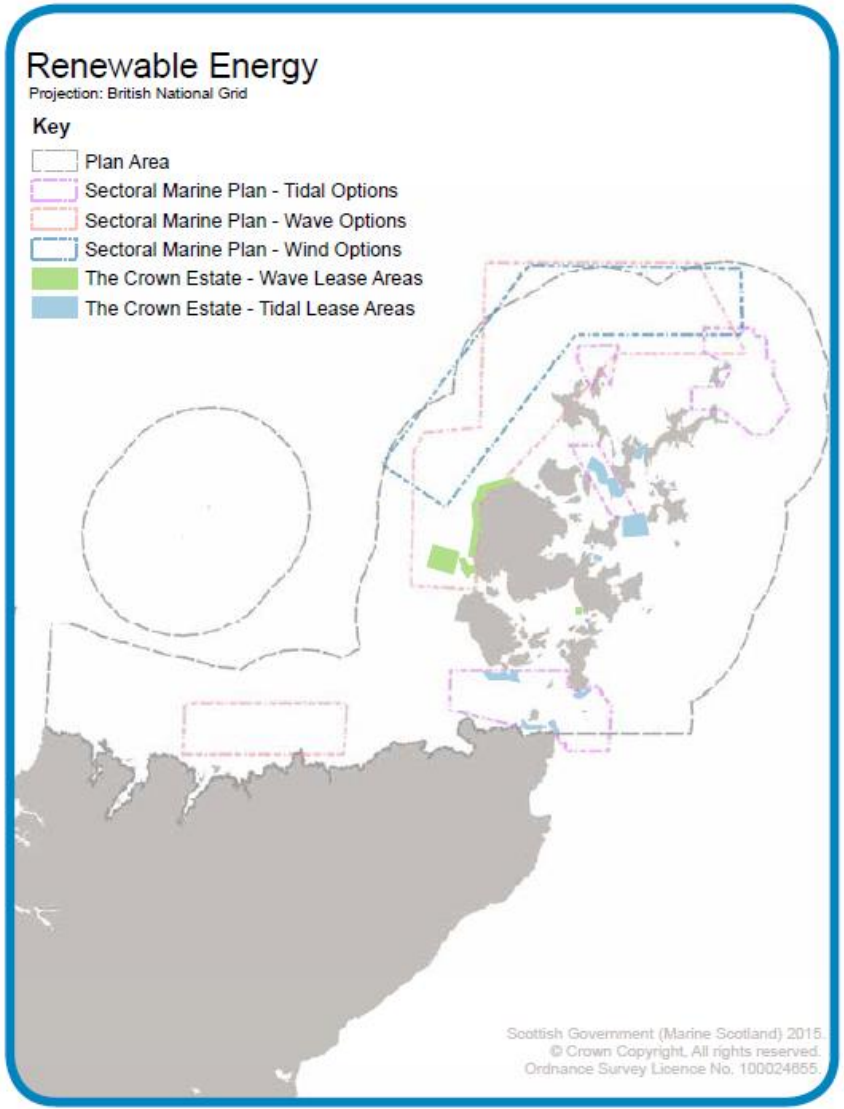
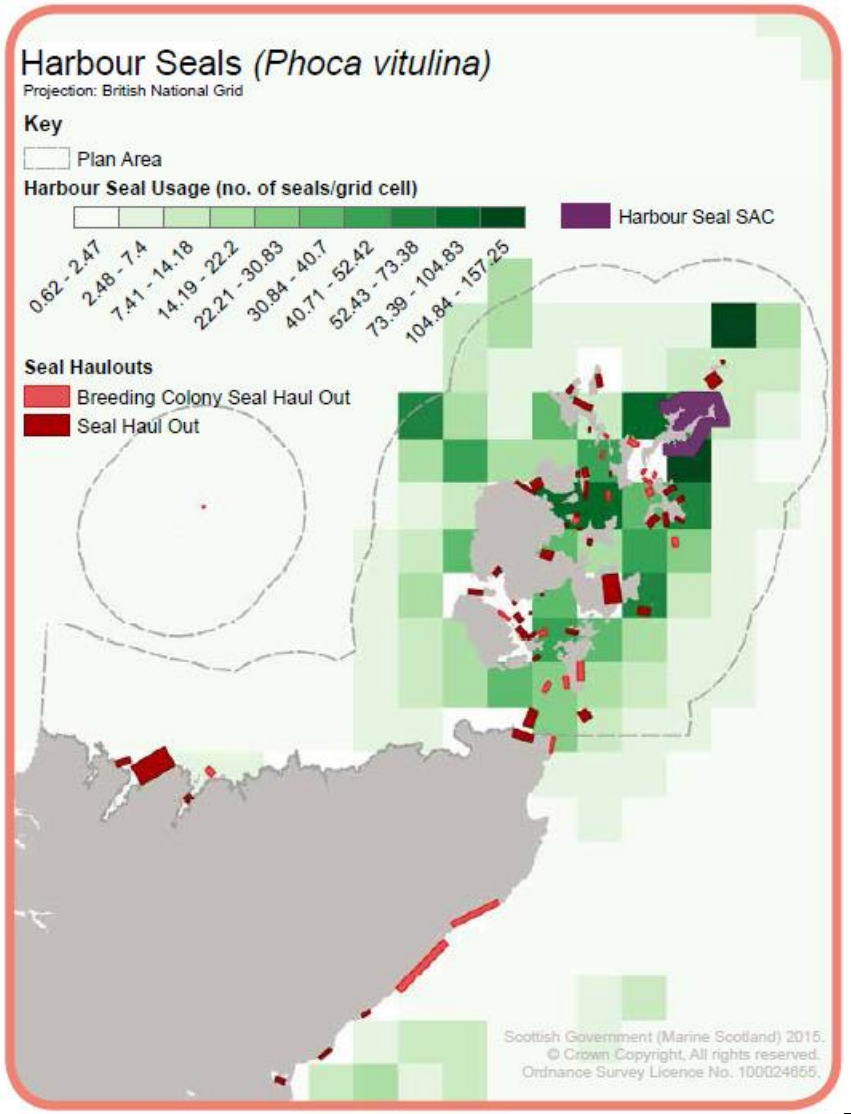
