

Survey-based stock assessments

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Introduction – stock assessments

Assessments of exploited fish stocks combine biological and fisheries information to gain understanding of the population dynamics of these stocks in response to fishing pressure, and provide policy makers with quantitative sustainable catch options for the following year(s). The traditional analytical assessment models are very data hungry, and rely on time-series of both fishery-dependent (collected in active fisheries, Fig. 1) and fishery-independent data (collected on scientific surveys, Fig. 2), often including details on the length and age structures of the stock, maturity ogives, natural and fishery-induced mortality rates, recruitment figures, and estimates of the total and spawning biomasses of the stock.



Fig. 1. Data collection on commercial vessels: restrictions in space (1-2 persons) and time (samples have to be processed before the next catch arrives on deck) often lead to selective sampling of certain species and/or parameters.

Growing demand for catch advice

Over the years, the number of fish stocks for which managers (European Commission) request catch advice from ICES (International Council for the Exploration of the Sea) has increased dramatically. However, many of these “new” fish stocks do not have population estimates from which catch options can be derived using the existing advisory frame-works, as no funds have been made available to collect the required data. These cases are labelled

“data-limited” stocks



Fig. 2. Data collection on research vessels: more scientists can embark, they can work in dedicated labs, and have full control of fishing operations and sample processing -> all species and more parameters can be documented.

Many of these stocks will remain in this category for years to come as 1) the current economic climate makes it unlikely that the funds needed for data collection will become available in the short term, and 2) the construction of the fishery-dependent time-series that serve as input for the analytical models has just started. Meantime, scientific catch advice for the data-limited index stocks is still expected ...

Development of survey-based stock assessments



Survey-based stock assessments only rely on survey indices (or other reliable indicators of stock size, see Example 2) that provide trends in stock metrics such as total mortality, recruitment and abundance and/or biomass. The general concept of survey-based catch advice is based on Russell's (1931) non-equilibrium definition of overfishing: when catch exceeds biological production and causes a reduction in the stock that is picked up by a survey, the catch should be incrementally decreased and vice versa. To counter for the uncertainty that may exist in survey index values due to variation in external circumstances between years (e.g. weather, loss of survey stations due to presence of other activities, ...), the advice is based on a comparison of the 2 (or 3) most recent index values with the 3 (or 5) preceding values, combined with recent catch or landings data.

Example 1: Lesser spotted dogfish (*Scyliorhinus canicula*) in the Greater North Sea – SURVEY INDEX

