

# HEALTHY AND BIOLOGICALLY DIVERSE : SPECIES

## Wider fish community

### Key message

Indicators reflecting species richness and species diversity across the wider fish community varied spatially, however, offshore areas showed a consistent decrease in status. An indicator relating to fish size showed an increase over the assessed area (less than 200 m water depth) that was most pronounced in offshore waters west of Scotland and north of Shetland.

### Background

The assessment of the wider fish community is based on data relating to 167 species collected by the International Bottom Trawl Survey (IBTS) undertaken by Marine Scotland Science and other nations during the first and third quarters of each year. These scientific trawl surveys are used to assess changes in the status of bottom dwelling (demersal) fish communities and to inform fisheries management.

The assessment includes commercial species such as whiting (*Merlangius merlangus*, Figure 1) and haddock (*Melanogrammus aeglefinus*), but also includes many species that are not the target of large commercial fisheries, such as the Norway pout (*Trisopterus esmarkii*), Atlantic horse mackerel (*Trachurus trachurus*) and Argentines (*Argentina*

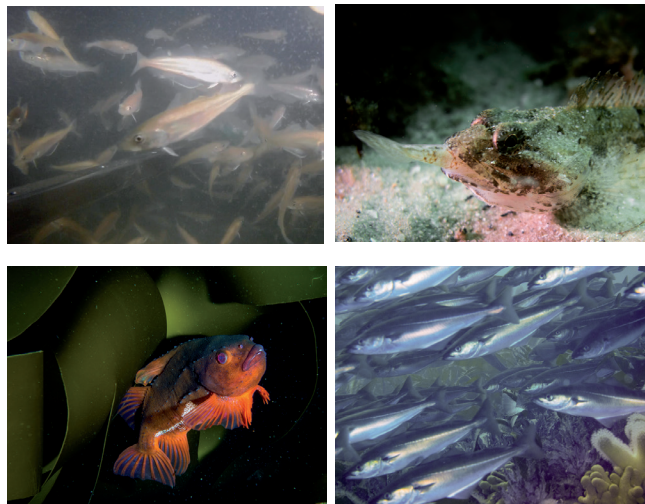


Figure 1: (top, left) whiting © Crown; (top, right) short spined sea scorpion eating fish, (bottom, left) male lump sucker, (bottom, right) saithe. © Lisa Kamphausen, NatureScot.



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Haddock (*Melanogrammus aeglefinus*).

*sphyraena*). Elasmobranchs, such as the flapper skate (*Dipturus intermedius*), are also recorded in the survey.

The IBTS dataset is ideal for generating quantitative measures of particular characteristics of the fish community, called community indicators, and these can be used to monitor changes in those characteristics over time and over different regions.

Three community indicators are used in the assessment of the wider fish community. **Species Richness** counts the number of demersal fish species recorded in any survey sample. The **Shannon Diversity Index** is a measure of the relative abundance of each species in the sample. Together they provide an indication of biological

For further information on this topic go to: <https://marine.gov.scot/sma/assessment/wider-fish-community>

diversity across the fish community. A size indicator, the **Large Fish Indicator** (LFI), gives an indication of the proportion of large fish in the community that contribute to a balanced ecosystem.

## Results

All three community indicators show some change between the 2009 - 2017 and the 1999 - 2008 assessment periods.

Changes in species richness (Figure 2) and species diversity (Figure 3) are evident across these time periods, but magnitude and direction of this change differs spatially, with offshore areas showing decreases in both cases.

