Methods for studying vocalising cetaceans in energetic coastal sites

Poster #9101

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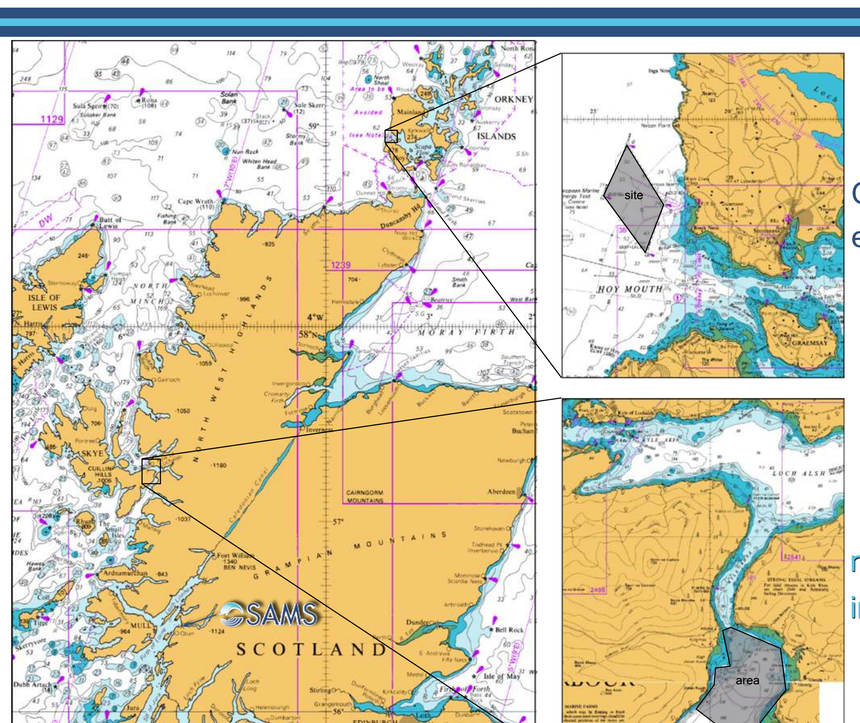
CHALLENGE

Cetaceans in energetic coastal waters (of interest to marine renewable energy development) are difficult to study, due to large waves and strong tidal currents. These dynamic environments impose challenges on long-term autonomous acoustic monitoring deployment. SAMS has made significant advancements in low-cost, simple mooring and drifting survey solutions.

Two example areas in Scotland are presented here.



WAVE STUDY - Billia Croo Test Site

Exposed Coast.

Run by European Marine Energy Centre (EMEC) to test wave energy extraction devices.

Av. wave height = 5m

Tidal current = 1-2 m/s

Av. depth = 60m

TIDAL STUDY - Kyle Rhea

Narrow Channel.

Located between the Isle of Skye and mainland Glenelg. Major channel for inshore vessel traffic.

Tidal current = 4-5 m/s

Av. channel depth = 20m

-Sound of Sleat to south = ~100m

TIDAL STUDY

Method

For the 'Marine Renewables Energy and the Environment (MaREE) project to study porpoise in the Kyle Rhea, we developed static and mobile platforms for CPODs to study porpoise presence and distribution across the tidal cycle. The static moored CPODs monitored temporal changes while mobile 'Drifting PODs' allowed changes in spatial distribution of porpoises over time to be studied. The two platforms demanded different designs, but both had to be deployable from a small RIB. The moored CPODs were deliberately positioned in strong tidal streams, periodically experiencing currents in excess of 4ms^{-1}.

