Popular science summary of the PhD thesis

PhD student	Paco Rodriguez-Tress
Title of the PhD thesis	Optimizing important pelagic fish resources by using data from commercial vessels and acoustics
PhD school/Department	DTU-Aqua

Science summary

Small pelagic fish species are vital components of marine ecosystems, playing a crucial role in trophic dynamics while also supporting economically significant fisheries. However, their highly aggregative schooling behavior complicates the use of fisheries-dependent data in stock assessments, as it directly affects fishery catch rates. As a result, fisheries management primarily relies on fisheries-independent acoustic surveys, despite the wide availability of fisheries-dependent data. This PhD aimed to address two key objectives: (i) advancing the understanding of the schooling behavior of small pelagic fish across different spatial and temporal scales and (ii) re-evaluating the potential of fisheries-dependent data for stock assessment by incorporating alternative fishing effort metrics that account for fish aggregation patterns.

To investigate schooling dynamics, acoustic survey data were used to analyse small pelagic fish behavior in different ecosystems. The first study focused on diel schooling dynamics in Baltic sprat (*Sprattus sprattus*) and herring (*Clupea harengus*), quantifying temporal changes in school formation and structure. The second study examined capelin (*Mallotus villosus*) in East Greenland, exploring density-dependent effects on school structure. Results indicated that at higher population densities, both school size and number exhibited potential non-linear relationships with fish abundance.

The second objective of the research explored how fisheries-dependent data, including vessel monitoring system (VMS) and logbook data, could be leveraged for stock assessment. Using a decade of data from the North Sea sprat fishery, the study assessed the relationship between fishing effort metrics and stock biomass. While traditional catch-per-unit-effort (CPUE) approaches showed weak correlations with stock abundance, alternative fishing effort metrics based on vessel search behavior provided insights for potential applications for real-time stock monitoring.

Future work should focus on incorporating alternatives acoustic systems for more precise school size measurements and developing models that account for the spatial structuring of fish aggregations. Such advancements will enhance our understanding of small pelagic fish population dynamics and their broader ecological implications as well as contributing to improve stock assessments efforts.