Greater North Sea ecoregion; demersal stock trends 2000-2015 and ICES advice 2015

Summary

This document summarises the trajectories of the main whitefish and Nephrops stocks exploited in the Greater North Sea Ecoregion over the past fifteen years based on the ICES advice from 2015. It discusses the trends in North Sea fisheries management, including the reduction of fishing effort over the period 2000 to 2012 and the relationship with stock status for the main demersal stocks. In general stock status is improving which appears to correspond with the decrease in fishing effort over this period. The main exception is sea bass, which has been affected by poor recruitment and for which a management plan is advised.

Trends in the Nephrops stocks are also discussed, with the differential status of the main Functional Units (Functional Units are patches of muddy substrate considered to contain effectively biological stocks of Nephrops) highlighted. Nephrops in the Farn Deeps is considered to be the most vulnerable Functional Unit. The management unit at which Nephrops Total Allowable Catches (TACs) are set is the whole North Sea, however the assessment units are the Functional Units. The main issue with these stocks is that there is a lack of control over catches at Functional Unit level which risks over exploitation of the individual Functional Units. The North Sea Advisory Council is developing a management plan for Nephrops fisheries.

Trends in data limited stocks are discussed. Flatfish stocks, brill, lemon sole, witch, dab and flounder are considered stable, but trends in turbot are adverse over the longer timescale. This has led ICES to advise relatively stable Total Allowable Catches (TACs) for these stocks, with the exception of turbot where the advice is for a reduction of 20% on precautionary grounds. It is advised that individual species TACs rather than combined TACs be set for these stocks. Under the current arrangement combined TACs are set for turbot with brill, dab with flounder, and lemon sole with witch, which prevents control over individual stocks' exploitation. Anglerfish, thornback, spotted and cuckoo ray stocks are considered to be trending upwards based on survey data indices. There is more uncertainty concerning blond ray, starry ray and common skate, for blonde ray a precautionary 20% reduction in catch is advised whilst for common skate and starry ray, the lowest possible catches.

Trends in future advice are discussed. ICES is being requested to provide advice on other components of the ecosystem such as sea mammals, sea birds and ecological communities in line with the ecosystem approach and the attainment of 'Good Ecological Status' under the EU Marine Strategy Framework Directive. This year information and advice has been provided on cetaceans, particularly harbour porpoise which are bycaught in static net fisheries at a rate which is considered sustainable.

The provision of mixed fisheries advice is of increasing importance because it enables the implications of the EU landing obligation to be assessed in terms of choke species; that is species which fisheries are likely to run out of allowable catch before the allowable catch of other stocks has been fully utilised. In order to inform the EU long term management plan ICES has provided advice on fishing mortality for the main stocks, which would enable fishing mortality for Maximum Sustainable Yield (MSY) ranges, which would deliver a long term yield of no more than a 5% reduction in long term yield compared with MSY. This would improve scope for flexibility in managing yields from stocks in a mixed fishery context.

Further Information

Seafish Risk Assessment for Sourcing Seafood (RASS)

www.seafish.org/rass

International Council for Exploration of the Sea (ICES)

www.ices.dk

Author

William (Bill) Lart

Sustainability and Data Advisor

Seafish | Origin Way, Europarc, Grimsby DN37 9TZ

T: +44 (0) 1472 252 323 | F: (0) 1472 268792

William.Lart@seafish.co.uk

www.seafish.org

Introduction

ICES (International Council for Exploration of the Sea) produces scientific advice on fisheries management for the main North Sea demersal stocks, on an annual basis, which is used by fisheries' managers such as the European Union's Council of Ministers to set catch limits and other management measures. This note summarises trends over the short (3 years) and medium terms (circa 15 years) trajectories of the major demersal whitefish and Nephrops stocks and fisheries within the Greater North Sea ecoregion (see page 6), and advice on protected species. It also discusses trends in fishing effort and discard levels and their implications. There is a summary of ICES "mixed fisheries advice", which describes the way in which the fisheries catch the various stocks together and discusses the implications for fisheries management. There are links to sources of information. Finally the overall implications of the assessments and advice for fisheries management in the North Sea are discussed.

Contents

Ecoregion boundaries

ICES designate twelve ecoregions in Northeast Atlantic waters. This note covers the main stocks in the Greater North Sea as defined by ICES Sub area IV (North Sea) Divisions IIIa (Skagerrak) and VIId (Eastern English Channel); see Figure 1. However, neither the ecoregion boundaries nor the all the stocks coincide with these definitions; stocks were included if they substantially coincided.