4 Drifting PODs on an Ebb tide in Kyle Rhea

Drifting POD assembly

Equipment - 'Drifting PODs'

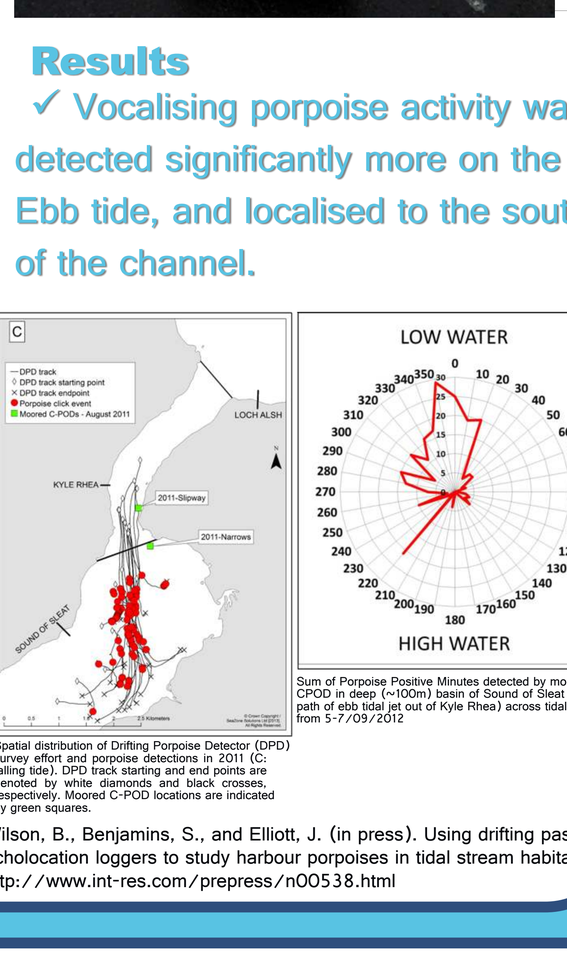
- surface buoyancy
- GPS logger
- surface flag
- subsurface drogue
- ballast
- polypropylene rope

Drifted with CPOD suspended 5m below surface with tidal movement until retrieved.

Equipment - Static mooring

- ballast (organic sack and gravel or chain and anchor)
- acoustic release - for deep subsurface moorings
- polypropylene rope
- hard and soft floats
- CPODs
- dissolving release mechanism (polo mints)

Shallow mooring used anchor to grip seabed, with line and chain ballast to maintain surface line and float, which deliberately submerged with tidal current.



Results

✓ Vocalising porpoise activity was detected significantly more on the Ebb tide, and localised to the south of the channel.

Mouth of the channel of Kyle Rhea, viewed from southern shore

Shallow Moored CPOD assembly

Spatial distribution of Drifting Porpoise Detector (DPD) survey effort and porpoise detections in 2011 (C: falling tide). DPD track starting and end points are denoted by white diamonds and black crosses, respectively. Moored C-POD locations are indicated by green squares.

Sum of Porpoise Positive Minutes detected by moored CPOD in deep (~100m) basin of Sound of Sleat (in path of ebb tidal jet out of Kyle Rhea) across tidal cycles from 5-7/09/2012

Wilson, B., Benjamins, S., and Elliott, J. (in press). Using drifting passive echolocation loggers to study harbour porpoises in tidal stream habitats. http://www.int-res.com/prepress/n00538.html

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Oilthigh na Gàidhealtachd agus nan Eilean

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Iomairt na Gaidhealtachd 's nan Eilean

