PrePARED

Predators + Prey Around Renewable Energy Developments

Quarterly Report: Q3 2024
Date: 27/09/2024

Project Overview

This quarter has focussed on finalising fieldwork in the Firth of Forth and Moray Firth areas, data processing and analyses, and modelling. Several reports are also being drafted for delivery in Q4.

Summary of activities undertaken in Q3 2024

Task 1.1 Broadscale fish response to OWF in Firth of Forth:
1) Fisheries acoustic, demersal fish and seabird at sea surveys were completed on July 2nd. Fish and seabird distribution data have been acquired, compiled and are now being used to a) refine species distribution models necessary to predict both prey and predator distributions and b) assess the quality of current species distributions models by confronting newly acquired data with model predictions. RoxAnn data have been acquired, compiled and will be used to update models of seabed roughness and hardness (used as covariates in fish distribution models). PrePARED partners have been informed of the survey outcomes through quarterly meetings and workstream dedicated meetings.
2) As for 2023, length frequency analyses are being used instead of otolith analyses and have proven to be a robust alternative due to the ability to discriminate juveniles from adults based on size for all target species. RoxAnn data collected on PrePARED surveys have been collected and data from other MD surveys will be used to complete the 2024 database and update the spatial resolution of seabed models.
3) Fisheries acoustician is currently working on the post processing of acoustic data.

Task 1.2 Finescale fish response to OWF in Forth: The BRUV/Fish trap survey was completed on August 16th with 47 fish trap and 68 BRUV (Baited Remote Underwater Video) deployments successfully completed both within and outside windfarms. Data generated will be used to refine species distribution models and understand the effects of offshore windfarms on fish distributions. BRUV footage analyses are currently underway. RoxAnn data (seabed characteristics) have been collected and temperature, salinity and primary productivity data collected at sites within and outside windfarms. RoxAnn data have been compiled and are being collated with data acquired on other SGMD surveys.

Task 2.1 Seabird spatial distribution models in Forth: The spatial modelling comparison paper is currently being drafted. This forms the basis of the analytical approach that BioSS is using for the predator-prey spatial models. BioSS have reformulated an analysis plan, based on Phil joining the team, and are applying the modelling approaches to the seabird-fish datasets.

Task 2.2 Seabird movement models in Forth: Work on Tasks 2.2 and 2.3 has been scaled down this quarter, as BioSS have been contributing to the seal foraging report in Task 4.1. They have reviewed the R code and report. BioSS have implemented a new analytical approach called 'Neighbouring Cross Validation' (NCV) to deal with autocorrelation in the seal tagging data. BioSS have also written caveats and limitations to the analysis, to aid with correct interpretation of the results. Working with SGMD, BioSS have been comparing spatial overlap between predictions from some of the models in 1.1 (using the fish and seabird-at-sea data) with estimated foraging locations from the seabird movement models in 2.2 (using the GPS tracking data).

Task 3.1 Large-scale fish distribution in Moray: The BRUV and 24-hour lander surveys were successfully completed in July.

Task 3.2: Fine scale fish distribution in Moray – The BRUV and 24-hour lander surveys were successfully completed in July.

Task 3.3 Fish acoustic telemetry in Moray: Fish tracking array remains active and collecting data. Awaiting ROV retrieval of 14 problematic receivers (with onboard data) that would not release from the seabed. Given success of network and emerging data for haddocks, an application has been made to the Home Office to permit attachment of acoustic tags to flatfish. This is the other dominant group of fish using the PrePARED sites and for which no fine scale movement data exist. Discussions are ongoing as to

whether the autumn servicing of the array is moved to the spring as the newest batch of tagged fish were only released at the end of Q2 2024.

Task 4.1 Drivers of broadscale marine mammal distribution in Moray: Draft report has been written. Meetings have been held between UoA and BioSS to QA data and finalise analysis. Delivery of draft report to MG & PAG likely to be delayed until early in Q4 2024.

Task 4.2 Finescale marine mammal distribution in response to OWF and prey fields in Moray: Unfortunately, our target to deliver a draft report on the relationship between porpoises and prey around OWF has not been achieved, with delays resulting from re-direction of staff time to Task 4.3. Analysis of BRUV and PAM data conducted, with priority being given to development of a presentation for ICES Conference. Revised time scales dependent upon progress of additional work within Task 4.3 and outcome of CRF09, and we suggest finalising decisions on this in Q1 2025.