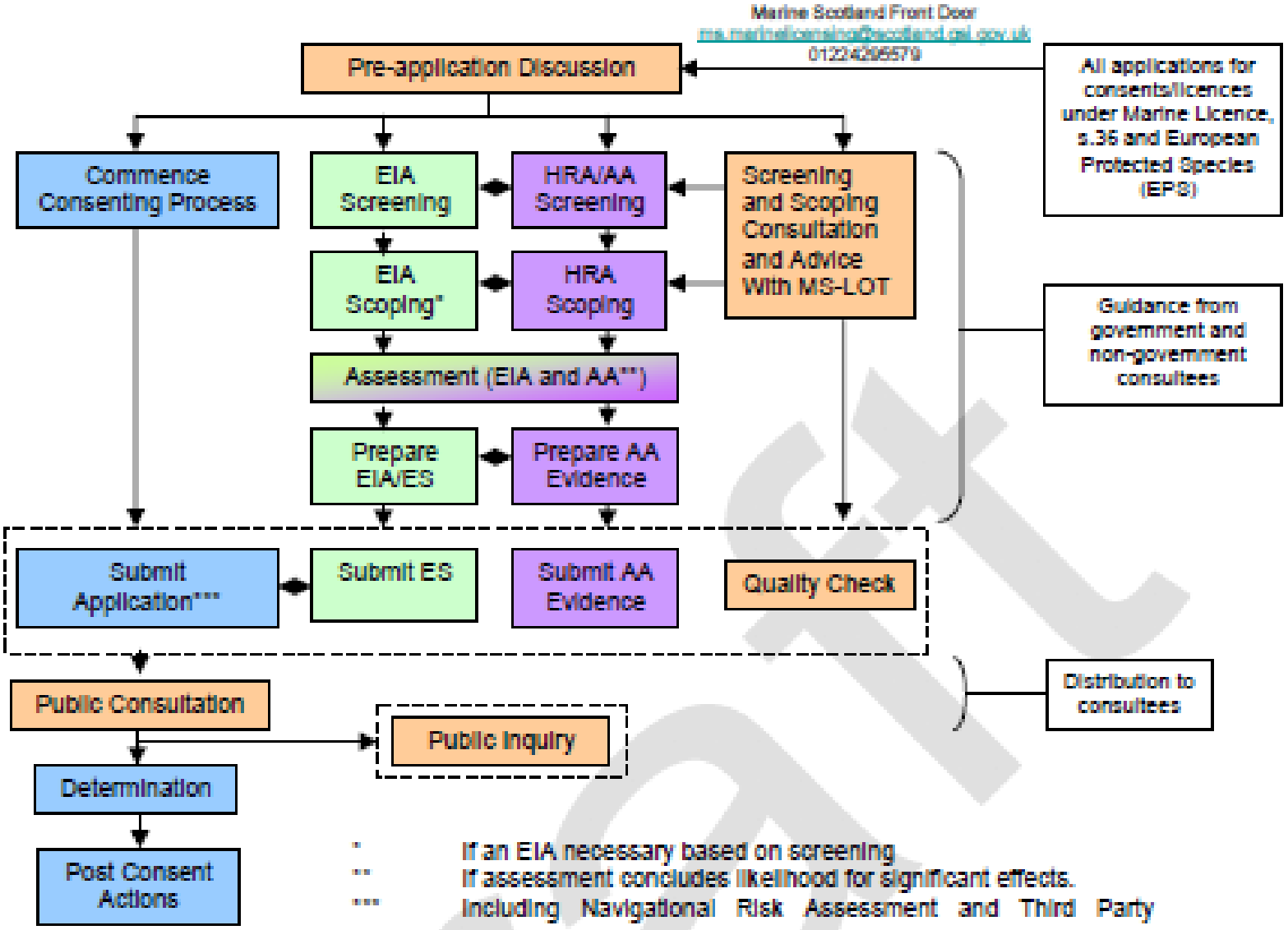




