Proportion of Large Fish (Large Fish Index)

MSFD Descriptor 4 - Marine food web
MSFD Criterion: 1.7 - Ecosystem structure

OSPAR COMMISSION

Key Message Recovery in the proportion of large fish in the demersal fish community is evident in the Greater North Sea. Assessment values indicating recovery are only met in the northern part of the Celtic Seas. In many individual survey-based assessments where assessment values are not currently met, recent recovery trends suggest they could be achieved by 2022, if current pressure levels are not increased

Background

Fishing mortality constrains the age structure of fish communities, reducing the proportion of larger / older individuals. Fishing is also size-selective, preferentially removing larger / older fish, and therefore affects fish community size composition. So far, three indicators relating to fish size have been developed to assess impacts of fishing on fish communities and the food web, considering parameters showing different responses in the ecosystem.

The Large Fish Index (LFI) has been developed to respond to fishing pressure on the proportion of large fish in demersal fish communities (species living on or near the seafloor). It was developed to support the Ecological Quality Objective for the North Sea demersal fish community. The North Sea LFI methodology has subsequently been adapted to derive LFIs for the Celtic Sea and Northern Iberian Shelf Sea.

The LFI uses estimates of fish abundance-at-length provided by international bottom trawl surveys. These are standardised monitoring programmes that occur each year in the same period taking representative samples according to specific guidelines. The assessment of each survey involves determining the suite of species constituting the demersal fish community and the length criteria defining large fish. The proportion of the demersal fish biomass that has a length exceeding the length criteria can then be calculated.

Specific assessment values are derived from the time series used for each regional assessment. The longest survey time series analysed started in 1983.

Results

Trends in the Large Fish Index (LFI) in each of the 13 groundfish surveys assessed are shown in **Figure 1**.

The assessment in the Greater North Sea relied primarily on two surveys (**Figure 1** - plots j and k), conducted at different times of the year, which both covered the greater part of the Region. Both surveys suggest that the proportion of large fish does not currently meet assessment values (**Figure 2** and **Figure 3**). However, both surveys show recovery and that size composition has recovered strongly from its most disturbed condition at the turn of the century. Extrapolation of current recovery trends in these two surveys suggests that LFI assessment values should be met before the next European Union (EU) Marine Strategy Framework Directive (MSFD) assessment in 2024. These results are generally supported by the other surveys.

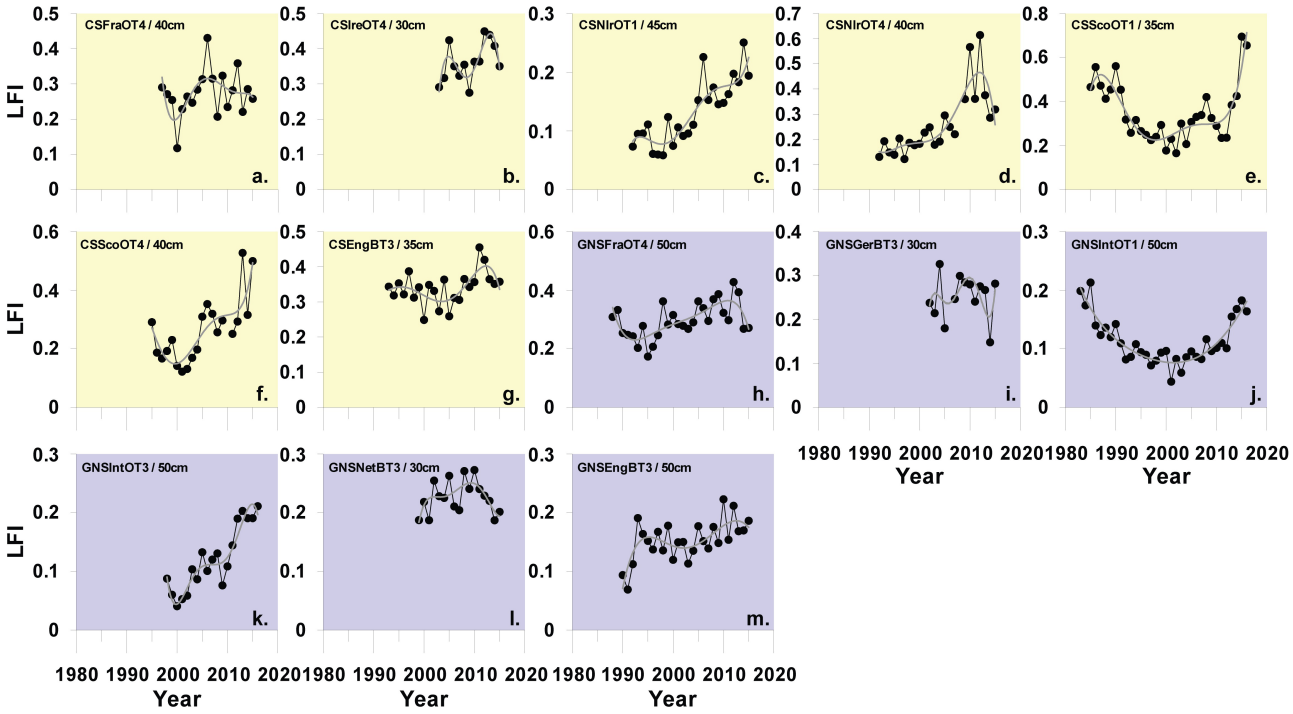

Figure 1: Trends in the large fish index (LFI) in 13 groundfish surveys in the Greater North Sea and Celtic Seas using the optimal length value (L_{LF}) determined to define 'large fish' for each survey

Plots are colour coded to reflect region (yellow: Celtic Seas; purple: Greater North Sea)

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Results cont...

