

Marine Mammal Scientific Support Research Programme MMSS/001/11

MR 7.2.3 Report

Collision risk and impact study: Field tests of turbine blade-seal carcass collisions

Executive Summary

In the absence of any field data, collision risk models currently assume that all collisions between marine mammals and tidal turbines will be fatal. This precautionary assumption is not likely to be true and will lead to over-estimation of mortality rates. Estimated mortality rates are likely to be a serious constraint on turbine deployments and reducing the uncertainty should have the effect of reducing these rate estimates.

To address this issue a series of collision trials were carried out with grey seal (*Halichoerus grypus*) carcasses using a shaped, rigid bar fixed to the keel of a jet drive boat to simulate the leading edge of a turbine blade. The blade profile chosen represented a section near the tip where it is narrowest/sharpest and therefore most potentially damaging. The boat was driven at and collided with a number of previously frozen grey seal carcasses at a range of speeds. The angle at which the carcass was struck influenced the effective speed of that collision. This was accounted for by measuring the angle of the centre line of the keel to the water's surface (which varied with the vessel's speed) using video cameras and incorporating this into the effective speed calculations. Carcasses were impacted at a range of effective speeds from 1.95 m/s to 5.32 m/s. Resulting injuries were assessed via inspection of radiographs and by detailed post-mortem analysis. These data and the estimates of effective collision speeds were used to assess the likelihood of injury or death in real collisions.

Post-trial x-rays and post-mortems revealed no evidence of skeletal trauma. Neither were there obvious indicators of trauma such as tears, avulsions or rupture in the integument, musculature or organs, in any of the test subjects as a result of the collision trials. However, due to the difficulties in assessing soft tissue damage such as bruising and tissue oedema in previously frozen carcasses these soft tissue assessments were not considered reliable indicators of trauma in this experiment.

The results of the trials suggest that slow speed collisions with the tips of tidal turbines, at less than the maximum 5.32 m/s measured in this test, are unlikely to produce serious or fatal injuries in grey seals. It seems likely that a significant proportion of impacts would not be fatal, given the range of speeds tested in this set-up and the speeds with which wild seals will be exposed to when interacting with tidal turbines (see Data derived collision risk assessment). These are however, preliminary results and should be treated with caution as they are limited in their inability to assess soft-tissue damage or to determine potential unconsciousness as a result of collisions.