



Department for Business, Energy & Industrial Strategy

Recent Papers from BEIS Offshore Energy SEA funded projects

Since 1999, the UK's Department for Business, Energy & Industrial Strategy and its forerunner departments (most recently the Department of Energy and Climate Change) programme has funded a significant number of marine surveys and research projects to improve the information base for strategic assessment and activity specific consenting. The reports of, and data from, these studies are publicly available and deposited in the SEA data archive hosted by the British Geological Survey at <http://www.bgs.ac.uk/data/sea/home.html>.

The authors and researchers involved in BEIS SEA studies have been encouraged to submit papers for peer reviewed publication. A list of recent publications is given below arranged chronologically under 3 headings: Birds, Marine mammals (and noise), and Seabed and water column. Where available, links to the paper or journal are included.

Birds

1. Grecian WJ, Lane JV, Michelot T, Wade HM & Hamer KC (2018). Understanding the ontogeny of foraging behaviour: insights from combining marine predator bio-logging with satellite-derived oceanography in hidden Markov models. *J. R. Soc. Interface* **15**: 20180084. <http://dx.doi.org/10.1098/rsif.2018.0084>.
2. Langston R & Teuten (2018). Ranging behaviour of northern gannets. *British Birds* **111**: 131-143.
3. Thaxter CB, Ross-Smith VH, Bouten W, Masden EA, Clark NA, Conway GJ, Barber L, Clewley GD & Burton NHK (2018). Dodging the blades: new insights into three dimensional space use of offshore wind farms by lesser black-backed gulls *Larus fuscus*. *Marine Ecology Progress Series* **587**: 247–253.
4. Thaxter CB (2017). Chapter 15: Tracking and telemetry of marine birds. In: Perrow, M. (ed.) *Wildlife and Wind Farms: Offshore Volume 2: Conflicts and Solutions*. Conservation Handbooks. Pelagic Publishing.
5. Shamoun-Baranes J, van Gasteren H & Ross-Smith V (2017). Sharing the Aerosphere: Conflicts and Potential Solutions. In: Chilson P, Frick W, Kelly J & Liechti F (eds) *Aeroecology*. Springer, Cham, pp.465-497.
6. Thaxter CB, Clark NA, Ross-Smith VH, Conway GJ, Bouten W & Burton NHK (2017). Sample size required to characterise area use of tracked seabirds. *Journal of Wildlife Management* **81**: 1098-1109.
7. Ross-Smith V, Thaxter C, Clark N, Shamoun-Baranes J, Bouten W & Burton N (2016). GPS telemetry reveals differences in the foraging ecology of breeding lesser black-backed gulls between three Special Protection Area colonies. *BOU Proceedings – Birds in time and space: avian tracking and remote sensing*.
8. Ross-Smith V, Thaxter CB, Masden EA, Shamoun-Baranes J, Burton NHK, Wright LJ, Rehfish MM & Johnston A (2016). Modelling flight heights of lesser black-backed gulls and great skuas from GPS: a Bayesian approach. *Journal of Applied Ecology* **53**: 1635-1891.
9. Thaxter CB, Ross-Smith VH, Clark JA, Clark NA, Conway GJ, Masden EA, Wade HM, Leat EHK, Gear SC, Marsh M, Booth C, Furness RW, Votier SC & Burton NHK (2016). Contrasting effects of GPS device and harness attachment on adult survival of lesser black-backed gulls *Larus fuscus* and great skuas *Stercorarius skua*. *Ibis* doi: [0.1111/ibi.12340](https://doi.org/10.1111/ibi.12340).

