



Melanogrammus aeglefinus

The world catch of haddock in 2011 was 429,599 tonnes (t) (1). Haddock is the most important finfish species for Scottish fishermen and the second most important whitefish species in the UK after cod, with approximately 29,000 t landed in the UK in 2011, with a first sale value of £35.4 million (2). UK consumption in 2011 was 25,322 t product weight (3) or around 84,000 t whole weight, which means that the UK consumes around 19% of the world catch. The only species which can be described as haddock in UK markets is *Melanogrammus aeglefinus* (4). There is no commercial farming of haddock.

Haddock is distributed on both sides of the North Atlantic (see Fig. 6 on page 8). They can reach 100cm in length and live for up to 20 years. They are found most commonly at 80-200m depth, over rock, sand, gravel or shells, usually at temperatures between 4° and 10°C.

Haddock populations are characterised by large variations in stock size caused by very large fluctuations in the number of young fish entering the population. As a consequence, haddock populations may be composed of a relatively small range of year classes.

The general status of the main haddock stocks in the North East Atlantic is good, and the Northeast Arctic and North Sea stocks are inside safe biological limits. However, recent poor recruitment has meant that stocks around Iceland and at Rockall are now at risk of being outside

safe biological limits, whilst the Faroe and west of Scotland stocks are outside safe limits. ICES has recommended measures for stock recovery.

The Northwest Atlantic Fisheries Organisation (NAFO) manages fisheries in international waters of the Northwest Atlantic, where there is no directed fishery for haddock. USA (Gulf of Maine and Georges Bank) and Canadian coastal waters haddock stocks are considered healthy (5).

Nine fisheries landing haddock, five from the Northeast Arctic, two from Iceland and one each from North Sea and Canadian stocks are currently MSC certified (6).

The purpose of this guide is to outline the status of haddock stocks and describe some of the measures being taken to protect them.

BUYERS' TOP TIPS

Know your source of supply and stock status

Biological stocks are distinct populations which inhabit particular geographical areas; each one has a different spawning area but there may be some mixing between them. Haddock is divided into 'management stocks' which mostly coincide with biological stocks. These areas contain the main fisheries. Find out the management stock from which the fish has been caught.

Ensure your supplies are from legal fisheries

In recent years there have been serious problems with illegal fishing of some haddock stocks. Whilst the situation has improved, it is important to avoid illegally landed fish

An informed buying policy

Most of the important haddock stocks are within safe biological limits, and fisheries managers have instituted measures to increase the probability that they keep inside these limits. The important issues are avoiding the bycatch of fish such as cod when targeting haddock, and the use of measures to protect small haddock.

Seafish Responsible Sourcing Service

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Maximum Sustainable Yield (MSY) and the Precautionary Approach (PA)

Current ICES advice on cod stocks is given on the basis of MSY and the precautionary approach (7). MSY means fishing at a level that takes the maximum catch (yield) that can safely be removed from a fish stock, on a continuous basis, whilst maintaining its long-term productive capacity, and is achieved by keeping the Spawning Stock Biomass (SSB) above the biomass action point $MSY_{Btrigger}$. The precautionary approach aims to limit fishing mortality (F) and catches to levels that avoid depleting the stock’s reproductive capacity, keeping its SSB above its biomass reference level (defined as B_{pa} ; see Fig. 3).

These concepts are illustrated in the schematic (Fig. 1). This shows how catches from an unfished stock would increase in line with exploitation (or fishing mortality, F), up to a point where the total mortality on the stock causes so many fish to be caught at a relatively small size (and discarded or landed) that the potential production of the stock, based on growth of individual fish, is not realised (‘growth overfishing’). The peak of this curve represents MSY and indicates where F_{MSY} lies.

However, providing sufficient fish survive to become adults and spawn, they may still have the reproductive capacity to replace themselves. Stock collapse can occur when fishing mortality reaches a level (F_{lim}) where removals from a stock are so high, and its spawning capacity is so diminished, that fewer and fewer juveniles are produced. So, not only is the size of the stock being reduced by too high a level of exploitation, but there are fewer juvenile fish to replace those that are caught, and stock levels are likely to fall even lower (‘recruit overfishing’). The yellow area between the green (inside safe limits) and red (outside safe limits) zones in the schematic and stock trajectories (North Sea example at Fig 2 & 3) represents levels of F or SSB that management should seek to avoid to ensure that the stock has a high probability of remaining sustainable.