Task 4.3 Dose response curves in Moray: Target to extract data on porpoise occurrence and foraging buzzes, and liaise with industry to estimate received noise levels at each PAM location, partially achieved. All porpoise occurrence and foraging buzz data have been extracted. However, dose-response work has been re-focussed onto deterrence functions for outputs related to management of SNS SAC through EDRs. Also, some delays on availability of industry funded noise data. Anticipated that noise data will become available during Q4 2024.

Task 4.4 Fish nutritional value: In Q3, analysis of the Moray Firth and Firth of Forth surveys continued - analyses are now largely complete for the PrePARED 2022 samples, with the following species having been processed: Mackerel, Viviparous eelpout, Bull-rout, Lemon sole, Long rough dab, Flounder, Whiting, sprat, Common dab, Grey gurnard. SMRU have received haddock collected around Moray East

OWF and awaiting samples from the sandeels surveys to help estimate changes in foodscapes between pre-construction (2019) and post-construction (2024).

This expanded bomb calorimetry analysis has continued with over 500 new energy density values produce as part of Task 4.4. A full-time technician is being trained in Q4, to allow SMRU colleague to focus on Task 5.2 (Generalities in marine mammal response to OWF, focus on seals in her PhD). The technician will focus on sandeels for the next few months to bolster a key gap for a species of critical importance.

Task 5.2 Generalities in marine mammal response to OWF: Work on manuscript on the effect of PAM array design on dose response functions for harbour porpoises continues. Analysis is now focusing on establishing rules for truncation distances for the functions (i.e. the range from the source at which to truncate the data). This paper is planned for submission at the end of Q4 or early in Q1 2025. Work on seals is advancing, via Philippa Wright's PhD – exploring overlap with prey data and expanding on Whyte et al response to noise studies. Collaboration with the University of Aberdeen team continues to streamline these efforts and maximise impact. This work highlights the importance of survey design in using PAM stations for dose-response estimation (and the benefits and challenges of PAM stations at large distances from the source. This ties into Task 6.4.

Task 6.1 Minimum data requirements for seabird distribution and movement models: BioSS met with Rebecca Langton to discuss producing uncertainty layers for the sandeel map (Langton et al,2021). Rebecca will aim to do this by Dec-24, and BioSS will incorporate this uncertainty, along with ICES stock assessments, to investigate whether the (static) sandeel map can be adapted to be more dynamic.

Task 6.3 UK EEZ marine habitats similarity assessment for OWF sites: Report production (Habitat Similarity Assessment) is underway and has been shared with SMRUc. All sections drafted, Intro. Methods and Results completed, reporting document template populated. Discussion sections drafted. Awaiting comments from SMRUc once they have time to review. SMRUc have seen all stages of development of report. Once feedback is received this will then be shared internally, before being released.

Task 6.4 Survey design for predator-prey studies: SMRUc have just received the draft outputs from Task 6.3 and will work in Q4 2024 and Q1 2025 to develop a briefing paper on best 'bang for buck' monitoring methods (using the investment in PrePARED as a means)

Task 7.1 IPcoD and DEPONS integration of new data and testing: Updates to the DEPONS model are being made and work from Task 4.3 and 5.1 will feed into this analysis. The updated version of iPCoD (called iPCoD+DEB v1.0) is being finalised currently. SMRUc are engaging with Aarhus University to progress the DEPONS updates.

Task 7.2 Adding biological realism to SeabORD and testing: Work has begun in developing movement simulations with the aim of capturing the core components shared across exemplar species using the NetLogo program. UKCEH aim to simulate movement modes corresponding with those from movement modelling of empirical data (e.g., hidden Markov models), including commuting and foraging behaviour, using a biased correlated random walk where the bias towards the colony increases with time resulting in a generic seabird central-placed foraging trip simulation. This should be fully established in Q4, at which point UKCEH can define the framework for parameterising the different species from modelling of empirical data (i.e., how the characterisations of different movement modes vary between species, and the probability of switching between them) to develop this model further to represent our focal species.