BEIS Offshore Energy SEA Research

10. Cleasby IR, Wakefield ED, Bearhop S, Bodey TW, Votier SC & Hamer KC (2015). Three-dimensional tracking of a wide-ranging marine predator: flight heights and vulnerability to offshore wind farms. [*Journal of Applied Ecology* 52: 1474-1482](#).
11. Thaxter CB, Ross-Smith VH, Bouten W, Clark NA, Conway GJ, Rehfish MM & Burton NHK (2015). Seabird-wind farm interactions during the breeding season vary within and between years: A case study of lesser black-backed gull *Larus fuscus* in the UK. [*Biological Conservation* 186: 347-358](#).
12. Thaxter CB, Ross-Smith VH, Clark NA, Bouten W & Burton NHK (2015). GPS telemetry reveals within-wind farm behavior of lesser black-backed gulls during the breeding season. In: Köppel J & Schuster E (eds.) Book of Abstracts (page 65). Conference on Wind energy and Wildlife impacts (CWW 2015), March 10-12, 2015. Berlin, Germany.
13. Thaxter CB, Ross-Smith VH, Clark JA, Clark NA, Conway GJ, Marsh M, Leat EHK & Burton NHK (2014). A trial of three harness attachment methods and their suitability for long-term use on lesser black-backed gulls and great skuas. [*Ringling & Migration* 29: 65-76](#).
14. Wade HM, Masden EA, Jackson AC, Thaxter CB, Burton NHK, Bouten W & Furness RW (2014). Great skua (*Stercorarius skua*) movements at sea in relation to marine renewable energy developments. [*Marine Environmental Research* 101: 69-80](#).
15. Thaxter C, Ross-Smith V, Burton N, Wade H, Masden E & Bouten W (2013). Connectivity between seabird features of protected sites and offshore wind farms: lesser black-backed gulls and great skuas through breeding, migration and non-breeding seasons. [*BOU proceedings – Marine Renewables and Birds*](#).
16. Wakefield ED, Bodey TW, Bearhop S, Blackburn J, Colhoun K, Davies R, Dwyer RG, Green J, Grémillet D, Jackson AL, Jessopp MJ, Kane A, Langston RHW, Lescroël A, Murray S, Le Nuz M, Patrick SC, Péron C, Soanes L, Wanless S, Votier SC & Hamer KC (2013). Space partitioning without territoriality in gannets. [*Science* 341: 68-70](#).

Marine mammals (and noise)

17. Arso Civil M, Quick N, Cheney B, Pirotta E, Thompson P & Hammond P (submitted). Changing distribution of the east coast of Scotland bottlenose dolphin population and the challenges of area-based management. *Aquatic Conservation: Marine and Freshwater Ecosystems*.
18. Sparling C, Lonergan M & McConnell B (2017). Harbour seals (*Phoca vitulina*) around an operational tidal turbine in Strangford Narrows: no barrier effect but small changes in transit behaviour. [*Aquatic Conservation: Marine and Freshwater Ecosystems* 28:194-204](#).
19. Graham IM, Pirotta E, Merchant ND, Farcas A, Barton TB, Cheney B, Hastie GD & Thompson PM (2017). Responses of bottlenose dolphins and harbour porpoises to variations in piling noise during harbour construction. [*Ecosphere* 8: 1-16](#).
20. Quick NJ, Cheney B, Thompson PM & Hammond PS (2017). Can the camera lie? A non-permanent nick in a bottlenose dolphin (*Tursiops truncatus*). [*Aquatic Mammals* 43: 156-161](#).
21. Jones EL, Sparling CE, McConnell BJ, Morris CD & Smout S (2017). Fine-scale harbour seal usage for informed marine spatial planning. *Scientific Reports* 7: 11581.
22. Farcas A, Thompson PM & Merchant ND (2016). Underwater noise modelling for environmental impact assessment. [*Environmental Impact Assessment Review* 57: 114-122](#).
23. Hastie GD, Russell DJF, McConnell BJ, Thompson D & Janik VM (2016). Multiple-pulse sounds and seals: results of a harbour seal (*Phoca vitulina*) telemetry study during windfarm construction. [*Advances in Experimental Medicine and Biology* 875: 425-430](#).