The Impact Assessment Process



Key steps in impact assessment

- Distribution of target receptors at sea
- Model interactions of receptors and turbines
- Estimate effects on individuals
- Predict impacts on populations

Applies to mammals, birds and fish

Estimating distribution at sea

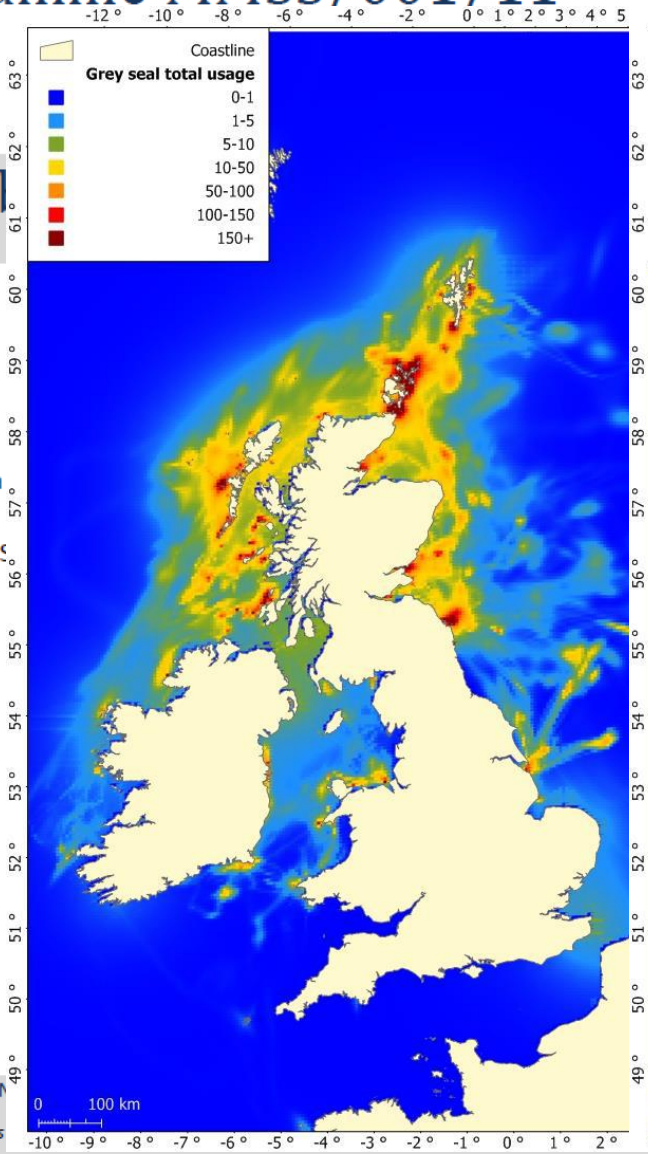
- Field survey methods
  - “Classical” boat-based and vantage point surveys
  - Digital aerial surveys

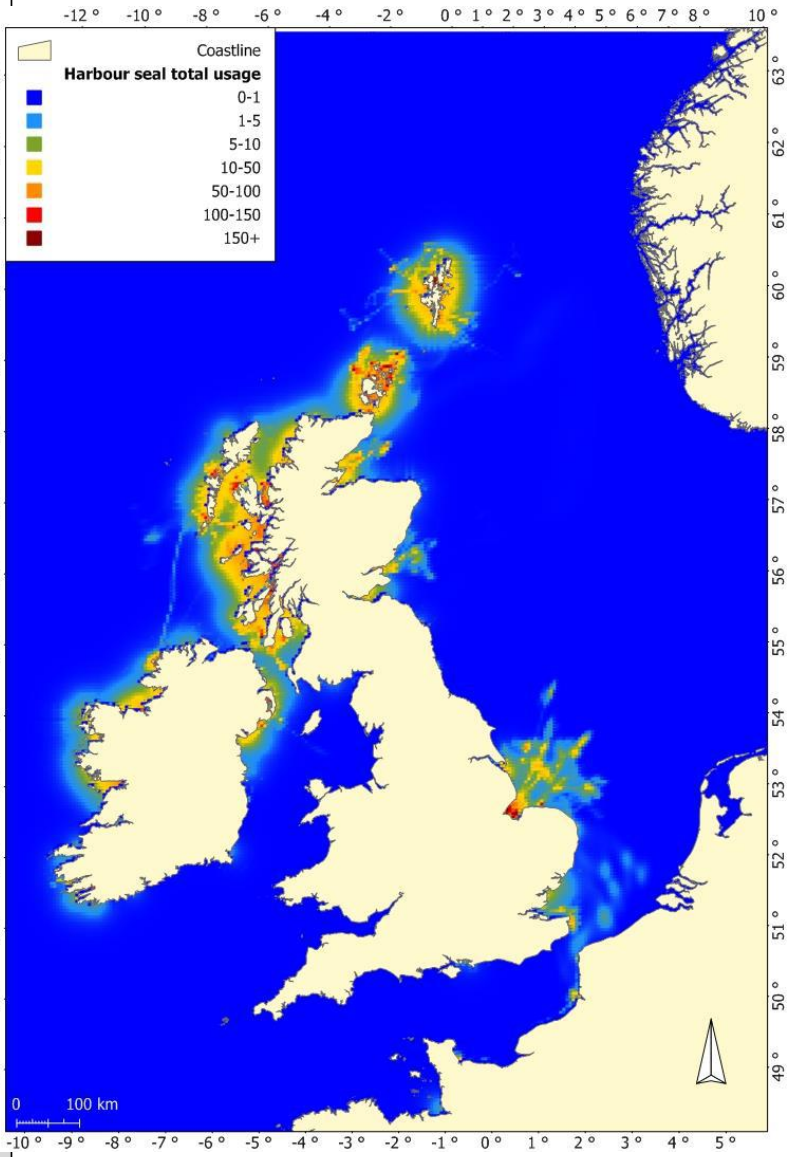
Telemetry data

Marine Mammal Scientific Support Research Programme MMSS/001/11

Grey and harl

Sea





ESTHER JONES[1], BERNIE MCCONN

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What we are doing to improve collision risk assessment?

Marine mammal assessments and evidence

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Tidal developments

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The Scottish Government
Riaghaltas na h-Alba

RESEARCH SPECIFICATION

Contract Research Fund Project Code: CR/2014/11

Fine scale seal density m

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RESEARCH SPEC

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Update of collision risk est
seals and tidal

marinescotland
TOPIC SHEET NO. 129 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.

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.

Methodology and approach

In order to understand the interactions between marine animals and operating turbines, a monitoring system is required with the ability to track animals in 3D with a high spatial and temporal resolution. The system will need to operate for several months in order to acquire useful amounts of data to allow general conclusions to be made about animal behaviour around tidal turbines (multiple encounters with different animals and species).

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 or vocalise infrequently (e.g. seals, minke whales, basking sharks). However, recent research showed that a new generation of active acoustic monitoring systems (AAM) such as multibeam imaging sonar, have the capacity to image marine mammals and provide a basis for monitoring close range interactions.