Task 7.4 Integration of PrePARED findings for harbour porpoise CIA: Data collation of wind farm data for UK OWF has continued to support CIA assessments. SMRUc intend to engage with Pathways to Growth in Q4 2024 to ensure further access to CIA parameters from as built windfarms. Due to the re-development of the iPCoD model (Scottish Government funded) which will allow for closer comparison of cumulative impact assessment tools (as the redevelopment involves an energetics engine, as in the DEPONS model), they intend to carry out this work in Q4 2024 and Q1 2025 to capitalise on the new version of iPCoD being available (once releases by Marine Directorate). By delaying this work, it also ensures the CIA undertaken is as realistic as possible.

Task 8.2 Communications Plan: The Management Group (MG) met to discuss the communications plan and a working document is in place providing guidelines to project management colleagues.

Task 9.1 Annual Knowledge Exchange Workshops: Discussions ongoing within the Management Group as to the format of stakeholder engagement in 2025. There has been overall agreement, and approval from OWEC, to consider targeted meetings, webinars or other events instead of another large PrePARED AKEM.

Task 9.2 Dissemination of project findings: Dissemination of PrePARED reports through project website, blog, social media, and email distribution. The Management Group (MG) met to discuss dissemination to ensure a plan is in place for successful uptake of PrePARED outputs. Initial steps are in place to begin targeted engagement with key stakeholders and the MG will meet again to discuss next steps.

Task 9.4 Website and social media: Webpages continue to be updated to improve accessibility, readability and aesthetics. Webpage analytics in September showed an increase in page visits and users. A site visit to Seagreen OWF allowed project manager to

receive positive feedback from developers (SSE) that they actively use the project website reviewing PrePARED reports in their day-to-day work and finding the monthly blog to be a digestible way to read project updates. Social media postings, particularly on LinkedIn, are being well received.

Summary of activities to be undertaken in Q4 2024

Task 1.1 Broad scale fish response to OWF in Forth: 1) Produce point biomass estimates of pelagic fish from acoustic transects. 2) Completion of length frequency analyses

Task 1.2 Fine scale fish response to OWF in Forth: Completion of RoxAnn analyses

Task 2.1 Seabird spatial distribution models in Forth: 1) Applying spatial framework to Forth-Tay prey data with contemporaneous seabird tracking data. 2) Draft manuscript on spatial modelling methods.

Task 2.2 Seabird movement models in Forth: Applying movement models to Forth and Tay prey data collected within project

Task 3.1 Large-scale fish distribution in Moray: Initiate post processing of acoustic signal, trawl and RoxAnn analyses from June survey

Task 3.2 Fine-scale fish distribution in Moray (reef effects): Start processing BRUV and AI camera video footage from the 2024 camera surveys

Task 3.3 Fish acoustic telemetry in Moray: Service array in the Moray Firth: 1. Completion of 6 month data download (*TBC based on timing of most recent servicing in Q2*)

Task 4.1 Drivers of broadscale marine mammal distribution in Moray: Finalise harbour seal report – delayed from Q3 2024

Task 4.2 Finescale marine mammal distribution in response to OWF and prey fields in Moray: Update on delayed delivery of final report on relationship between porpoises and prey around OWF

Task 4.3 Dose response curves in Moray: Complete dose-response analyses

Task 4.4 Fish nutritional value: Processing of summer 2024 prey samples

Task 5.1: Generalities in fish response to OWF: Collate and compare Moray Firth and Firth of Forth acoustic and camera footage processed data

Task 5.2 Generalities in marine mammal response to OWF: Complete the dose-response analyses

Task 6.1 Minimum data requirements for seabird distribution and movement models: Compare revised version of model against that derived using Forth-Tay prey data

Task 6.2 Minimum data requirements for marine mammal distribution models: Scope further simulations using data sets of different resolutions, and transferability, in relation to outputs from Task 4.1

Task 6.3 UK EEZ marine habitats similarity assessment for OWF sites: Update from delayed report from Q2.

Task 7.1 IPCoD and DEPONS integration of new data and testing: Delivery of the draft report (final report in Q2 2025)

Task 7.2 Adding biological realism to SeabORD and testing: 1) Initial development of simulated foraging tracks for exemplar species. 2) Development of initial parameterisation to work with joint predator-prey maps

Task 7.4 Integration of PrePARED findings for harbour porpoise CIA: Updated CIA analyses

Task 9.1 Annual knowledge exchange workshops: Come to agreement on strategy for 2025 stakeholder engagement.

Task 9.2 Dissemination of project findings: Support for technical and non-technical dissemination of project findings

Task 9.4 website and social media: Maintain project website and social media comms