Project brief

Thünen Institute of Sea Fisheries 2022/05a

ProByFish – Management of bycatch stocks in mixed fisheries

Alexander Kempf[1], Marc Taylor[1], Miriam Püts[1]

- **Strict implementation of the landing obligation helps to secure sustainable management of bycatch species.**
- **Reductions in fishing effort were necessary in all performed simulations to bring unintended bycatch to sustainable levels for as many of the examined species as possible.**
- **Alternate management measures – such as more selective nets or closures of fishing areas – sometimes resulted in less efficient fisheries and higher fishing effort in order to compensate, which reduced the positive effect on bycatch mitigation. Such downstream effects are often missed.**

Background and aims

The overall aim in the ProByFish project was to develop a modelling framework and decision-making tools for fisheries management of bycatch species. While fisheries management often focuses on target species (e.g. saithe, Norwegian lobster, plaice, sole), the impacts on bycatch species (e.g. turbot, lemon sole, sharks and rays, but also cod due to its poor stock status) are not always sufficiently considered. Within bycatch, a distinction must be made between preferred bycatch, for which the fisherman has quotas and the bycatch can be marketed, and unwanted bycatch (no quota and/or no marketing possible).

In ProByFish, targeted stocks that are already adequately protected through catch quotas for target stocks were distinguished from bycatch stocks that are not sufficiently protected by target stock catch limits. In the latter case, management measures were identified and tested to ensure a sustainable management for these species as well.

Approach

Using complex simulation models of mixed fisheries (where different species are caught together), it was evaluated in e.g., the North Sea case study whether the current fishing patterns and management of target species according to the maximum sustainable yield (MSY) concept was sufficient to ensure also sustainable levels of bycatch. If this was not the case, the spatial distribution of species and bycatch patterns were studied in more detail in order to propose more specific management measures (e.g. closed fishing areas, reduction of fishing effort in certain parts of the fleet, technical modifications to fishing gears).

Key findings

The simulations with mixed fisheries models indicate that the implementation level of the landing obligation has a large influence on results. Under the current low level of implementation, fisheries can continue to fish as they have done in the past, but several bycatch stocks – including, for example, cod or witch in the North Sea – were in this scenario not fished according to the maximum sustainable yield principle and/or show an excessive risk (>5%) of falling below critical biomass limits (Figure 1). In contrast, a strict implementation of the landing obligation led to most bycatch species being fished sustainably. However, choke effects occur more frequently under a strict implementation, as under the landing obligation fisheries have to stop fishing as soon as the first quota is exhausted, even though quotas for other species are still available. This leads to early closures in most demersal fisheries with socio-economic consequences.

In general, all tested scenarios required fishing effort reductions from current levels in order to achieve sustainable fishing levels under the MSY principle for all target and bycatch species. Analyses of alternative management measures to avoid bycatch (e.g., more selective gears, closed areas) showed that, in addition to bycatch mitigation, some fisheries became less efficient, as reflected by a decrease in catch per unit effort of target or preferred bycatch species. This was observed, for example, when larger mesh sizes were simulated to reduce catch of undersized fish in the German saithe and cod fisheries (see TR1 scenario in Figure 2). This inefficiency resulted in an increase in fishing effort (e.g., days at sea), which significantly reduced the positive effect on bycatch levels. In contrast, a positive example was the effect of using sorting grids to increase selectivity in the Nephrops fishery (see TR2 scenario in

Figure 2). Here, little difference in catch per unit effort was predicted, and at the same time, unintended bycatch of cod and whiting was reduced in the model. Closed areas also induced very different results for the different species depending on location and size. In addition, there were effects of effort shifts that resulted in increased fishing pressure outside of closed areas.

Further details can be found in the ProByFish Final Report (2021).