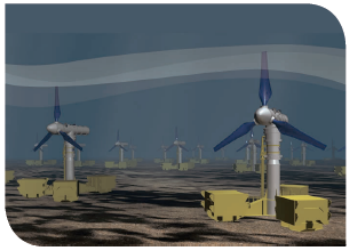


FIGURE 1.
ARTIST'S IMPRESSION OF AN ARRAY OF ATLANTIS AR1500 TIDAL TURBINES. (CREDIT: ATLANTIC RESOURCES).

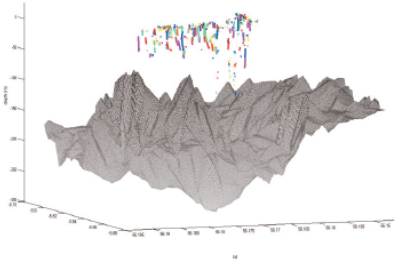
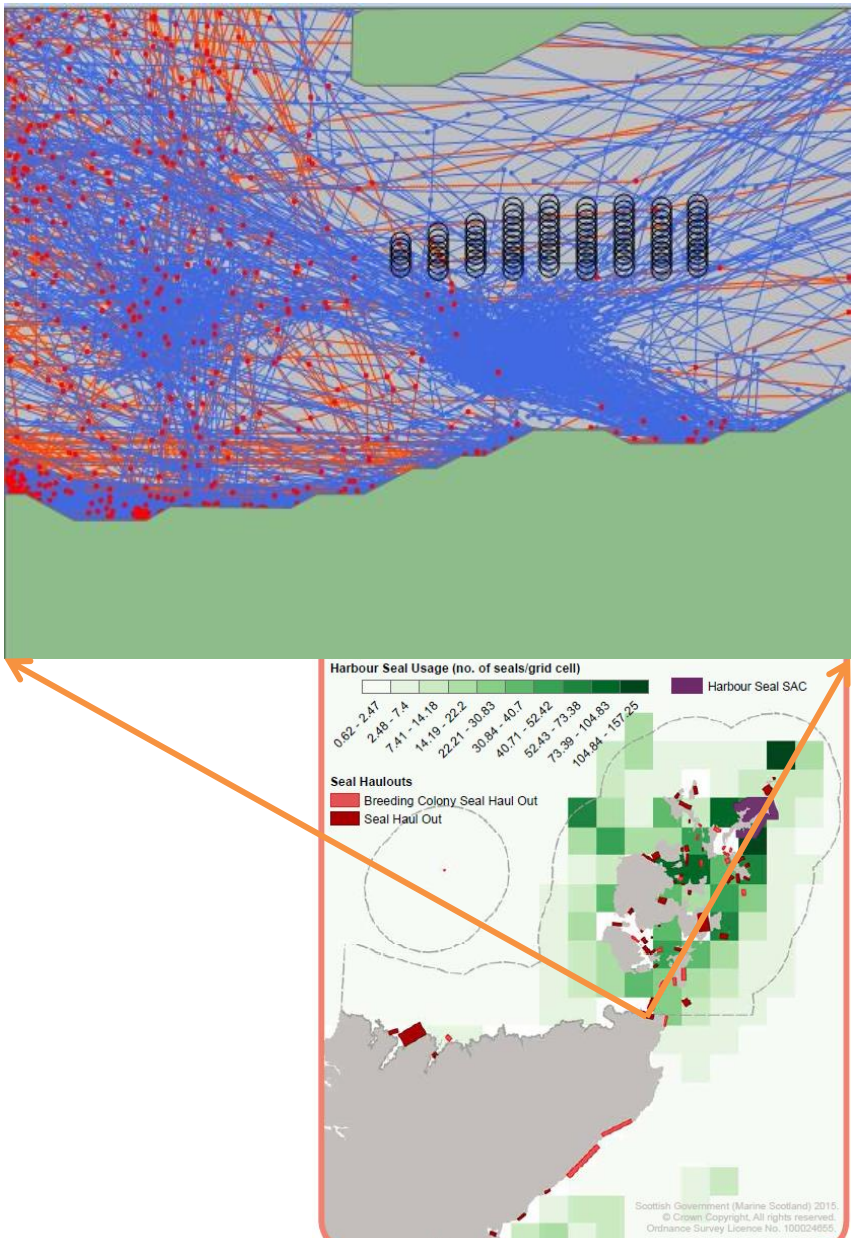


FIGURE 2.
EXAMPLE UNDERWATER PORPOISE TRACKS FROM A MULTIPLE HYDROPHONE ARRAY PAM SYSTEM.