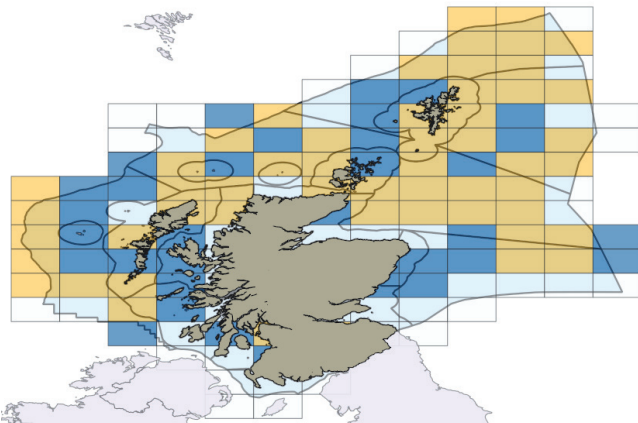


Figure 2:  
The difference in the Species Richness indicator between the 1999 - 2008 assessment period and the 2009 - 2017 assessment period.  
Blue indicates an increase in the index (greater Species Richness), yellow a decrease (reduced Species Richness), and no colour reflects zero change. All maps show Scottish Marine Regions and Offshore Marine Regions, overlying ICES statistical rectangles.

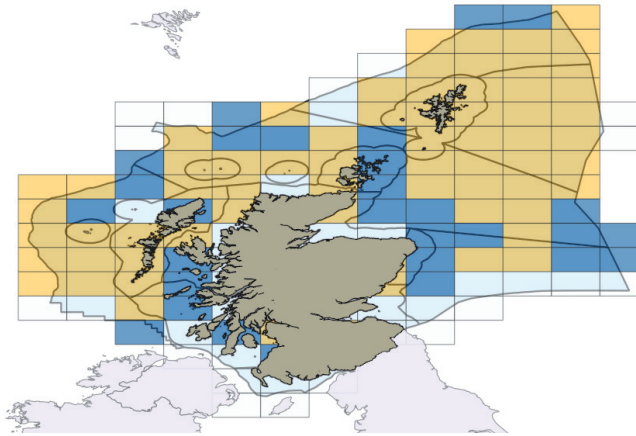


Figure 3:  
The difference in the Shannon Diversity Index indicator between the 1999 - 2008 assessment period and the 2009 - 2017 assessment period.  
Blue indicates an increase in the index (more diversity), yellow a decrease (less diversity), and no colour reflects zero change.

The Species Richness indicator has decreased in many offshore waters, but some increases are seen in some coastal waters between the West Highlands and the Outer Hebrides, north of the Orkney Islands and in coastal waters of North East Scotland.

Species diversity for 2009 - 2017, as indicated by the Shannon Diversity Index, has also increased in coastal waters, particularly around the West Highlands and Argyll, as well as waters around Orkney and the North East region. However, it decreased around Shetland and in many offshore waters.

In contrast to the two indicators relating to species composition, the Large Fish Indicator showed a widespread increase in value across assessed waters between the 1999-2008 and the 2009 -

2017 assessment periods (Figure 4). However, despite these increases, the LFI remains below the GES target of 0.3 (Figure 5) in the majority of cells assessed in 2009 - 2017.

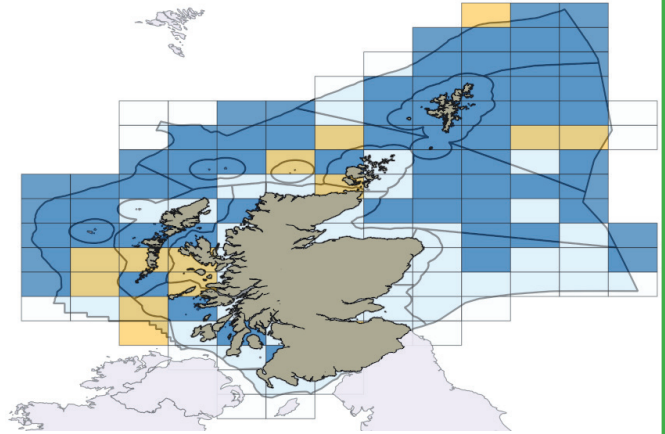


Figure 4:  
The difference in the Large Fish Indicator between the 1999 - 2008 assessment period and the 2009 - 2017 assessment period.  
Blue indicates an increase in the index (more larger fish), yellow a decrease (less larger fish), and no colour reflects zero change.

