Cumulative Effects of Offshore Renewables: from pragmatic policies to holistic marine spatial planning tools

Morgane Declerck[1], Neda Trifonova[2], Julie Black [3], John Hartley [4] and Beth Scott[5]

[1] *School of Biological Sciences, University of Aberdeen – m.declerck.19@abdn.ac.uk*
[2] *School of Biological Sciences, University of Aberdeen*
[3] *Joint Nature Conservation Committee (JNCC)*
[4] *Hartley Anderson*
[5] *School of Biological Sciences, University of Aberdeen*

To alleviate climate change consequences, UK governments are pioneering offshore energy developments (ORE) at an ever-increasing pace. The North Sea is a dynamic ecosystem with strong bottom-up/top-down natural and anthropogenic drivers facing rapid climate change impacts. Therefore, to ensure the compatibility of such large-scale developments with nature conservation obligations, cumulative effects need to be evaluated through cumulative impact assessments (CIA). However, by excluding climate change impacts, the CIA lacks spatio-temporal appropriate baselines linking oceanic ecosystem indicators to population dynamics, leading to uncertain predictions at populations levels. At a European level, the CIA is currently required under both the Strategic Environmental Assessment (SEA, Directive 2001/42/EC) and the amended Environmental Impact Assessment (EIA, Directive 2014/52/EU). The Marine Strategy Framework Directive (MSFD, Directive 2008/56/EC) also requires the assessment of the main cumulative and synergetic effects based on its ecosystem approach. At the UK level, CIA requirements and MSFD are mirrored within the Marine and Coastal Access Act, the UK Marine Policy Statement, and the UK National Policy Statement.

This study presents an overview of the CIA policy framework, enabling an ecosystem-based approach linking lower ecosystem components to top-predator populations using the UK as a case study. Firstly, we show how CIA and MSFD requirements are integrated into the UK licensing and maritime planning frameworks. Secondly, we provide policy pathways embedding the MSFD as a baseline for CIA at the European and UK levels. Thirdly we propose tools such as a shared monitoring effort and a modelling approach with connections to current online databases. Finally, we highlight how Contracts for Difference policy could be used as an integrative tool to enhance a holistic and pragmatic ecosystem-based framework for an inter-disciplinary CIA approach fit for a rapid expansion of ORE.

Acknowledgements

I would like to thank Prof. Beth Scott, Dr Neda Trifonova, Dr Julie Black and Dr John Hartley for their guidance.

Nuances of Nature Based Development

Michael B Thompson[1], and Diane Jones[2]

[1] *Environmental and Social Division of Mott MacDonalds Limited – michael.thompson@motmac.com*
[2] *Environmental and Social Division of Mott MacDonalds Limited – diane.jones@motmac.com*

As part of supporting the Blue Economy Vision there is a need to ensure sustainable development and solutions that bring biodiversity net gain.

In this talk we present some of Mott MacDonalds experience in sustainable development to date and the challenges encountered with using nature-based solutions. Projects covered include coastal defence programs, touching on handling managed realignment and wastewater treatment solution with accompanying habitat creation. The question of compensatory habitats and current understanding of what, where, when and how these can be undertaken is raised.

We also seek to provide insight on some of the policy and evidence-based challenges that occur, and the current gaps in knowledge experienced. This includes recent programs to map stakeholders and link associated environmental processes to enable a holistic view on impacts and cumulative aspects to be taken. This holistic view on processes is often missed and is a particular concern to properly assess outcomes of projects.

Communication of these challenges and their resolution is key to enhancing the uptake of blue economy within Scottish waters. As such, this talk seeks to encourage the development of partnerships, summarise lessons learned and identify potential opportunities for future research to deliver measurable impacts.

Improving understanding of vessel activity in Scotland's coastal waterways: implications for wildlife and policy

Emily Hague[1], Matthew K. Pine[2], Gregory O'Hagan[3], Patrick O'Hara[3], Alice Walters[4], Emma Steel[4], Katie Dyke[4], Juliane Retsch[5], Diego Piedra-Garcia[5], Carsten Hilgenfeld[5], Rachel Shucksmith[6], Teresa Fernandes[1] and Lauren McWhinnie[1,2]

[1] *Institute of Life and Earth Sciences, Heriot-Watt University, Edinburgh, United Kingdom – elh2001@hw.ac.uk*
[2] *Styles Group Underwater Acoustics, Auckland, New Zealand*
[3] *Canadian Wildlife Service, Environment and Climate Change Canada, Sidney, BC, Canada*
[4] *Whale and Dolphin Conservation, WDC Scottish Dolphin Centre, Spey Bay, Moray, United Kingdom*
[5] *FleetMon.com, JAKOTA Cruise Systems GmbH, Rostock, Germany, Rostock, Germany*
[6] *University of Highlands and Islands, Scalloway, Shetland, UK*

Understanding, and then subsequently monitoring and managing human activities in the marine environment is inherently challenging. Challenges include inadequate data, a limited understanding of environmental interactions within marine ecosystems, and the inherent complexities of managing species and activities that traverse multiple jurisdictions. To assess and understand the degree of impact or potential risk an activity poses, we first must know where and when that activity is taking place. For many 'static' actions, this information is relatively simple to obtain and characterise, but this is not true for all uses, especially 'mobile' activities. For example, vessel activity is highly mobile, and so understanding the potential risk posed in space and time can be challenging. This is, in part, because the vessel tracking system known as 'Automatic Identification System' (AIS) is only legally required to be broadcast by vessels over a certain tonnage or length, working commercially, or carrying a certain number of passengers. This means that without targeted data collection there is only a limited understanding of the presence and distribution of non-AIS vessels, such as small fishing boats, recreational vessels, and jet skis, despite non-AIS vessels constituting a significant portion of maritime traffic. This has important conservation management and policy implications, as these types of (more commonly non-AIS) vessel are associated with several potential impacts to marine wildlife, including underwater noise exposure, strike, and behavioural disturbance.

