SUPERGEN BLOG

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Interactions between diving seabirds and tidal stream turbines remain a main concern as the marine renewable energy industry develops. Assessing the risk of collisions is a key component of environmental impact assessments in development sites. Amongst diving seabirds, cormorants and shags are usually considered the most likely species to interact with turbine blades. These primitive seabirds are found widely in rugged coastal environments, often seen roosting on rocks alongside their feeding grounds, or swallowing fish following a successful pursuit. It is these behaviours which make them vulnerable; a tendency to feed in areas of fast currents at the coast, and to spend large amounts of time on the seabed.

Assessments of collision risk need information on dive behaviour. There have been numerous attempts to record diving depth of seabirds in areas of strong currents, often using expensive and sophisticated technologies. Whilst informative, these technologies are usually beyond the reach of companies assessing risk in their development sites. In addition, deploying equipment and analysing data is impractical and complicated, respectively. However, in the case of cormorants and shags, we know that birds almost always feed on the seabed, meaning that efforts can be dedicated to recording other aspects of behaviour relevant to collision risk. This project sought to develop a suite of inexpensive and practical methods to: (1) record cormorant and shag behaviours in areas of fast currents, and (2) understand what could cause variation in behaviours and collision risk amongst locations.

Several approaches were developed. The first uses range-finder binoculars and a tilt-logger to records the distance and direction between an observer and a diving bird, allowing approximate positions of the latter to be determined. The locations and times of the dives can then be recorded. The binoculars and logger were combined with a camcorder, providing a permanent record of behaviour, allowing dive-durations to be checked, and recording associated events such as prey-capture. The second approach involves the use of modified fish traps to sample prey-communities using a fishing vessel. Fish traps were adapted from commercially available designs and trialled in both seabed and floating configurations to sample a variety of benthic and demersal prey species. The final approach uses time-lapse photography units to provide counts of cormorants and shags at prominent roosts at 30minute intervals over prolonged time-periods. Cormorants and shags do not travel far from prominent roosts, primarily because they have wettable-plumage which needs drying-out between foraging bouts. As numbers of roosting birds are a good indication of the numbers of feeding birds in adjacent areas, continuous counts at prominent roosts can identify scenarios (e.g., tides, times-of-day, seasons, weathers) when interactions with installations are likely

The ‘bino-cam’ and fish-traps were tested in Shetland, where there is a large number and diversity of locations suitable for tidal stream turbines. Whilst some fine-tuning of approaches was needed, we soon started collecting dive behaviour across 9 sites ranging from Mousa Sound in the south to Bluemull Sound in the north. At the end of the 3week fieldwork period, we had performed approximately 70hr of observations, amassing around 30hr of footage. Of course, not all these tracks will be suitable for analyses – that’s just the nature of behavioural observations. However, we are confident that the vast majority will provide measurements of dive behaviour relevant to collision risk. At 3 locations, these observations were combined with information on prey-communities from the fish-traps. 20 traps were

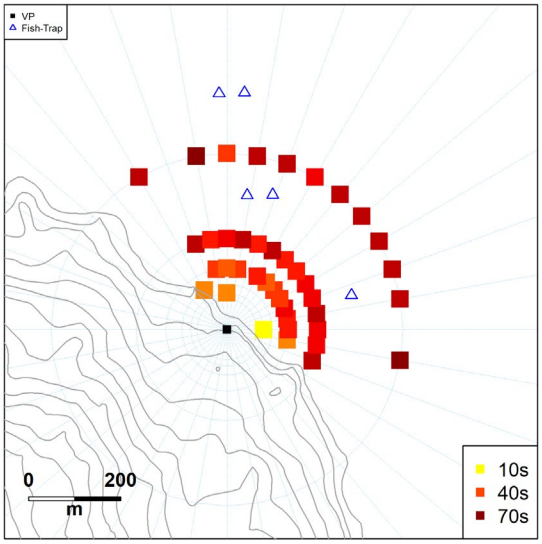
successfully deployed and recovered, with nine species of fish being captured without any losses of gear. The captures included fish known to interact with tidal stream turbines (e.g., saithe), commercially important species (e.g., cod), and those contributing significantly to cormorant and shag diet (e.g., butterfish). Various crustaceans and echinoderms were also observed in the seabed configuration. The Time-Lapse photography unit has been tested at several locations in Anglesey and Shetland. After several test-deployments in the Spring, 'permanent' deployments are now happening along the Menai Strait. We are collaborating with the Computer Science department at Bangor University to develop approaches to automate the counting of birds, as we will collect thousands and thousands of images!

