Keywords: Target Strength modelling, Prolate spheroid, Fluid-filled, Wideband

1.3. Integrating Bottom-Mounted Echosounders and eDNA to optimise Sandeel Monitoring

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Sandeels (Ammodytidae) are considered key species in marine ecosystems serving as an important link between lower and higher trophic levels. However, their spatial distribution and the factors influencing their habitat use remain poorly understood. Their patchy distribution, coupled with their unique life style—spending part of their time buried in the sediment and part in the water column—makes accurate monitoring difficult. This study explores the combined use of splitbeam bottom-mounted echosounders and environmental DNA (eDNA) to improve sandeel detection and quantification.

Acoustic backscatter datasets from sandeel-rich regions in the Belgian part of the North Sea (BPNS) are analyzed using Echoview software to detect single targets and schools. These detections are examined for variability in target strength (TS) and volumetric backscattering strength (Sv) across a frequency range around 200 kHz, alongside morphometrics and spatiotemporal dynamics. Machine learning techniques will then be leveraged to automate classification and improve accuracy. While acoustics offer broad temporal coverage and real-time data, eDNA provides high taxonomic resolution and may help resolve acoustic ambiguities. With this interdisciplinary approach, we aim to establish an optimal sandeel monitoring strategy for the BPNS while deepening our understanding of their spatial and temporal habitat dynamics.

Keywords: Sandeel, bottom-mounted echosounders, echoview, target classification, eDNA, quantitative monitoring strategy

1.4. An envelope-based acoustic classification method for krill in the California Current

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Krill, encompassing a range of euphausiid species, play a crucial role in all marine ecosystems by linking primary production to higher trophic levels. Krill distribution and abundance can be monitored reliably and efficiently using active acoustic methods, provided that krill echoes are adequately detected. Most commonly used algorithms for detecting krill echoes involve empirical filters based on the volume backscattering strength (S_V) spectra of krill aggregations. In this study, we introduce a novel method of krill echo classification using polynomial relationships between multi-frequency S_V differences. Unlike the traditional Sv-differencing, our method accounts for significant correlations between pairs of Sv-differences, which enables more accurate classification of krill echoes. The new filter conforms closely to the multidimensional space of Sv-difference observations, which also improves the rejection of non-krill echoes. We compare the specificity and sensitivity of this new filter to that of existing methods, and demonstrate its enhanced performance.

Keywords: Echo-classification, Fisheries Acoustics, Plankton