To address this, the Scottish Vessel Project is a collaborative initiative exploring several data collection approaches to build a more holistic overview of vessel traffic in coastal Scottish waters. The project utilises land-based watch data (through Whale and Dolphin Conservation's (WDC) Shorewatch and the Orkney Marine Mammal Research Initiative), collects and analyses AIS and time-lapse camera data (in collaboration with FleetMon.com and ECCC), and explores the utility of ship noise models to predict minimum underwater noise contributions from AIS vessels in an urbanised waterway (in collaboration with FleetMon.com and Styles Group Acoustics). This project provides a fundamental step towards improving our understanding of the total volume/presence of vessels, and their potential associated impacts, in Scotland's coastal seas. This understanding is imperative to provide managers and decision-makers the information to support the sustainable management of our coastal spaces.

Acknowledgements

We are extremely grateful to all WDC Shorewatch volunteers for countless hours of sea-watching and data collection. We also gratefully acknowledge the companies and individuals supporting this work through the hosting of AIS devices, including, but not limited to, Dolphin View Cottages Hillockhead, Sumburgh Head Lighthouse and Visitor Centre, RSPB Shetland, Orkney Marine Mammal Research Initiative, Hebridean Adventures, WDC Scottish Dolphin Centre, Heriot Watt Orkney Campus, Stonehaven Golf Club, Fairmont St Andrews, Shetland Webcams, Ardnamurchan Lighthouse, Carl and Claire Mullins, and Anne and David Wilson.

Assessing faunal diversity and status of European flat oyster beds through analysis of soundscapes, eDNA and visual surveys

Magnus Janson[1,2], Jennifer Dodd[1,2], Marco Fusi[2,3], Emma Hart[2,4],Torbjörn Johansson[5],Hannah Millar[6], Åsa Strand[5], William Sanderson[7], Karen Diele[1,2]

[1] School of Applied Sciences, Edinburgh Napier University–m.janson@napier.ac.uk
[2] Centre for Conservation and Restoration Science, Edinburg Napier University
[3]Joint Nature Conservation Committee
[4]School of Computing, Edinburg Napier University
[5]IVL Swedish Environmental Research Institute
[6] Marine Scotland Science
[7]School of Energy, Geoscience, Infrastructure and Society, Heriot-Watt University

European flat oyster beds(EFOBs) improve water quality, increase overall biodiversity and store carbon [1,2].Overfishing in the early 1900's vastly reduced their numbers and extent, and today only trace populations remain[3].Many native oyster restoration projects have recently been implemented across Europe, but time/cost effective methods for evaluating their ecological status are lacking. This PhD project will apply, develop ,and compare different methods and metrics, i.e. soundscapes, environmental(e)DNA and visual surveys, for assessing diversity of fauna associated with EFOBs at varying states of development/recovery, as an indicator for ecosystem complexity and status. The first ever systematic EFOB soundscape recordings were generated in Scottish and Swedish remnant habitats(summer 2022),by deploying passive acoustic monitoring units over ~2 weeks(Sweden) and 6 weeks (Scotland). Soundscape recordings, to be analysed using e.g. machine learning, will be compared with eDNA results derived from water and sediment samples, and with visual biodiversity survey data. Forthcoming results will demonstrate whether the applied methods, individually or combined, can be used as time and cost-effective tools to adequately assess/monitor ecosystem complexity and status, and inform EFOB conservation and restoration efforts. This research is timely, given recent national and international emphasis on restoring degraded habitats.

Acknowledgements

Thanks to all field assistants and the DEEP team(a partnership including the Glenmorangie Company and the Marine Conservation Society);the IVL Swedish Environmental Research Institute for hosting me; Matt Wale, Craig Stenton, Steve Simpson and Sophie Nedelec for additional advice; the MASTS-SFC Saltire Emerging Researcher Scheme (MASTS-SERS), the NERC SUPER DTP and Nature Metrics for funding/matched funding.

References

[1] Fariñas-Franco, J. M., Pearce, B., Mair, J. M., Harries, D. B., MacPherson, R. C., Porter, J. S., Reimer, P. J., & Sanderson, W. G. (2018). Missing native oyster (Ostrea edulisL.) beds in a European Marine Protected Area: Should there be widespread restorative management? Biological Conservation, 221, 293–311.
[2] Zu Ermgassen, P.S., Thurstan, R.H., Corrales, J., Alleway, H., Carranza, A., Dankers, N., DeAngelis, B., Hancock, B., Kent, F., McLeod, I. and Pogoda, B., 2020. The benefits of bivalve reef restoration: A global synthesis of underrepresented species. Aquatic Conservation: Marine and Freshwater Ecosystems, 30(11), pp.2050-2065
[3] Pogoda, B., Boudry, P., Cass Bromley,Tom, Cameron, C., Bérenger Colsoul, Donnan, D., Hancock, B., Hugh-Jones, T., Preston, J., Sanderson, W. G., Sas, H., Brown, J., Kruno Bonacic, Henning Von Nordheim, Philine,Zu Ermgassen, S. E., & Institute, A. W. (2020). NORA moving forward: Developing an oyster restoration network in Europe to support the Berlin Oyster Recommendation. Aquatic Conservation: Marine and