



## Fish behaviour in the vicinity of renewable energy devices - Completed Project

A project undertaken by the Marine Biological Association of the United Kingdom (MBA), funded by the Department of Energy and Climate Change (DECC) Offshore Energy Strategic Environmental Assessment (OESEA) programme. For further information, contact the Project Coordinator at [jph@hartleyanderson.com](mailto:jph@hartleyanderson.com)

### Context

There is a need to determine the movements and spatial use of commercially important species within and adjacent to renewable energy devices to adequately assess their impacts on marine fish abundance and diversity. Long-term monitoring of fish movements in offshore sites is challenging and the project required the design, testing and proving of new seabed lander technologies, as these deployments (up to around 5 years) are far in excess of traditional mooring installations, generally have to be serviced annually. The following output represents work undertaken (for which DECC were a part-funder) which along with the [NERC QBEX](#) project have put in place the required long-term fish and shellfish monitoring arrays and developed analysis tools, with a view to future consolidation of data recording and analysis.

### Project Objectives & Scope

The key objectives of the project included:



Figure 1: Lander being lowered into the water before final positioning and lowering to seabed

**Lander deployments:** The deployment of up to six Marine Biological Association (MBA) seabed landers, each housing an acoustic data-logging receiver, to form a spatial array at the Wave Hub wave energy site for long-term fish monitoring.

**Tag deployments:** The attachment of up to 80 acoustic transmitter tags on commercially important fish species from the site, with data retrieval from landers at least once within the project period. The additional attachment of up to 80 long-term data storage tags (DSTs, returned when fish are caught through the fishery) on fish of the same species from the area as tagged using acoustic transmitters.

**Data analysis:** Initial assessment using acoustic array data of fine-scale species movements (sex differentiated, where possible) including features of diurnality, site fidelity, movement response to noise and electrical sensitivity within the site, and the spatial dynamics across wider scales into adjacent regions from DST returns.

### Project Outcomes & Outputs

#### Lander deployments

The project succeeded in developing and deploying six seabed landers with attached VR3 receivers in July 2013 (Figure 1) to form an acoustic monitoring array around the wave energy site, capable of supporting long-term tracking of transmitter-tagged fish.

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## Tag deployments

Approximately 140 fish were tagged with acoustic transmitters (Figure 2) or DSTs in the vicinity of the site. Acoustic-tagged fish movements are tracked automatically by the receiver array while DSTs are returned when fish are caught through the fishery.



Figure 2: Example of acoustic transmitter-tagged sole and close-up of the tag attachment (with MBA embossed and numbered Petersen disk).

## Data analysis

Sims & Cottrell (2013) reported three re-captures of DST tagged blonde rays. Further data analyses are on-going, centred on the animals' vertical behaviour, which showed apparently complex movement patterns. For example, one of the blonde rays displayed nocturnal activity cycles and during active periods spent a surprising amount of time well away from the seabed and relatively close to the sea surface.

Progress has also been made in reconstructing the horizontal tracks of individual fish, using a probabilistic tidal geolocation model to estimate likely locations in relation to habitats and substrates. Figure 3 shows an individual blonde ray remaining for a month in a localised area to the west of the site, prior to moving offshore into deep water where it was caught by a French trawler. This indicated some site fidelity to shallower habitat in addition to wider ranging behaviours to deeper habitats.