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Funded by MaREE (*Marine Renewable Energy and the Environment*)
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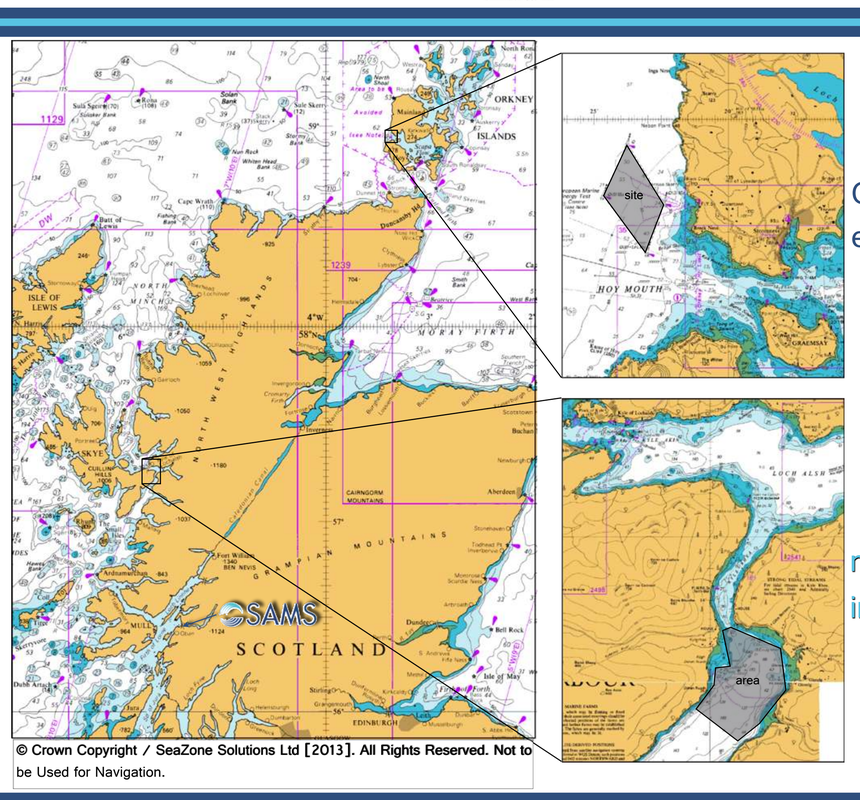

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Turn the page for the TIDE STUDY

Method

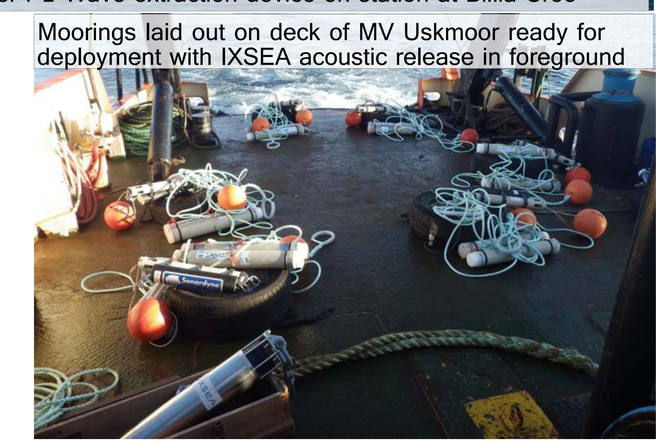
For the 'Hebridean Marine Energy Futures' project to study harbour porpoises at a wave site, we developed low cost, simple subsurface moorings that could easily be deployed and recovered, whilst not inferring with installed wave energy devices and meeting procedural needs of the EMEC 'Billia Croo' site and the device owners. The site is swept by ~1ms^{-1} of tide, and wave height can exceed 12m during storms. Previous phases of the study had been localised to 'scientific zone'.

Pelamis Wave Power P2 Wave extraction device on station at Billia Croo

Design

For the phase 4, an array of acoustic recording devices (CPODs) was laid in relation to the mooring position of a PWP device. The average depth was 60m. Due to heavy vessel traffic and device movement, no part of mooring was allowed within 25m of the surface. The moorings included an acoustically activated popup recovery system.