The SUPERGEN ECR funding has helped us develop portable, practical, and inexpensive approaches that provide information for risk assessment. Of course, improvements can be made, and we will continue developing approaches. In addition, we must acknowledge that these approaches are limited to locations where installations are inshore, and where cormorants and shags are the primary species of concern. However, as the industry develops, it is likely that many installations will occur in these locations. Therefore, we believe these approaches could have many applications over the next few years.

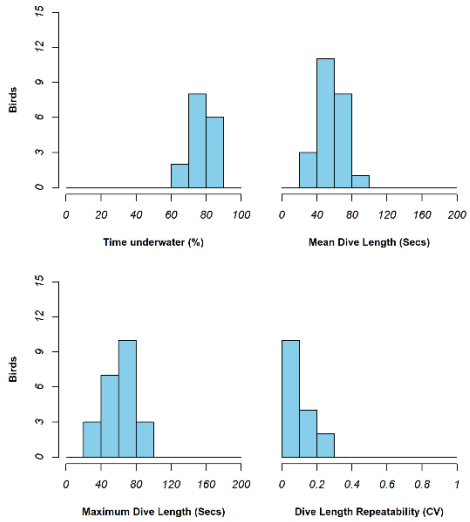
Observations using the bino-cam on Unst in Shetland.

A close-up of the bino-cam unit on Unst, Shetland.

The Time-Lapse unit deployed in the Menai Strait, Anglesey.

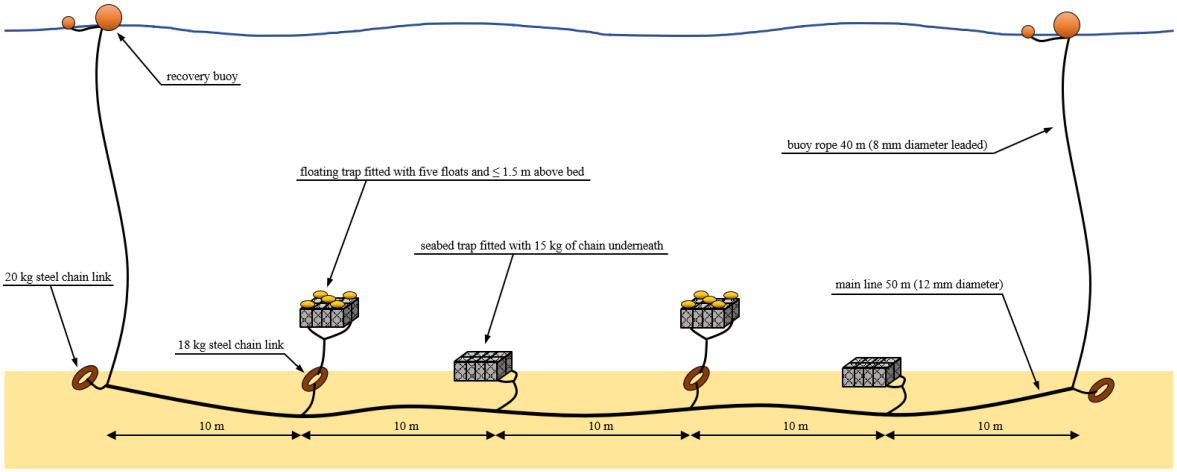


Average dive-times of cormorants at Mossbank, mainland Shetland.



Dive Behaviour of cormorants at Mossbank, mainland Shetland.

Image of roosting cormorants/shags from Time-Lapse in the Menai Strait, Anglesey.



Gear schematic showing the fish trap configuration developed for this project and successfully trialled at three locations in Shetland.

An example catch from the fish traps showing a variety of fish species.

Recovery of the fish traps using a fishing vessel.