Scientific advice given under the twin MSY/precautionary approach strategy will aim to either achieve catches consistent with fishing levels that would result in F_{MSY} , or reduce fishing mortality to return the stock to within safe biological limits ($>B_{pa}$). For many fish stocks, including haddock fisheries in the Barents Sea, North Sea and in the Northwest Atlantic, parties exploiting the stock have management plans, and ICES also provides advice on catches compatible with such plans. Where there is insufficient information to evaluate the status of the stock, ICES advice is given on its approach for data-limited stocks. Where there is insufficient information to evaluate the status of the stock, ICES advice is given on its approach for data-limited stocks. This uses abundance indices from research surveys and catches to set a TAC based on trends. Included in the method are precautionary measures where there is uncertainty.

Figure 1: Schematic of ICES’ MSY and PA reference points in relation to fishing mortality and Yield

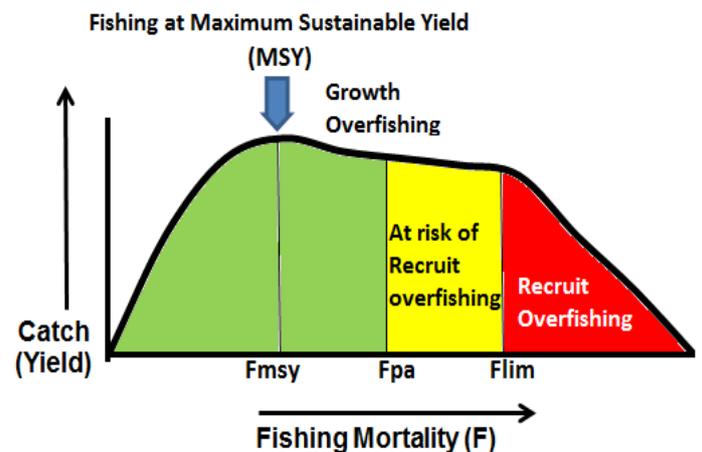


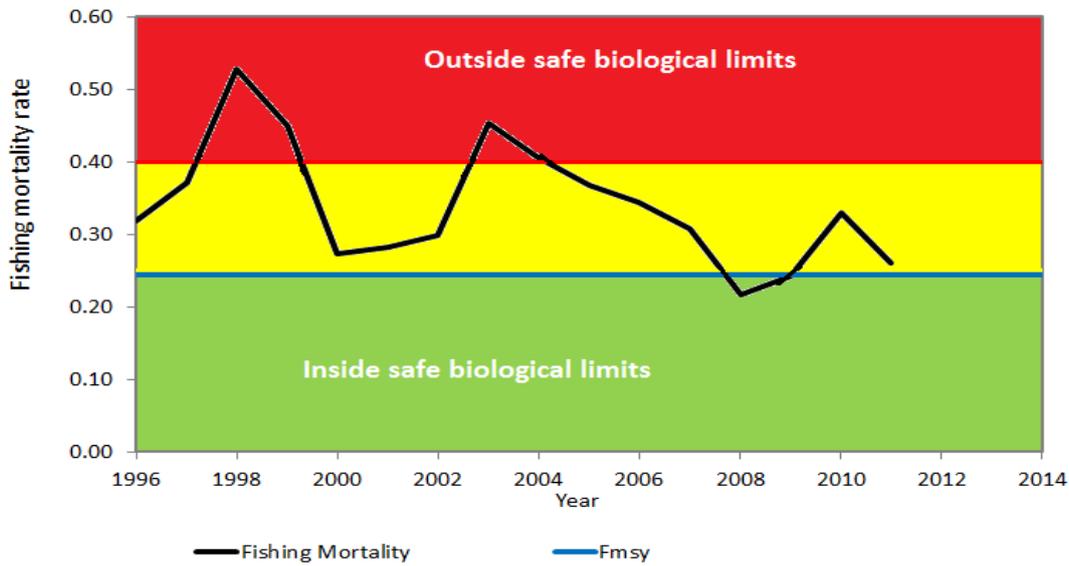
Table 1: Management Stock (colour keyed to Figure 1 and map in Figure 6)	Agreed TAC 2013 (t) (9)	Advisory TAC 2013 (t)	Scientific advice and management (June 2012 ICES advice) (8)
NORTH EAST ATLANTIC HADDOCK STOCK www.ices.dk/advice/icesadvice.asp			
Inside safe biological limits			
Northeast Arctic (Barents Sea) Areas I and II	200,000	238,000 (JRNC management plan)	The SSB has been above $MSY_{Btrigger}$ since 1990 and has been increasing in recent years, and is currently close to its highest historic level. It has benefited from very strong year classes recruiting at age 3 in 2007-9. More recent year classes are estimated to be around average with the result that the catches are likely to reduce over the coming years. Fishing mortality has been around F_{MSY} since the mid-1990s. The JRNC agreed a management plan for both cod and haddock in this area (13), which ICES found to be in accordance with the precautionary approach and the MSY framework, and provides advice accordingly. There are five MSC certified fisheries (6).