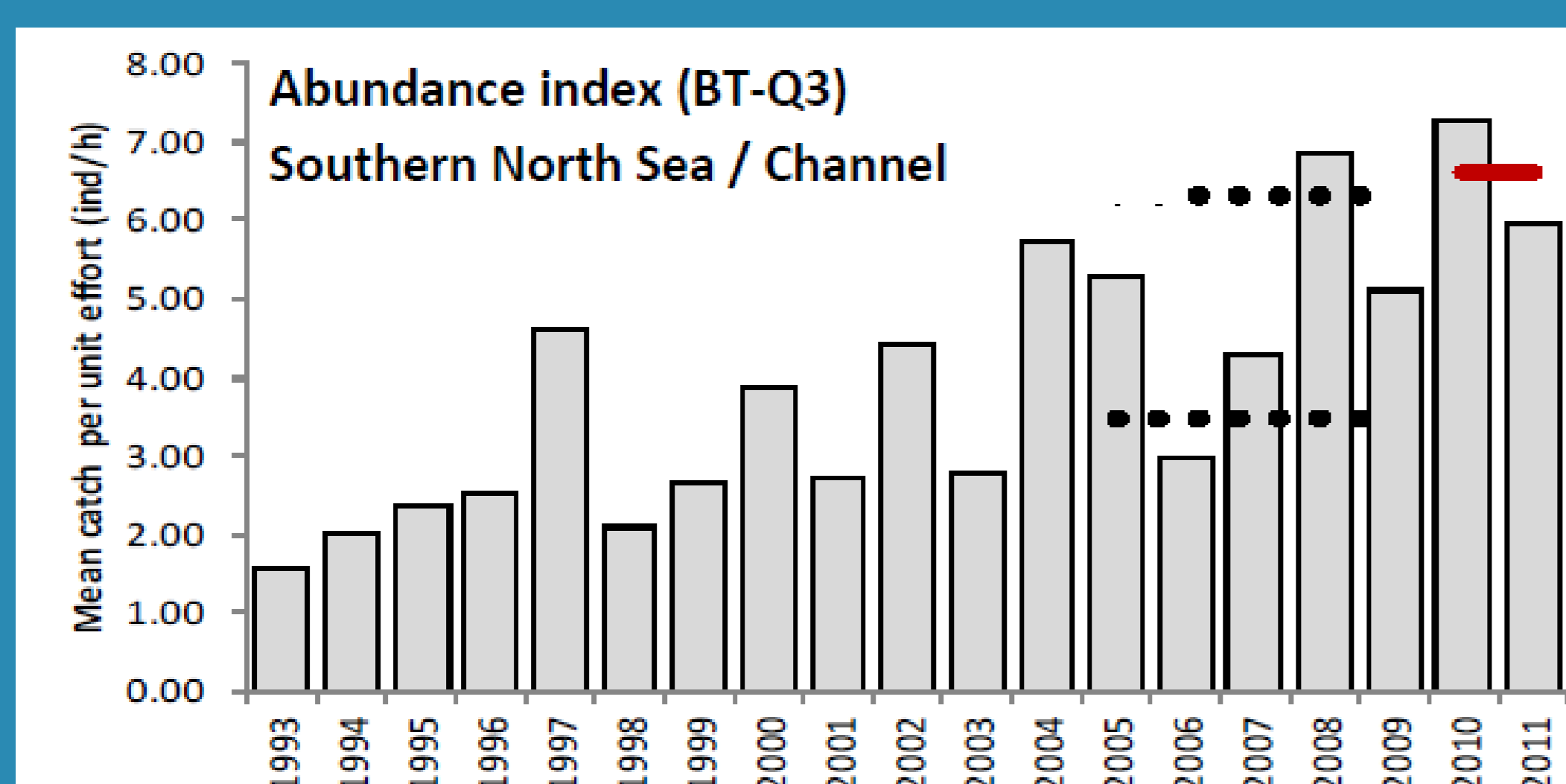


Fig. 3. Abundance trend of lesser spotted dogfish in the quarter 3 North Sea Beam Trawl Survey.



- 35% increase in abundance
- catches stable/increasing

Catch advice ↗

Example 2: Brill (*Scophthalmus rhombus*) in the Greater North Sea – COMMERCIAL INDEX

Relatively few brill are caught in trawl surveys, due to its territorial life style. Also the survey protocols are not well suited for catching brill in a quantitative way. Therefore, a commercial index is calculated and evaluated.