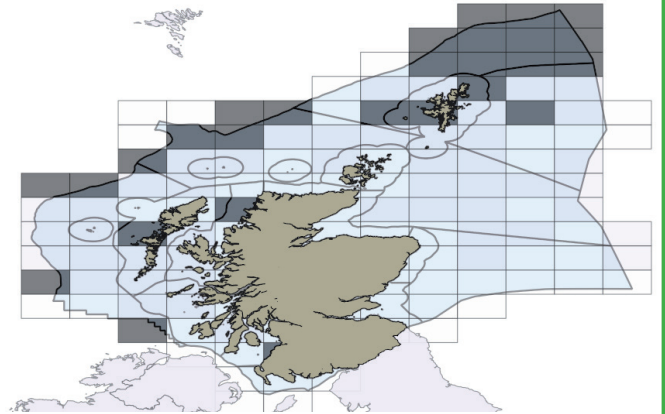


Figure 5:  
The Large Fish Indicator in the 2009 - 2017 assessment period with values above the GES criteria 0.3 in grey shading.

## Conclusion



The state of Scotland's demersal fish community is partly influenced by human activities, such as commercial fishing, as well as factors such as climate change. Recent measures to reduce fishing mortality in Scottish waters have benefitted the demersal fish community (Engelhard *et al.*, 2015). This may be reflected in the increased values for the Large Fish Indicator across assessed waters between the 1999 - 2008 and the 2009 - 2017 assessment periods. Whilst the exact nature of causality may be unclear, the LFI has been shown to be susceptible to changes in a small suite of species (Speirs *et al.*, 2016) being driven by a handful of species rather than the full suite being assessed. It is also likely influenced by climate change (Queiros *et al.*, 2018). Nevertheless, there remains a need for continued monitoring of demersal fish in Scottish waters.

## Knowledge gaps



















Rarest and perhaps most at risk species are not sampled sufficiently well to permit adequate assessment. Current levels of survey effort limit the applicability of analyses to those species that are adequately sampled at these levels of effort.

## Status and trend assessment

A regional traffic light assessment would not be appropriate for the wider fish community given the large scale movement of many species and the conflicting patterns revealed by the indicators in this assessment. As such, only a Scotland wide status is presented.

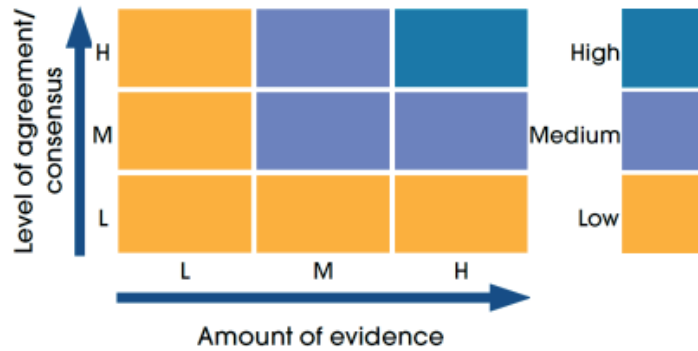
Region assessed	Status with confidence	Trend with confidence
All Scotland	 ☆	 ☆

## Status and trend assessment legend

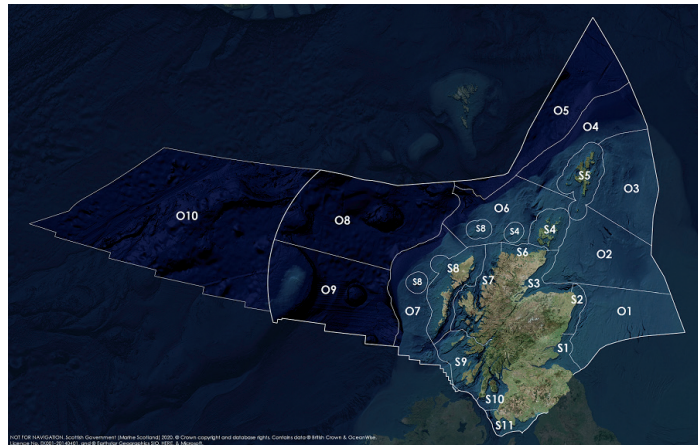
Status assessment (for Clean and safe, Healthy and biologically diverse assessments)		Trend assessment (for Clean and safe, Healthy and biologically diverse and Productive assessments)	
	Many concerns		No / little change
	Some concerns		Increasing
	Few or no concerns		Decreasing
	Few or no concerns, but some local concerns		No trend discernible
	Few or no concerns, but many local concerns		All trends
	Some concerns, but many local concerns	<b>Confidence assessment</b>	
	Lack of evidence / robust assessment criteria		
	Lack of regional evidence / robust assessment criteria, but no or few concerns for some local areas		Low
	Lack of regional evidence / robust assessment criteria, but some concerns for some local areas		Medium
	Lack of regional evidence / robust assessment criteria, but many concerns for some local areas		High