North Sea and Skagerrak IV, IIIa	46,675	47,811 (EU-Norway management plan)	Since the strong 1999 year class, only the 2005 and 2009 year class are estimated to be above average and recent recruitment has been poor. Nevertheless, fishing mortality has been below F_{pa} and around F_{MSY} since 2001, and the SSB has remained above $MSY_{Btrigger}$. The EU and Norway agreed a management plan in 2008 (9), which ICES accepts as precautionary and advises accordingly. One MSC certified fishery (6). See Page 9 for multi-species perspective.
Eastern Channel, Celtic Sea and west of Ireland ICES VIIb-k (TAC includes EU waters of VIII, IX and X)	14,148	9,500	The abundance of haddock has increased recently due to recruitment of the large 2009 year class and is well above $MSY_{Btrigger}$. Fishing mortality shows a declining trend over the time-series and remains above F_{MSY} (Fig. 5). ICES' advice is based on the transition to MSY. Discarding is a serious problem in this mixed fishery, and reducing the TAC to 9,500 t would increase discarding. However, the stock is predicted to remain above $MSY_{Btrigger}$ at this catch in 2013 (Fig. 5). There is an agreement to continue to find ways to improve selectivity in these fisheries.
Stocks at risk of being outside safe biological limits and below biomass action point $MSY_{Btrigger}$			
Rockall VIb	Not agreed	No directed fisheries and minimal bycatch and discards	The SSB increased up to 2008 as a result of the strong 2001 and 2005 year classes, but has decreased since then due to weak recruitment. Though the stock has been inside safe biological limits since 2003, it is probable that SSB will decrease to below $MSY_{Btrigger}$ in 2013. Fishing mortality has declined over time and is now below F_{MSY} . ICES advice is given on the basis of the MSY approach. The proposed Harvest Control Rules under the new EU-Russia management plan are considered by ICES to be in accordance with the precautionary approach unless the poor recruitment observed recently persists in the long term, when the stock is likely to fall below B_{lim} and lower F values than those currently in the HCRs would be required. There is a conservation area around Rockall intended to protect juveniles (Fig. 8)

