

Instantaneous and physical changes to the benthic ecosystem caused by fishing activity

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Beam trawling causes physical disruption to the seafloor through physical contact of the gear components on the sediment and the resuspension of sediment into the water column in the turbulent wake of the gear. Recently Dutch beam trawlers have replaced tickler chains by electrodes as alternative stimulation for catching flatfish. It is claimed that benthic impacts are reduced. Here we report on trials in a medium sand fishing ground to compare the physical impact of a conventional 4m commercial tickler chain beam trawl with that of the new commercial “Delmeco” pulse trawl. We use a Kongsberg EM2040 multibeam echo sounder (MBES) to measure the extent to which the beam trawls modify the topography of the substrate and a particle size analyser (LISST 100X) to measure the concentration and particle size distribution of the sediment mobilized into the water column. MBES measurements reveal that the disturbed sediment in the trawl track was on average located at a centimetre deeper after trawling of the conventional beam trawl than after pulse trawling. Particle size distributions of the sediment plumes were measured at 25m, 45m and 65m behind the gear and did not reveal any differences in concentrations between the two trawls. Whereas the empirical data serve comparative purposes, their lack of predictive capacity limits extrapolation to fleet level. Finite element (FE) models have shown to overcome this for otter trawls by predicting the penetration depth and sediment displacement associated with each gear component in different sediment types. In this study, FE models were developed for the conventional tickler chain beam trawl and the pulse trawl. Predictions were validated by results obtained during sea trials. As such, this study attempts to provide the basis for future predictions of physical impacts of beam trawling and its technical advances on a larger spatial scale.

Keywords: beam trawling, modelling, physical impact, pulse, sea trials