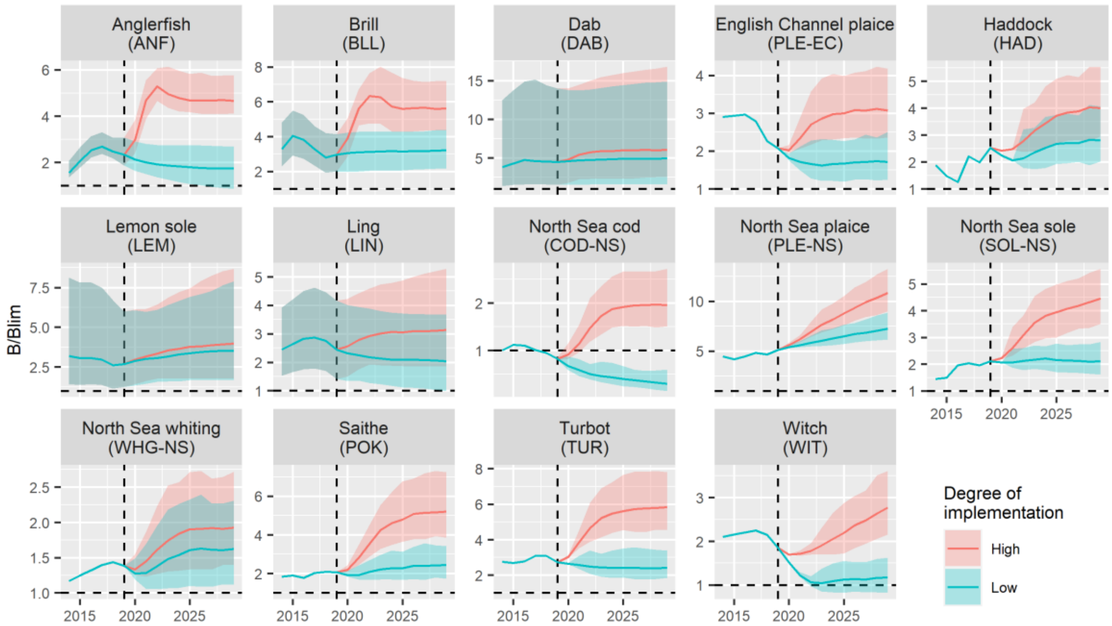

Figure 1: Spawning stock biomass (B) relative to limit biomass (Blim) per stock and scenario. Median values (colored lines) and uncertainty ranges (shaded areas; 5% and 95% percentiles) from 100 model runs are shown. The start of the simulations (2019) and the reference line B/Blim = 1.0 are shown as dashed lines. Scenarios differ in the degree of implementation of the landing obligation ("High" – strict implementation: fleets stop fishing once the first quota is exploited; "Low" – low degree of implementation: fishing does not stop when the first quota is exploited, but continues until the fishing effort from the previous year is reached). Source: adapted from ProByFish Final Report (2021).

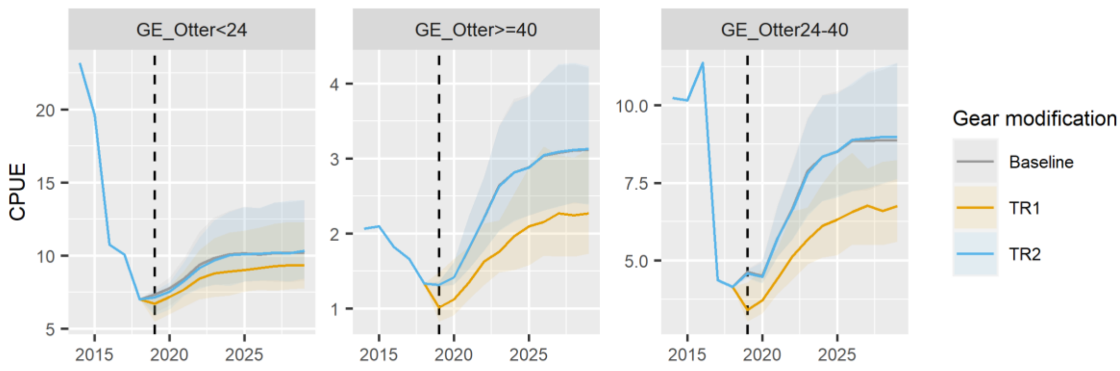

Figure 2: Catch per unit effort (CPUE) for selected German fleet segments and gear modifications. Median (colored lines) and uncertainty ranges (shaded areas; 5% and 95% percentiles) from 100 model runs are shown. The initial year of the simulations (2019) is indicated by the dashed line. The Baseline runs, without further modifications, is mostly hidden by the blue line. In the TR1 Scenario, larger mesh sizes of 140 mm are tested for otter trawls compared to mesh sizes of 100 mm to 120 mm in the Baseline Scenario. In the TR2 scenario, separation of the catch with sorting grids is simulated for otter trawls with mesh sizes between 70 mm and 99 mm. Source: Adapted from ProByFish Final Report (2021).

Further Information

Contact

[1] Thünen Institute of Sea Fisheries
alexander.kempf@thuenen.de
www.thuenen.de/en/sf

Support

Funded by the European Union

Duration

5.2018-5.2021

Project-ID

2025

Publication

Probyfish Final Report (2021)
The identification of measures to protect by-catch species in mixed-fisheries management plans (ProByFish). doi: 10.2826/20529.

Partner

Danish Technical University (Denmark)

Institut français de recherche pour l'exploitation de la mer (France)

Institute for Agricultural and Fisheries Research (Belgium)

Marine Institute (Ireland)

Wageningen University & Research (Netherlands)

DOI:10.3220/PB1644241551000