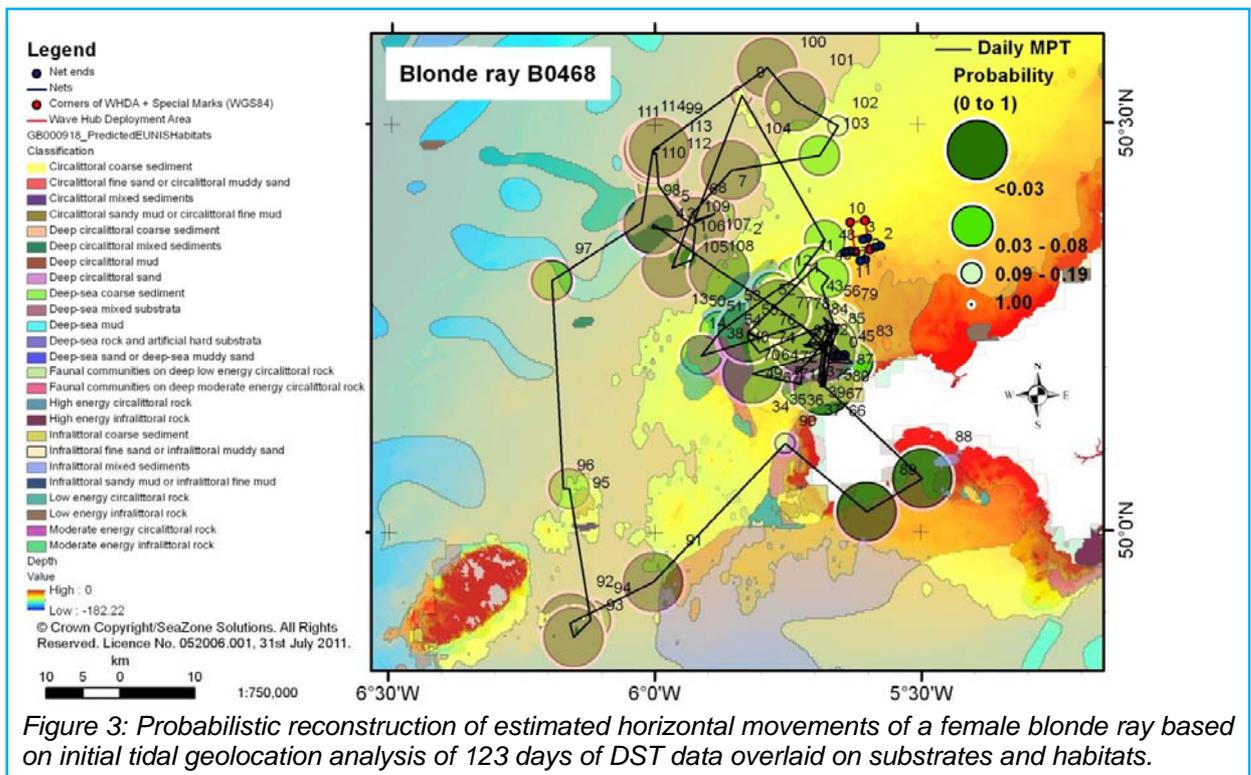


Figure 3: Probabilistic reconstruction of estimated horizontal movements of a female blonde ray based on initial tidal geolocation analysis of 123 days of DST data overlaid on substrates and habitats.

Sims & Cottrell (2013) indicated that a further 5 DST-tagged blonde rays had been recaptured. A data upload from the acoustic receivers on the landers is planned for spring 2014.

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### DECC Offshore Energy SEA

The SEA process aims to help inform licensing and leasing decisions by considering the environmental implications of a plan/programme and the activities which could result from its implementation. Since 1999, DECC has conducted a series of offshore energy SEAs, the latest covering wind, tidal stream and range, CO<sub>2</sub> and hydrocarbon gas storage, and oil & gas – see right.

Since the first SEA, the associated research programme has targeted key information gaps on the marine environment and potential industrial impacts, to inform the SEA process, developers, consenting bodies and others. Research priorities are discussed with the SEA Steering Group and a range of other stakeholders.

For more information on the OESEA programme, visit the offshore SEA web pages on <https://www.gov.uk/> or email [oepe@decc.gsi.gov.uk](mailto:oepe@decc.gsi.gov.uk)

A data portal for previous SEA reports and data is at <http://www.bgs.ac.uk/data/sea>

	Area	Sector
SEA 1	The deep water area along the UK and Faroese boundary	Oil & Gas (19 <sup>th</sup> Licensing Round, 2001)
SEA 2	The central spine of the North Sea which contains the majority of existing UK oil and gas fields	Oil & Gas (20 <sup>th</sup> Licensing Round, 2002)
SEA 2 Extension	Outer Moray Firth	Oil & Gas (20 <sup>th</sup> Licensing Round, 2002)
SEA 3	The remaining parts of the southern North Sea	Oil & Gas (21 <sup>st</sup> Licensing Round, 2003)
R2	Three strategic regions off the coasts of England and Wales in relation to a second round of offshore wind leasing	Offshore wind (R2 of Leasing, 2003)
SEA 4	The offshore areas to the north and west of Shetland and Orkney	Oil & Gas (22 <sup>nd</sup> Licensing Round, 2004)
SEA 5	Parts of the northern and central North Sea to the east of the Scottish mainland, Orkney and Shetland	Oil & Gas (23 <sup>rd</sup> Licensing Round, 2005)
SEA 6	Parts of the Irish Sea	Oil & Gas (24 <sup>th</sup> Licensing Round, 2006)
SEA 7	The offshore areas to the west of Scotland	Oil & Gas (25 <sup>th</sup> Licensing Round, 2008)
OESEA	UK offshore waters*	Oil & Gas (26 <sup>th</sup> Licensing Round, 2009) Gas storage Offshore wind (R3 of Leasing, 2009)
OESEA2	UK offshore waters*	Oil & Gas (27 <sup>th</sup> Licensing Round, 2012) Gas storage Carbon dioxide transport and storage Offshore wind, wave and tidal energy

\*For renewable energy included potential leasing in the UK Renewable Energy Zone (REZ) and the territorial waters of England and Wales but not the Scottish Renewable Energy Zone and Northern Irish waters within the 12 nautical mile territorial sea limit