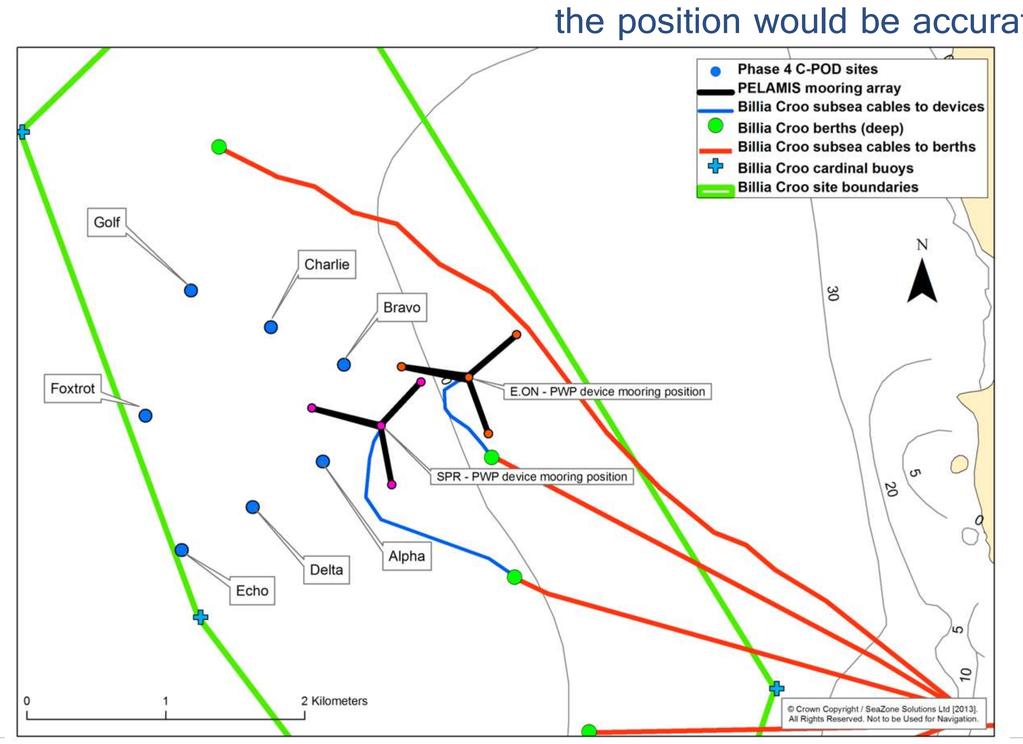
Each mooring was laid using an oceanic acoustic release ensuring the position would be accurate.



Moorings laid out on deck of MV Uskmoor ready for deployment with IXSEA acoustic release in foreground

Equipment (one of 7)

- 50kgs steel/concrete ballast
- Sonardyne LRT 7986 with rope canister and float
- 15metres of 12mm floating polypropylene rope
- hard floats
- shackles and swivels
- 2x CPODs



Plan of Phase 4 Mooring layout, including CPOD positions, site infrastructure and depth

WAVE STUDY

Results

✓The single mooring design proved effective at maintaining position and safe retrieval, when the delayed recovery system worked correctly.

✓Mooring design should include appropriate fixing points to allow secondary recovery method.

✓Using two acoustic recorders per mooring provided essential residual backup.

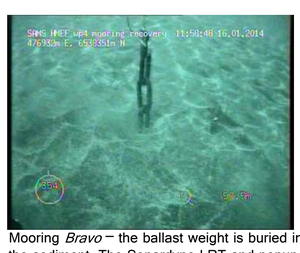
✓Porpoises were detected regularly during all C-POD deployments. Av. daily encounter rates ranged between ~1.7 – 9.4 encounters per day. There was no obvious influence of the Pelamis device presence.

✓In winter most porpoise encounters occurred at night whereas in summer there was little difference in day-night encounter rates. This may have significant consequences for future marine mammal survey design.

✓Significant differences in daily encounter rates among moorings indicate spatial heterogeneity in porpoise distribution at small scales (100's of metres), but reasons remain unknown.

Mooring *Alpha* – indication that the release has successfully initiated.

Mooring *Alpha* – view of the popup canister (with tangled line) and the 5m CPOD secured to the main riser.



Mooring *Bravo* – the ballast weight is buried in the sediment. The Sonardyne LRT and popup is clearly absent.

Mooring *Delta* – The Sonardyne LRT and popup is clearly absent. Different sediment types were noted.

Problems with primary recovery required ROV intervention.
Images provided by Roving Eye Enterprises from recorded footage.

Figure 1. Number of encounters at the seven moorings identified in Chart 1. There were significant differences between moorings close (A-B) to the PWP device and those far away (E-F).

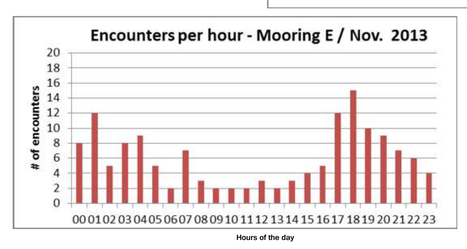


Figure 2. Example of summed porpoise encounters by hour across November 2013 (at Mooring E). A clear diurnal pattern is apparent, with most encounters occurring at night.

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