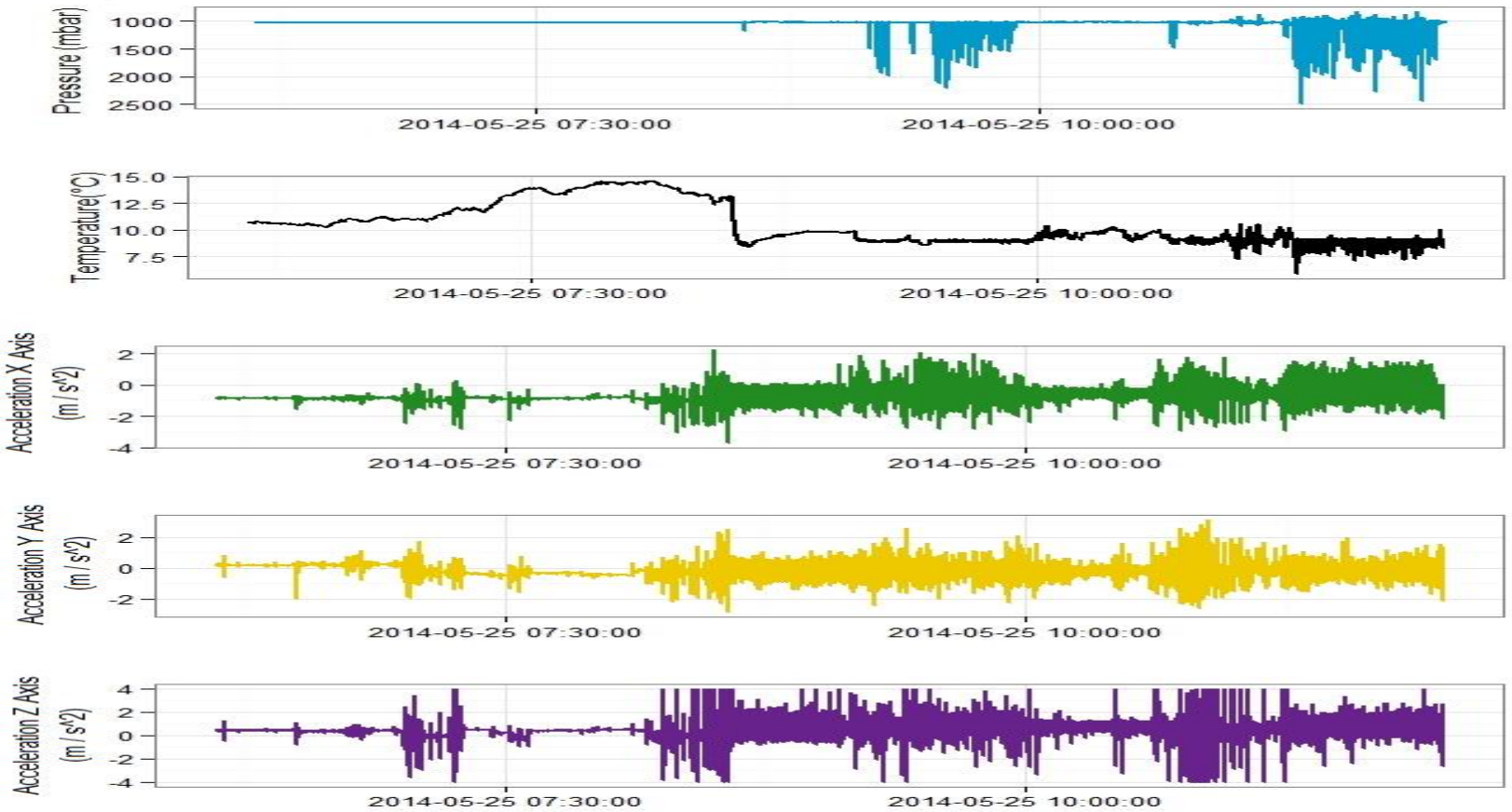
Fine-scale seal telemetry

- SMRU re-assessed collision risk for MeyGen using recent seal telemetry plots (red & blue lines)
- Notional array in black (turbines not to scale)
- Higher resolution enabled more accurate quantification of CR
- ~1/7th the estimates in the original application