Surveys in the Celtic Seas only covered relatively small parts of that region. The assessment therefore relied on the compilation of individual survey-based assessment outcomes. The proportion of large demersal fish meets the assessment value in the northern half of the region (**Figure 1** - plots e and f). The LFI In other parts of the Celtic Seas region does not meet the assessment value. Recovery is evident in the Irish Sea and LFI assessment values could be achieved there by 2020 (**Figure 1** - plots c and d). In the south and west of this region, evidence of a recovery in LFI values is unclear (**Figure 1** - plots a, b and f), and at best suggests that it could take a decade or more before the assessment value is reached, unless current levels of pressure are reduced.

There is medium / high confidence in the assessment methodology and high confidence in the data availability.

Conclusion

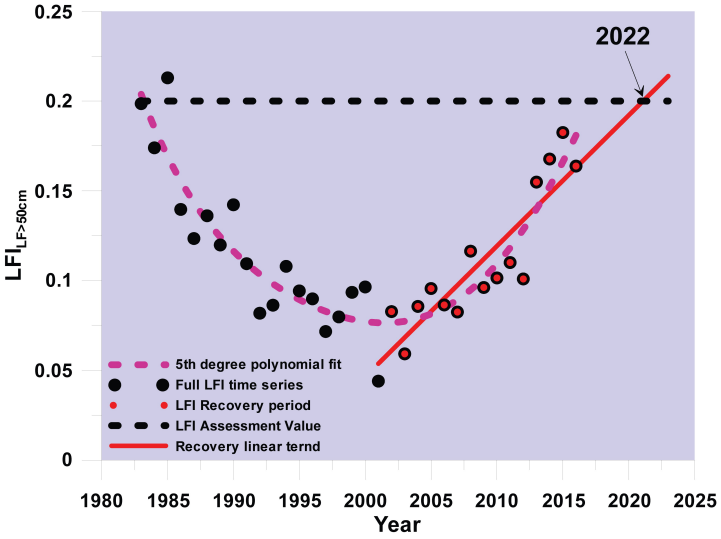
The recovery in the proportion of large fish in the demersal fish community reported in the Greater North Sea in Quality Status Report (QSR) 2010 has continued in the period to 2015. Recovery is also evident in a large part of the Celtic Seas region.

Assessment values are met only in the northern part of the Celtic Seas. Elsewhere assessment values could be achieved by 2022 if the current pressures levels are not increased. Exceptions were observed, notably in the south and west of the Celtic Seas region, where evidence of recovery is lacking, or the recovery rate was so low that it could take more than a decade before demersal fish size composition achieves the assessment value, unless current levels of pressure are reduced.

The time-lagged response of the Large Fish Index (LFI) to variation in fishing pressure means that where assessment values are met, or where they are not met but recovery is underway, measures necessary to restore demersal fish size composition are probably already in place. Additional measures may be required where assessment values are not met and evidence of recovery trends is either absent or weak. However, since LFI assessment values have generally yet to be achieved over most of the area assessed, any relaxation of management would be premature.

Knowledge Gaps

Knowledge gaps focus on: the lack of empirical data (including historical data) or appropriate models to inform Large Fish Index (LFI) assessment value setting; the lack of a single universal protocol to determine the optimal length value defining 'large fish' for all surveys; the effects of warming sea temperature on LFI assessment values and on demersal fish size composition recovery rates; and, a full understanding of relationships between all human pressures and their impact on the full demersal fish community, not just the commercial stocks. Future development of the indicator should explore the potential of spatial sub-divisional assessments..



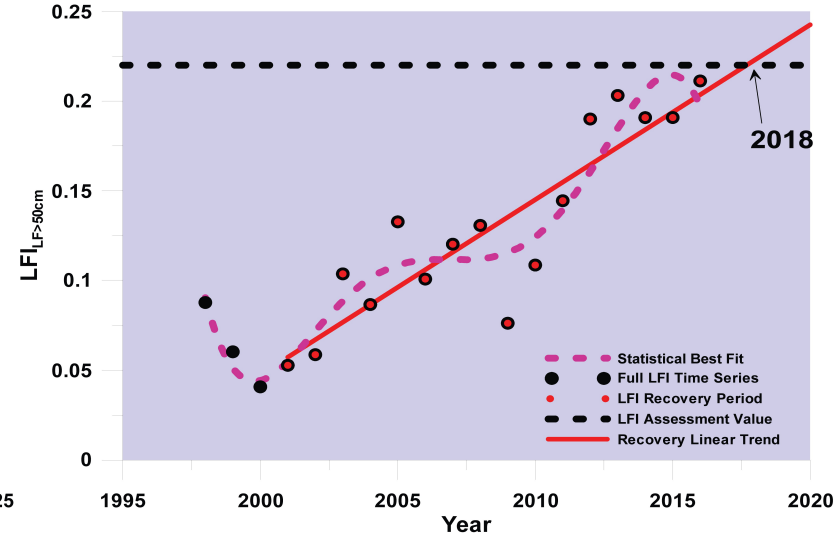


Figure 2 (far left): Large Fish Index (LFI) time series derived from the first quarter (January to March) international otter trawl survey in the Greater North Sea (Figure 1, plot j) showing annual data, data used to determine the recovery trend, linear trend fitted to the recovery period data, and the LFI assessment value

Figure 3 (left): Large Fish Index (LFI) time series derived from the third quarter (July to September) international otter trawl survey in the Greater North Sea (Figure 1, Plot k) showing annual data used to determine the recovery trend, linear trend fitted to the recovery period data, and the LFI assessment value