Table 1: Management Stock (colour keyed to Figure 1 and map in Figure 6)	Agreed TAC 2013 (t) (9)	Advisory TAC 2013 (t)	Scientific advice and management (June 2012 ICES advice) (8)
Iceland ICES Va	36,000 (Sept 2012- Aug 2013)	<32,000	The SSB has decreased rapidly since peaking in 2004-8 as several strong year classes (1998-2003) dissipated, to be followed by below-average recruitment. Fishing mortality has been mainly above precautionary levels since 2001, though F_{MSY} is undefined. ICES' advice for 2013 is based on the precautionary approach. A management plan in accordance with the MSY approach is under development and is likely to be put into force this year. There are two MSC certified fisheries (6).
Stocks outside safe biological limits.			
Faroe Plateau ICES Vb	Effort limitation (catch in 2011 = 3,500 t)	No directed fishery and minimal bycatch and discards	Year classes from 2003 onwards have all been well below the long-term average and SSB has decreased since 2003 to below B_{lim} in 2012 (Fig. 3). Fishing mortality has fluctuated from above F_{lim} in 1998 and 2003 to just above F_{MSY} (Fig. 2) for the last 3 years. Previous management of this fishery (days-at-sea) translated into an average fishing mortality above precautionary levels, which ICES considers to be inconsistent with both the PA and the MSY approaches. Work is on-going in the Faroes to move to a system based on MSY principles developed by ICES.
West of Scotland ICES VIa	4,211 (TAC includes EC waters of Vb)	9,300	Though fishing mortality has declined rapidly since 2005, to around F_{MSY} since 2008, a succession of weak recruitments since the strong 1999 year class has caused SSB to decline since 2002 and fluctuate around B_{lim} since 2007. A proposed EU management plan is considered by ICES to be precautionary. ICES' advice is given on the basis of the MSY framework, and includes implementation of technical measures to reduced high discard rates.
Reference points not defined			
Irish Sea ICES VIIa	1,189	<710	The assessment is indicative of trends only, and the state of the stock is currently uncertain. Recruitment and SSB increased between 1992 and 2008, since when SSB has decreased. There are no specific management measures, and ICES' advice is based on the ICES approach for data-limited stocks, and includes introduction of further technical measures to reduce discards.

Table 2: Management Stock (colour keyed to Figure 1 and map in Figure 6)	Agreed TAC 2011 (t)	Advisory TAC 2011 (t)	Scientific advice and management
NORTHWEST ATLANTIC HADDOCK STOCKS www.nafo.int , www.nmfs.noaa.gov , www.dfo-mpo.gc.ca ,			
Inside safe biological limits			
Georges Bank (5Z) & Gulf of Maine (5Y)	55,600 (2011)	57,300 (2011)	Georges Bank haddock SSB increased substantially from an historic low in 1993 as measures were implemented to reduce harvest rates and, with exceptionally large 2003 and 2010 year classes, is now assessed at about 34% above the target SSB level associated with MSY. Strong recruitment and reduced harvest rates have also resulted in a recovery of the Gulf of Maine stock, and SSB is assessed to be at 59% of its target population level and is no longer considered overfished. Both stocks are now considered to be harvested sustainably and advice is give on this basis. New measures for the management of ground fish such as haddock in the Northeast allow vessels to fish in sectors that provide fishermen more control over where and how they fish and the ability to target healthier stocks and avoid overfished stocks (5).
Canadian Coastal Waters NAFO 4X, 5Y	5,100 in 2012/13 Year April-Mar	5,100	Surveys have shown that recruitment was low in 2007 and 2008, but high in 2009 and 2010, which is expected to reverse the recent decline in SSB. The 2012 assessment estimated that the SSB was between 40% and 80 % of SSB corresponding to MSY, and advice was given for a precautionary TAC in line with the management plan (11). One MSC certified fishery (6).
Reference points not defined			
Flemish Cap 3M and Grand Bank 3NLO	N/A		NAFO has jurisdiction outside 200 miles. Haddock does not appear as a quota stock in the NAFO tables. Recorded catches collapsed from about 81,000 t in 1980/81 to 370 t in 2004 (12).

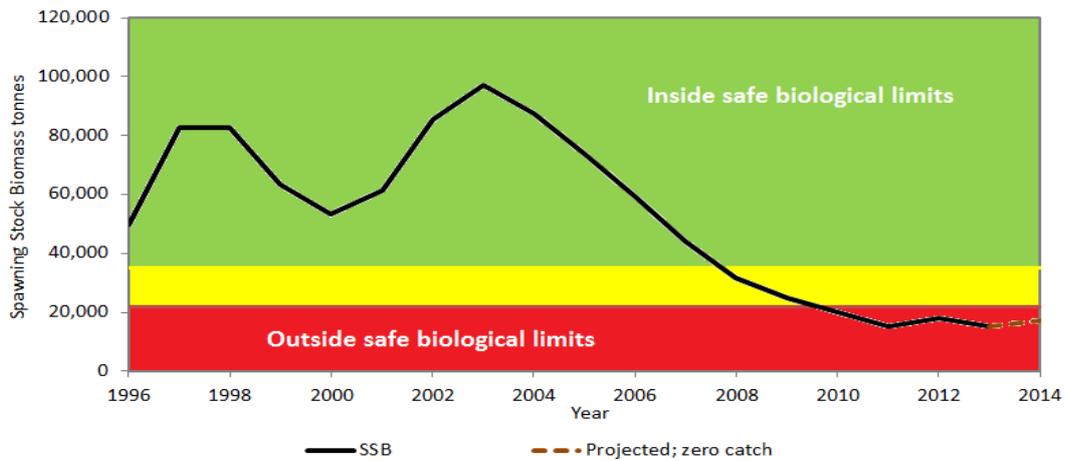
Faroe Plateau Haddock in ICES Vb: stock trajectories