## Overall confidence

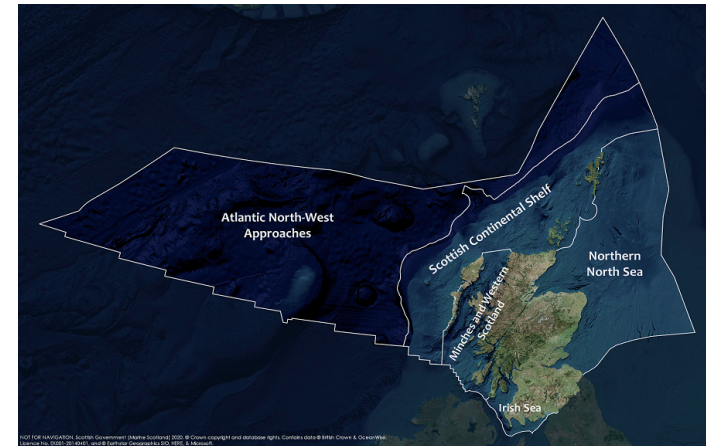


## Assessment regions

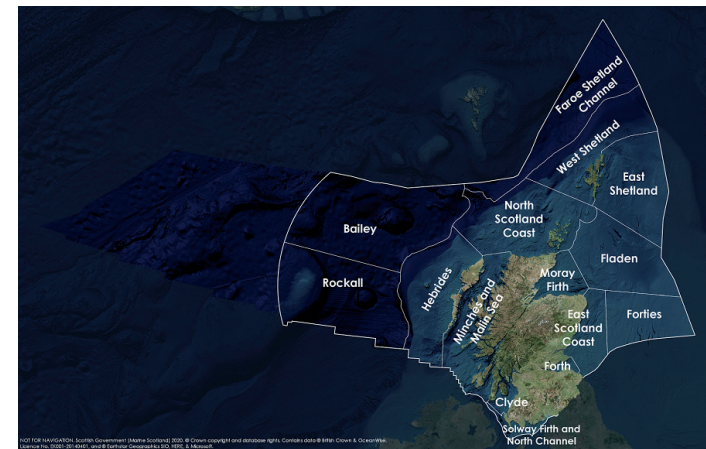


The Scottish Marine Regions (SMRs; S1 - S11) and the Scottish Offshore Marine Regions (OMRs, O1 - O10)

Key: S1, Forth and Tay; S2, North East; S3, Moray Firth; S4 Orkney Islands; S5, Shetland Isles; S6, North Coast; S7, West Highlands; S8, Outer Hebrides; S9, Argyll; S10, Clyde; S11, Solway; O1, Long Forties; O2, Fladen and Moray Firth Offshore; O3, East Shetland Shelf; O4, North and West Shetland Shelf; O5, Faroe-Shetland Channel; O6, North Scotland Shelf; O7, Hebrides Shelf; O8, Bailey; O9, Rockall; O10, Hatton.



Biogeographic, Charting Progress 2 (CP2) Regions. These have been used as the assessment areas for hazardous substances.



Scottish Sea Areas as used in Scotland's Marine Atlas 2011. These are sub divisions of the biogeographic, or Charting Progress 2 (CP2), Regions.