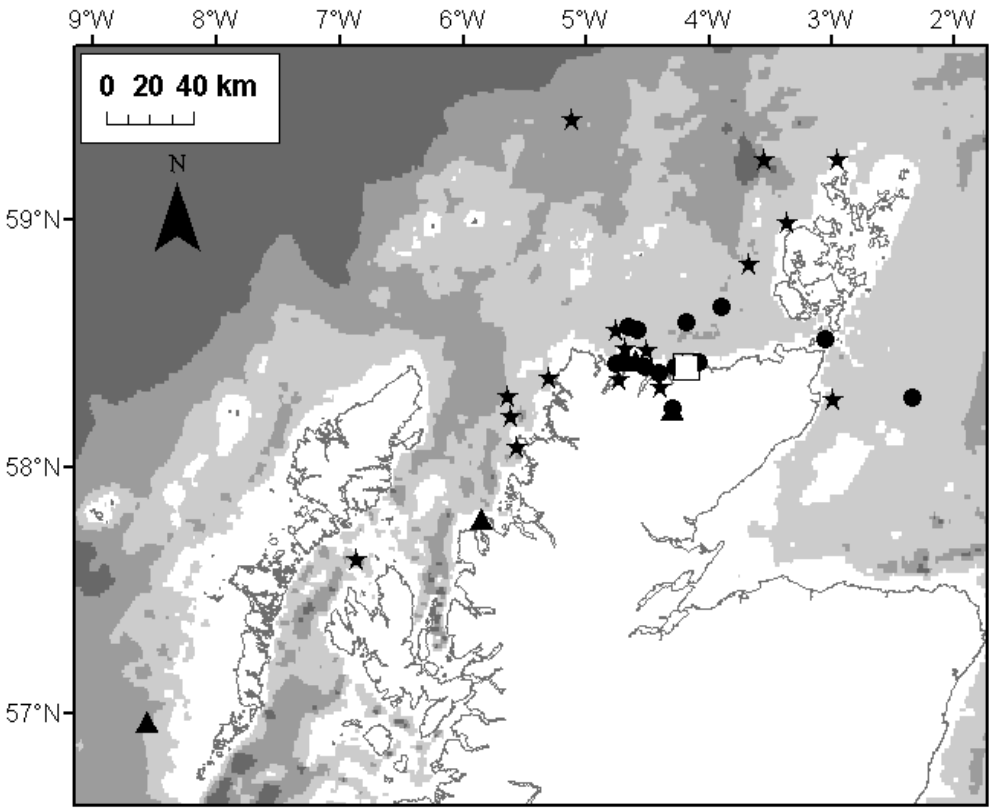


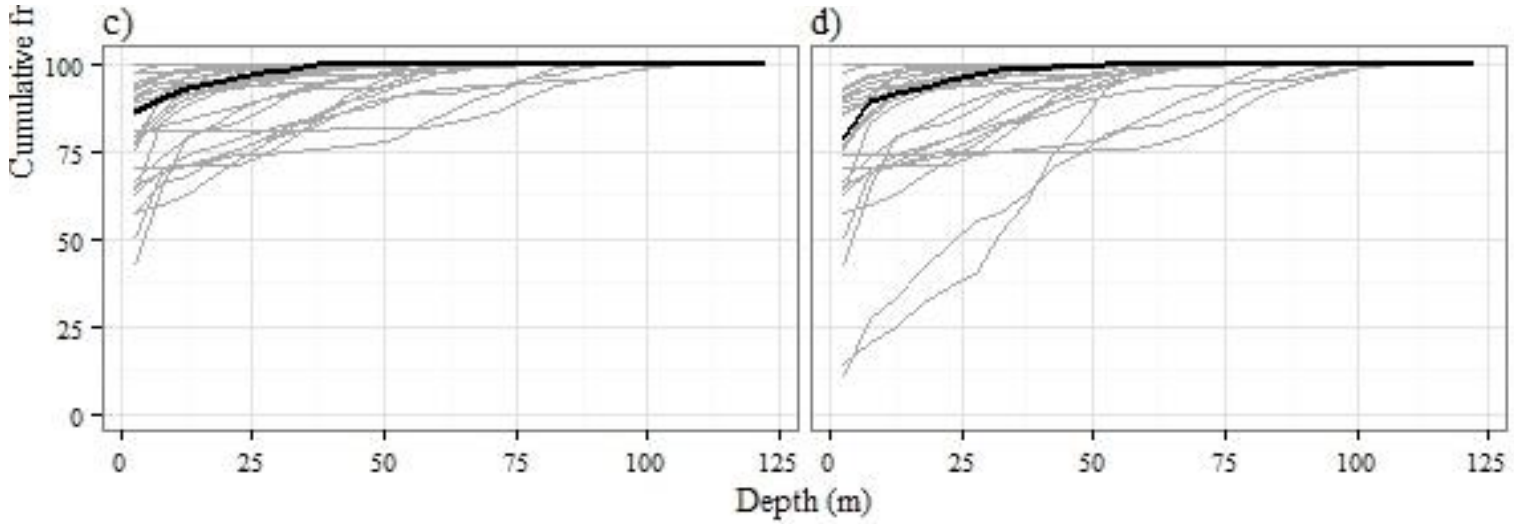
SMRU (In Press). Data based estimates of collision risk: An example based on harbour seal tracking data around a proposed tidal turbine array in the Pentland Firth. SMRU for SNH and Marine Scotland.

Problems of Underwater Behaviour and Avoidance Rates



Swimming depths of returning Atlantic salmon in coastal waters





Understanding seabird risk of collision: seabird behaviour

Complex usage of tidal sites driven by:

- **Current speed and tidal state** – different species forage in a range of different current speeds, with only some foraging in high velocity current flows.

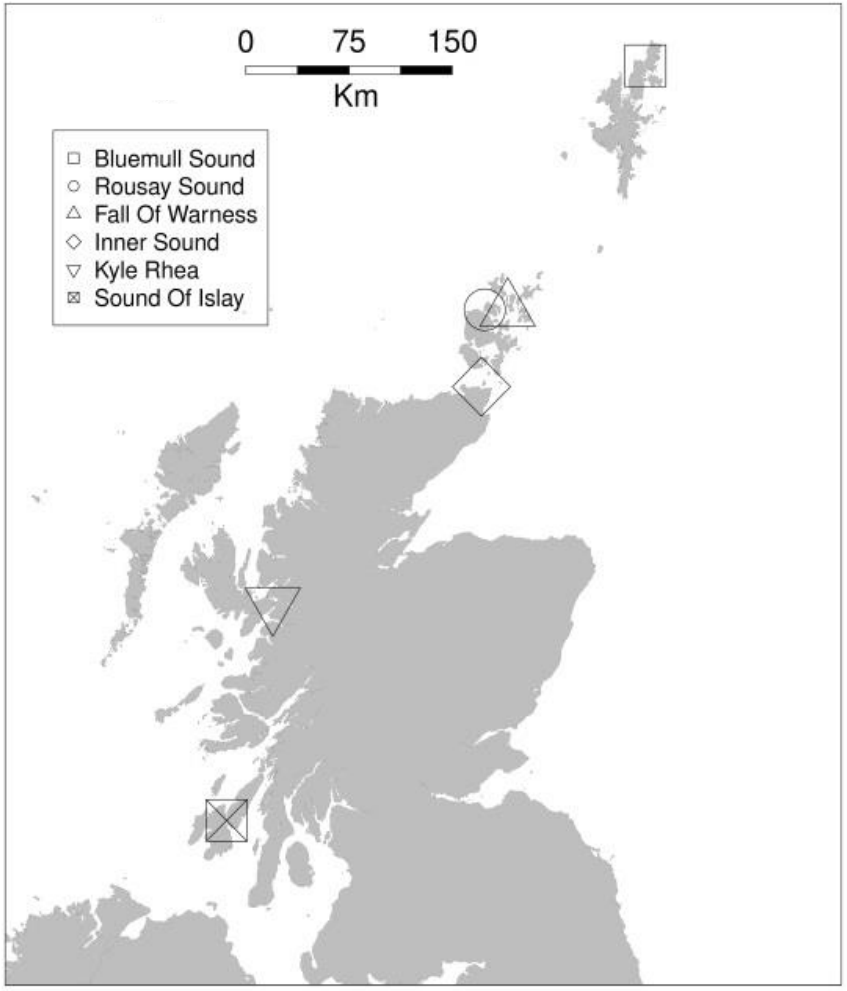
- **Hydrodynamic processes and fine-scale oceanographic features** (e.g. eddies, upwellings, downwellings, shearlines) – different species likely to target different habitat based on target prey and method of foraging (foraging on seabed or in water column).