Figure 2: Fishing mortality trajectory for Faroe Plateau haddock ICES Div. Vb. ICES 2012 assessment.



F_{MSY} has been estimated at 0.25 (blue line) at the same level as the F_{pa} (see Fig. 1), but further analysis is required to confirm this level. The stock appears to have been at risk of being exploited unsustainably over most of the period 1996-2011.

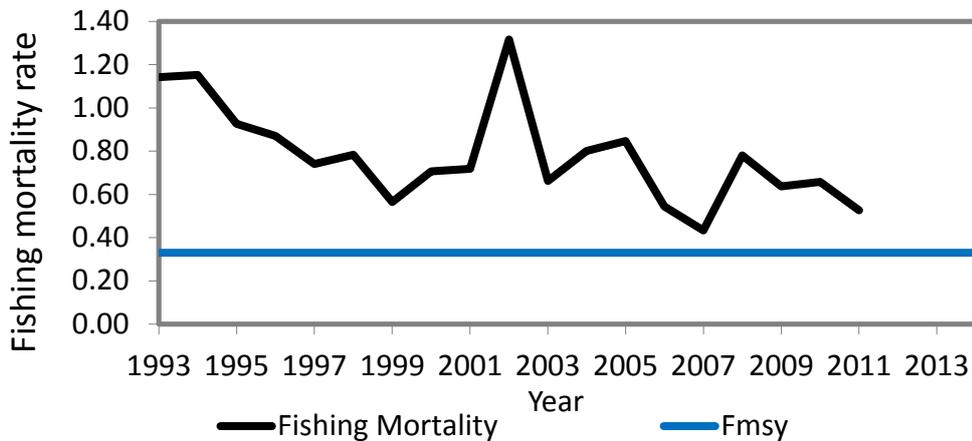
Figure 3: Spawning Stock Biomass (SSB) .ICES Div. Vb. ICES 2012 assessment.



$MSY_{Btrigger}$ and B_{pa} are at 35,000 t and safe biological limits (B_{lim}) is at 22,000 t. The stock has been outside safe biological limits since 2009, and even the recommended zero catch in 2013 will not result in the stock being inside safe biological limits in 2014 (brown line).

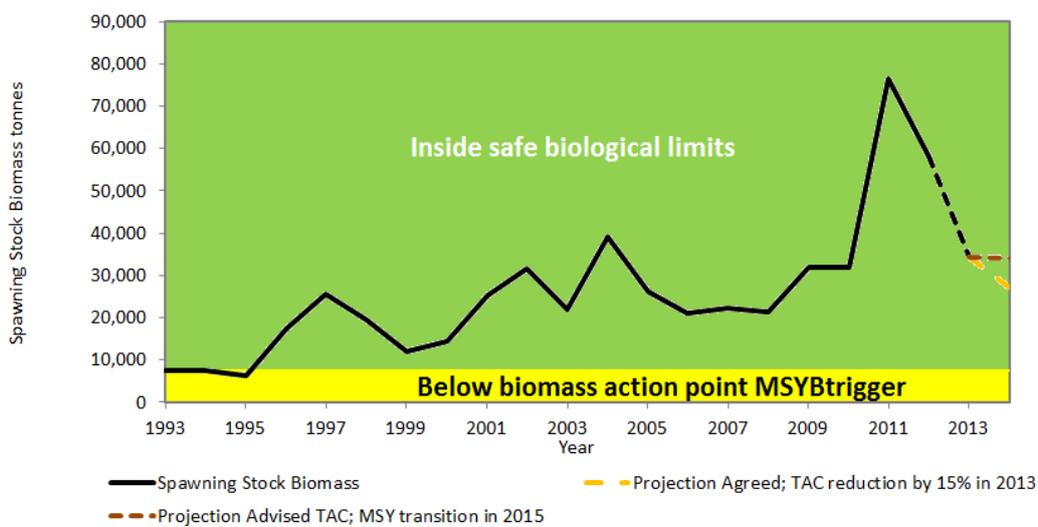
Haddock in ICES VIIb-k stock trajectories

