Popular science summary of the PhD thesis

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Title of the PhD thesis	Integrating commercial fisheries and scientific survey data: Advances, new tools and applications to model the fish and fishery dynamics
PhD school/Department	DTU Aqua

Science summary

The ecosystem-based approach to fisheries management (EBFM) has been posing some new challenges for fisheries scientists and those engaged with their management, given its complex nature to safeguard the marine ecosystems while simultaneously attending the societal and human needs for food and economic benefits. In order to accomplish more solid conservation and management solutions, the EBFM requires the gathering and use of data sources at a very fine spatial and temporal resolution. Such a holistic approach also calls for the development of innovative and robust quantitative methods that can integrate and evaluate the different biological data sources that are used in the evaluation of fish stocks. Monitoring and assessing the status of fish stocks typically rely on two types of information: one type that is collected together with the commercial fisheries, also known as fishery-dependent data, and another type that is collected through scientific-based surveys, also known as fishery-independent data because they do not depend on the commercial fishing activities. Due to their different aims, the sampling design underlying the collection of each data type provides distinct levels of bias sources, and have been consequently hampering their joint coupling in a statistical modelling approach. Nevertheless, if such a model can account for these different bias sources adequately, it is expected that a more complete picture of the spatial and temporal abundance dynamics of the fish stocks can be achieved; hence, providing more reliable information in support of the management of fish and fisheries. The present thesis aims, thus, to support the EFBM with state-of-the-art statistical and bio-economic tools to model both fish and fishery dynamics, with insights provided from the Danish fisheries. The central pillar of the thesis was the development of a flexible spatio-temporal statistical model (LGNB) that integrates both fishery-dependent and independent data simultaneously, while accounting for their relative bias contributions in the abundance estimator of commercially exploited fish species. Seeded by the LGNB model, the thesis further derived three applications to evaluate aspects such as i) sampling optimization of fishery monitoring programs, ii) identification of essential fish habitats such as spawning and nursery grounds, and iii) effect of fishing closures on the fish and fishery dynamics.