Seabird risk of collision with tidal-stream energy devices: seeking generalisations

No clear consistency in habitat use for black guillemots and shags (Waggitt *et al.* in prep) – suggests possibility of site-specific usage.

Improved understanding of behaviour in relation to habitat use should enable generalisations to be made.

Accelerometer tags

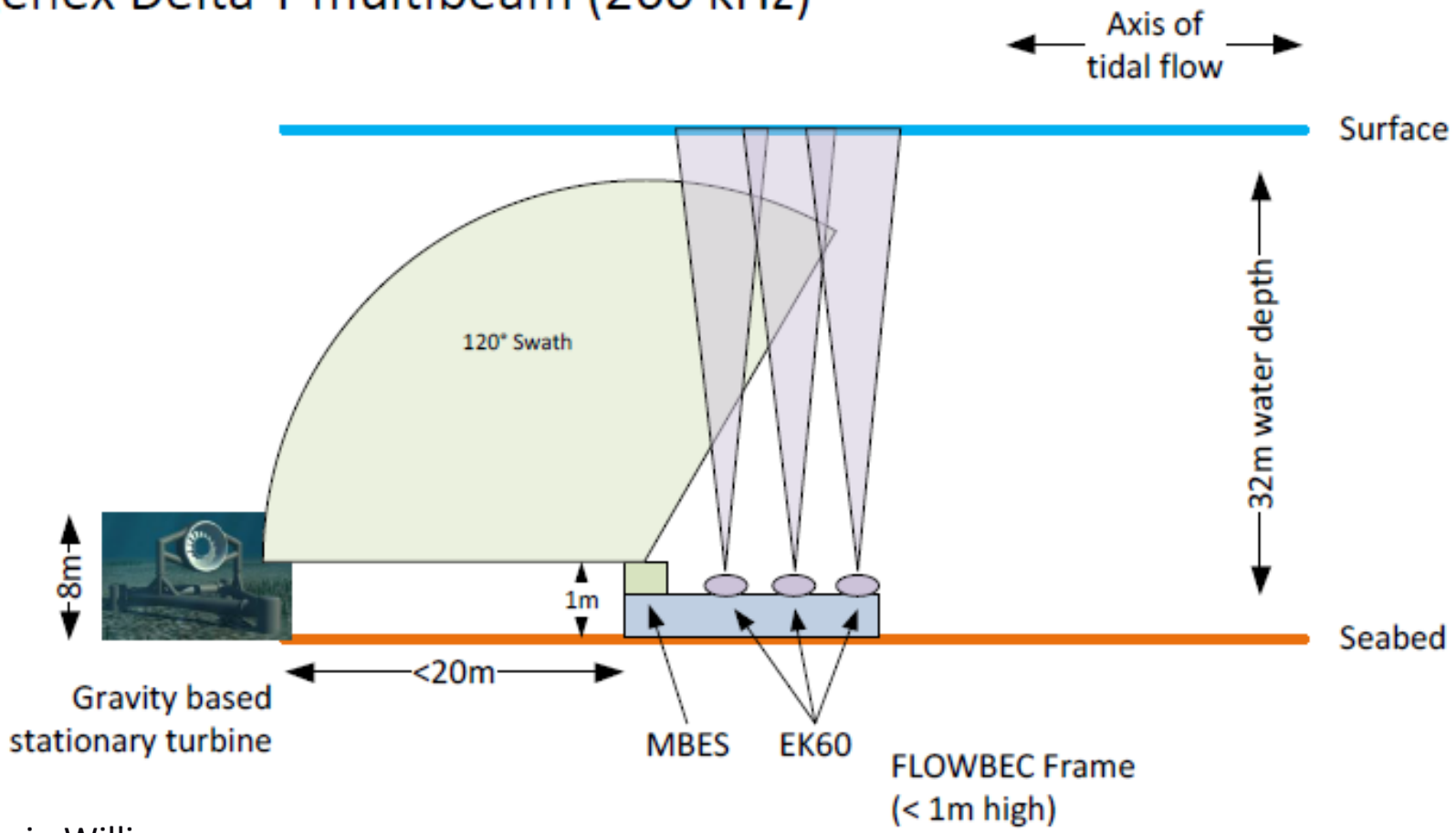


FLOWBEC + RESPONSE

Beth Scott, Eric Armstrong, Chris Hall, Benjamin Williamson, James Waggitt, Philippe Blondel, Paul Bell – and more…

Subsea Acoustic Platform

- 14 day batteries and data recording
- Simrad EK60 echsounder (38, 120, 200 kHz)
- Imagenex Delta T multibeam (260 kHz)



Slide by Benjamin Williamson

SNH Draft Guidance on Collision Risk

Assessing collision risk between tidal turbines and marine wildlife

- **Built on previous review**
- **Describes 3 models:**

  Collision risk model (CRM)
  Encounter rate model (ERM)
  Exposure time population model (ETPM)

- **Covers diving birds, marine mammals and fish**
- **No preference for any model**

The guidance also provides information on:

- Obtaining animal densities from survey data
- Density of animals at collision risk depth
- Recommended biological parameter values
- Collision risk spreadsheets
- Different types of turbine
- Cumulative impact

Collision Risk Assessment

MS Contract: Update of collision risk estimation for harbour seals and tidal turbines. (In Progress)