Figure 4. Fishing mortality trajectory for haddock in ICES Division VIIb-k. ICES 2012 assessment.



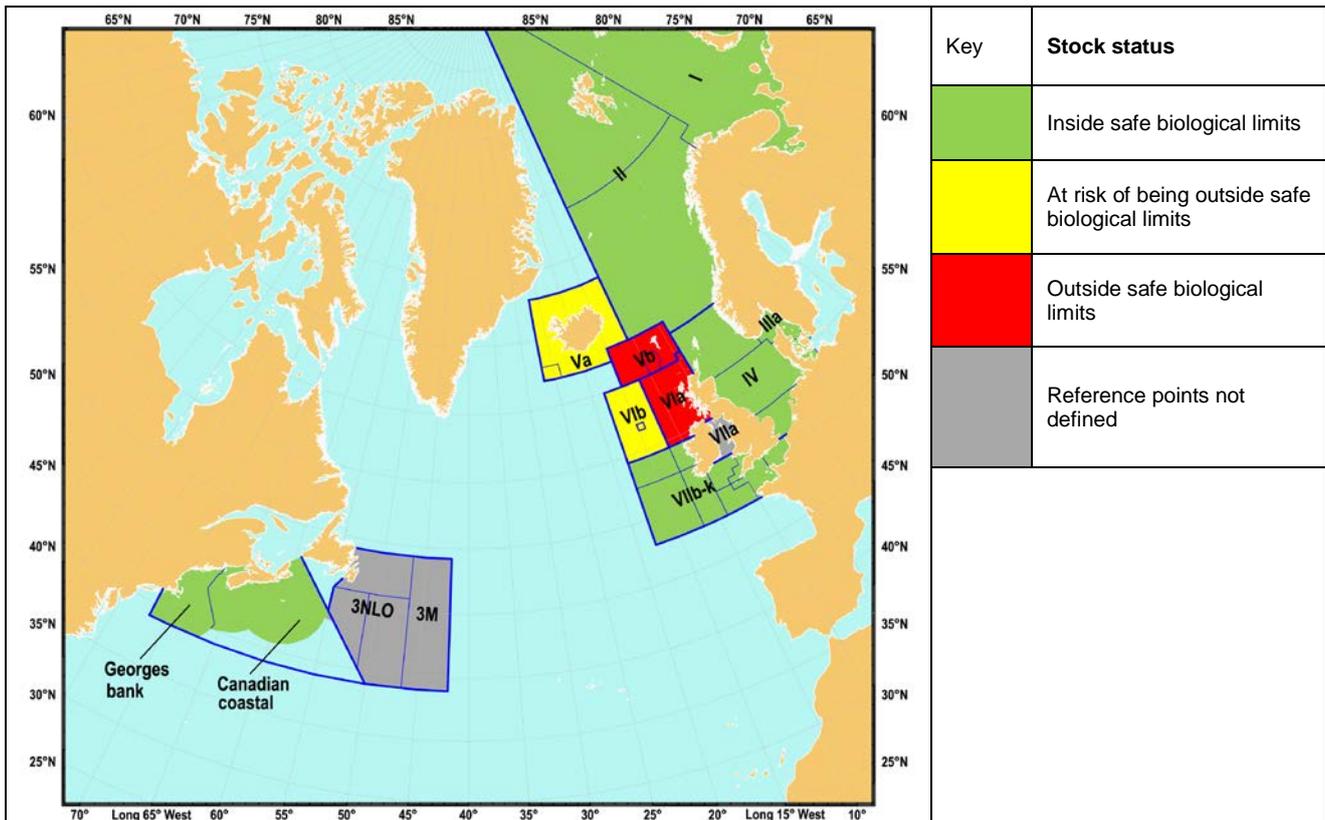
The fishing mortality rate has shown a declining trend since 2002 but is estimated to remain above F_{MSY} , (blue line). Safe biological limits (F_{lim} and F_{pa} ; see Fig. 1) are not defined for this stock.