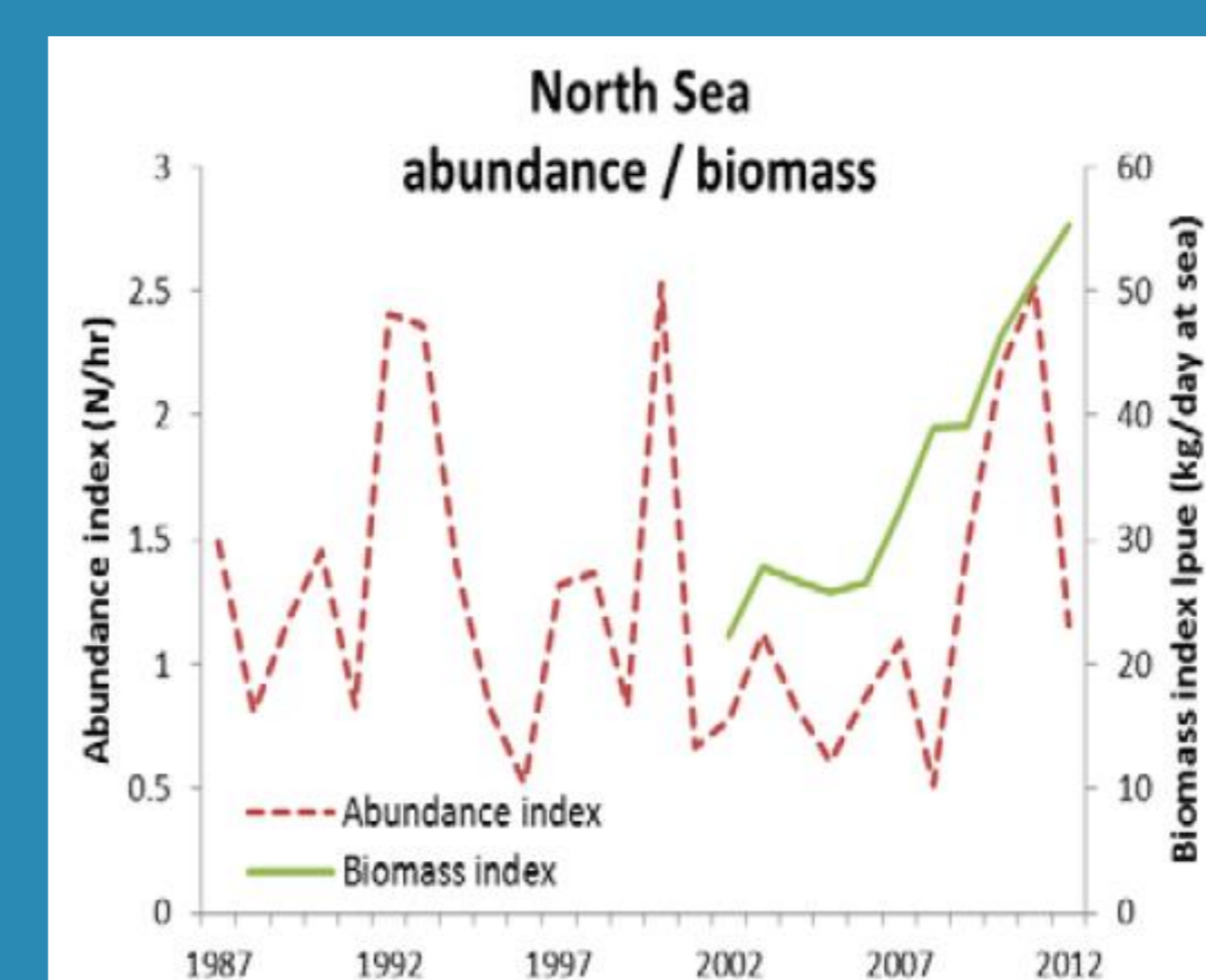


Fig. 4. Abundance and biomass trends of brill in the Dutch commercial fleet.



- 56% increase in abundance
- catches stable/above average

Catch advice ↗

Further margins of precaution

Inclusion of length information: a trend in the numbers of fish and/or biomass in a stock doesn't tell you the complete story. Looking at the abundance of different size categories in a survey can often be of help when evaluating the stock's biological health. Increase in the amount of large fish (above minimum landing size, and preferably for many years) indicates decrease in fishing mortality, and increase of small fish can indicate increased recruitment. For many stocks useful recruitment signals are difficult to get and what information can be obtained by looking at different size categories varies from one stock to another.

Uncertainty cap: A change limit of $\pm 20\%$ is applied in the advice, also when the comparison of index values indicates stronger changes.

Precautionary buffer: A precautionary margin of $- 20\%$ is applied in the advice, when the stock status is unknown in relation to candidate reference points for stock size or exploitation.