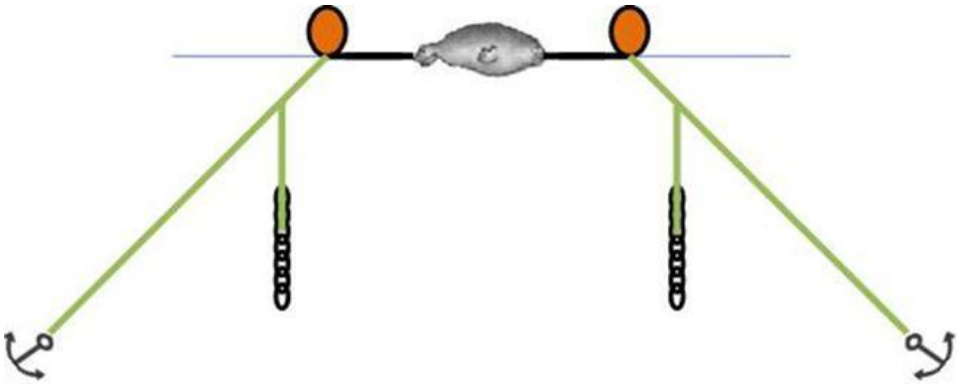
Goal: to provide more realistic assessments of encounter risk between harbour seals and tidal turbines in the PFOW region.

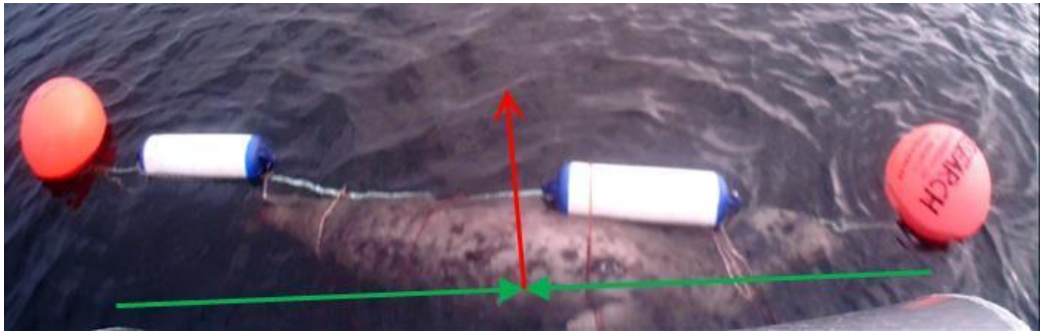
Objectives:

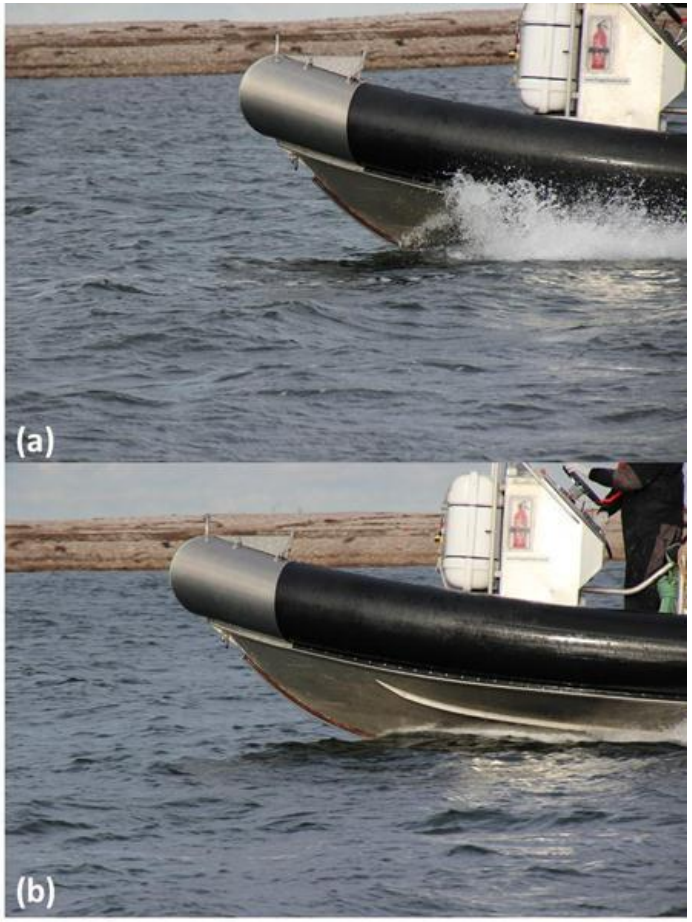
- *Assess the effects of tidal, diurnal and seasonal variations on seal density in PFOW resource areas,*
- *Assess likelihood that seals would suffer a fatal injury as a result of an encounter.*
- *Update current encounter risk models to reflect this understanding*

Collision consequences – all fatal?

SMRU (2015). Collision Risk and Impact Study: Field tests of turbine blade-seal carcass collisions. Report to SNH & Marine Scotland.







Consequences of collision

- *Grey Seal Carcasses struck at speeds <5.3m/s similar to tip speeds of tidal turbines during part of tidal cycle*
- *Carcasses X-rayed before and after; plus autopsy after.*
- *No evidence of skeletal trauma*
- *No obvious muscle or organs tears or ruptures*
  - *Big caveat: carcasses previously frozen*
- ***For a proportion of tidal cycle at least, blade strike appears unlikely to produce serious or fatal injuries to grey seals***
  - *Another big caveat: unable to assess potential stupor or torpor*

Consequences for populations

Currently use PBR for seals

- Does not cover life of project
- Not a stable assessment
- Treats all risks equally

Migratory Fish

- Difficult to assign to populations

Seabirds

- Various PVA-based methods

Actively considering alternative approaches.

INFORMATION NEEDS FOR CONSENTING: WHAT NEEDS TO BE DONE?

1. Better estimation / quantification of seal (fish, bird) densities at sea.
2. Better understanding of underwater behaviour and avoidance rates
3. Development & refinement of approaches to Collision Risk Assessment
4. Better understanding of consequences of collisions
5. Improved assessment of Population Consequences