Figure 5: Spawning Stock Biomass trajectory for haddock in ICES Division VIIb-k. ICES 2012 assessment.



$MSY_{Btrigger}$ is set at 7,500 t. Two projections are shown; ICES' projection for an advised TAC compatible with reaching MSY in 2015 (brown line), and the agreed TAC reduction of 15% in 2013 (orange line). Both these projections show the stock above the biomass action point $MSY_{Btrigger}$ in 2014. Safe biological limits (B_{lim} and B_{pa}) are not defined for this stock.

Figure 6: Management stocks of North Atlantic haddock; keyed by status from Table 1.



Organisation key

FAO: Food and Agriculture Organisation of the United Nations; acts as a neutral forum where all nations meet as equals to negotiate agreements and debate policy. FAO is also a source of knowledge and information.

EU: The European Union manages fisheries within European Economic Zones and in cooperation with Norway for certain stocks.

ICES: International Council for the Exploration of the Sea; responsible for providing scientific advice for North East Atlantic fishery management.

JRNC: Joint Russian Norwegian Commission for fisheries. Responsible for management of fisheries resources off North Norway and Atlantic Russia.

NAFO: Northwest Atlantic Fisheries Organisation. Provides science and management in northwest Atlantic international waters.

NEAFC: North East Atlantic Fisheries Commission. Responsible for fisheries management outside Exclusive Economic Zones in the North East Atlantic.

Management and conservation measures

Fishing gear

Haddock is caught predominantly by demersal towed gears (trawls and seines) in both directed and mixed fisheries; it is also caught with baited long-lines, and gill nets. Haddock and cod are often caught together in mixed fisheries, and any recovery plans for cod will impact on haddock catches and landings. Cod is a larger species and is caught at a larger size than haddock, hence the mesh size for optimum exploitation of haddock is not the same as that for cod.

The main issues concerned with conservation of haddock stocks are:

Maintenance of stocks within safe biological limits

The key to this is the control of fishing effort and catches. The probability of sustainable harvest is improved where there are international agreements on the management of the stock and good reporting of catches.

Mixed fisheries

In mixed fisheries exploiting a number of different species, there is a risk of a mismatch between the allocated quota and the catch which the fishermen are taking. This can

be countered by improving species selectivity and/or controlling fishing effort. In 2012 ICES advised on catches based on mixed fisheries advice (8) for the North Sea. The agreed TAC for North Sea haddock corresponds closely to fishing effort being the same in 2013 as 2012.

Developments in the cod recovery measures for the Kattegat, Skagerrak, North Sea and eastern English Channel, west of Scotland and Irish Sea have been incentivised through the granting of additional fishing effort opportunities to vessels using more species-selective gear or other measures designed to reduce mortality on cod (13); see the Seafish Responsible Sourcing Guide for cod (14) for developments.

Haddock have been observed to swim upwards when they encounter the trawl and this has enabled gear technologists to design measures such as square mesh panels and coverless trawls to enable them to escape from trawls used to catch *Nephrops*.

Small fish

Measures have been introduced to reduce discarding in the 80mm mesh *Nephrops* fisheries of the UK

and other countries. In the UK, larger square mesh panels and thinner codend twine are required (15), and selective grids are also available. Nevertheless, ICES advises that further technical measures should be introduced to reduce discard rates of haddock in many fisheries.

Since 2002, the North Sea and west Scotland whitefish fleet has operated with 120mm cod-ends, which are designed to release the majority of haddock and cod under the minimum landing size (15). The Barents Sea fishery uses Sortex™ grids to improve size selection with minimum capture sizes set at 39cm and 45cm in the Russian and Norwegian fisheries respectively. The approach adopted by the EU and NEAFC off Rockall is to avoid trawling within the area where there are large concentrations of small fish (16); see below. The effectiveness of this measure is yet to be evaluated.