24. Lucke K, Hastie GD, Jurczynski K, McConnell B, Moss S, Russell DJF, Weber H & Janik VM (2016). Aerial low frequency hearing in captive and free-ranging harbour seals (*Phoca vitulina*) using auditory brainstem responses. [*Journal of Comparative Physiology A* **202**: 859-868.](#)
25. Russell DJF, Hastie GD, Thompson D, Janik VM, Hammond PS, Scott-Hayward LAS, Matthiopoulos J, Jones EL & McConnell BJ (2016). Avoidance of wind farms by harbour seals is limited to pile driving activities. [*Journal of Applied Ecology* **53**: 1642-1652.](#)
26. Hastie GD, Russell DJF, McConnell B, Moss S, Thompson D & Janik VM (2015). Sound exposure in harbour seals during the installation of an offshore wind farm: predictions of auditory damage. [*Journal of Animal Ecology* **52**: 631-640.](#)
27. Jones EL, McConnell BJ, Smout S, Hammond PS, Duck CD, Morris CD, Thompson D, Russell DJF, Vincent C, Cronin M, Sharples RJ & Matthiopoulos J (2015). Patterns of space use in sympatric marine colonial predators reveal scales of spatial partitioning. [*Marine Ecology Progress Series* **534**: 235-249.](#)
28. Russell DJF, McClintock BT, Matthiopoulos J, Thompson PM, Thompson D, Hammond PS, Jones EL, MacKenzie ML, Moss S & McConnell BJ (2015). Intrinsic and extrinsic drivers of activity budgets in sympatric grey and harbour seals. [*Oikos* **124**: 1462-1472.](#)
29. Cheney B, Corkrey R, Durban JW, Grellier K, Hammond PS, Isals-Villanueva V, Janik VM, Lusseau SM, Parsons KM, Quick NJ, Wilson B & Thompson PM (2014). Long-term trends in the use of a protected area by small cetaceans in relation to changes in population status. [*Global Ecology and Conservation* **2**: 118-128.](#)
30. Hastie GD, Donovan C, Götz T & Janik VM (2014). Behavioral responses by grey seals (*Halichoerus grypus*) to high frequency sonar. [*Marine Pollution Bulletin* **79**: 205-210.](#)
31. Russell DJF, Brasseur SMJM, Thompson D, Hastie G, Janik VM, Aarts G, McClintock BT, Matthiopoulos J, Moss SEW & McConnell B (2014). Marine mammals trace anthropogenic structures at sea. [*Current Biology* **24**: 638-639.](#)
32. Silva MA, Jonsen I, Russell DJF, Prieto R, Thompson D & Baumgartner MF (2014). Assessing performance of Bayesian state-space models fit to Argos satellite telemetry locations processed with Kalman filtering. [*PLoS ONE* **9**\(3\): e92277.](#)
33. McClintock BT, Russell DJF, Matthiopoulos J & King R (2013). Combining individual animal movement and ancillary biotelemetry data to investigate population-level activity budgets. [*Ecology* **94**: 838-849.](#)
34. Russell DJ, McConnell BJ, Thompson D, Duck CD, Morris C, Harwood, J & Matthiopoulos J (2013). Uncovering the links between foraging and breeding regions in a highly mobile mammal. [*Journal of Applied Ecology* **50**: 499-509.](#)

Seabed and water column

35. Wasson B & de Blauwe H (2014). Two new records of cheilostome Bryozoa from British waters. [*Marine Biodiversity Records* **7**: e123.](#)
36. Gafeira J, Long D & Diaz-Doce D (2012). Semi-automated characterisation of seabed pockmarks in the central North Sea. [*Near Surface Geophysics* **10**: 303-314.](#)
37. Howell KL, Davies JS & Narayanaswamy BE (2010). Identifying deep-sea megafaunal epibenthic assemblages for use in habitat mapping and marine protected area network design. [*Journal of the Marine Biological Association of the United Kingdom* **90**: 33-68.](#)
38. Oliver PG, Holmes AM, Killeen IJ & Turner JA (2010). Marine bivalve shells of the British Isles (Mollusca: Bivalvia). [*Amgueddfa Cymru - National Museum Wales*.](#)
39. Hastie LC, Pierce GJ, Wang J, Bruno I, Moreno A, Piatkowski U & Robin JP (2009). Cephalopods in the north-eastern Atlantic: species, biogeography, ecology, exploitation and conservation. [*Oceanography and Marine Biology: An Annual Review* **47**: 111-190.](#)

BEIS 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, the Department has conducted a series of offshore energy SEAs, the latest covering wind, tidal stream and tidal range, CO₂ 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@beis.gov.uk

	Area	Sector
SEA 1	The deep water area along the UK and Faroese boundary	Oil & Gas (19 th 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 th Licensing Round, 2002)
SEA 2 Extension	Outer Moray Firth	Oil & Gas (20 th Licensing Round, 2002)
SEA 3	The remaining parts of the southern North Sea	Oil & Gas (21 st 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 nd 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 rd Licensing Round, 2005)
SEA 6	Parts of the Irish Sea	Oil & Gas (24 th Licensing Round, 2006)
SEA 7	The offshore areas to the west of Scotland	Oil & Gas (25 th Licensing Round, 2008)
OESEA	UK offshore waters*	Oil & Gas (26 th Licensing Round, 2009) Gas storage Offshore wind (R3 of Leasing, 2009)
OESEA2	UK offshore waters*	Oil & Gas (27 th & 28 th Licensing Rounds, 2012 and 2014) Gas storage Carbon dioxide transport and storage Offshore wind, wave and tidal energy
OESEA3	UK offshore waters*	Oil & Gas (future Licensing Rounds) 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 (now Exclusive Economic Zone) 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