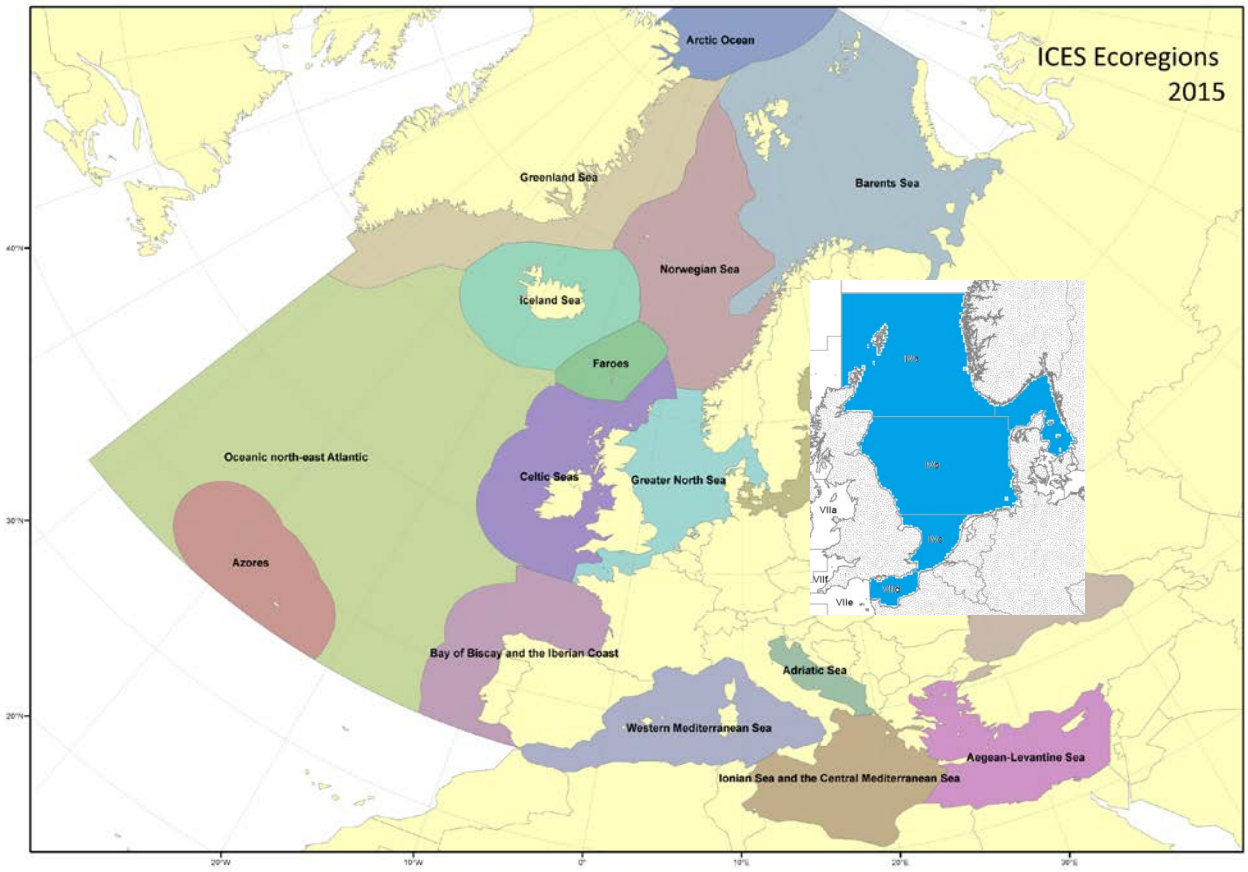

Figure 1 Northeast Atlantic and Mediterranean ecoregions. The demersal stock and fisheries management trends described in this note correspond to the Greater North Sea Ecoregion as defined by ICES Sub area IV (North Sea) Divisions IIIa (Skagerrak) and VIId (Eastern English Channel) see insert.

Assessed stocks

Fish stock assessments calculate: Fishing mortality (F); the rate at which fish are removed from the stock by fishing, and Spawning Stock Biomass (SSB); which is a measure of the reproductive capacity of the stock, measured in tonnes. In order to help managers manage each stock has a designated set of reference points against which is the stock is assessed. For some stocks, Management Plans (MPs) are agreed and ICES will advise in line with these plans. Generically, ICES assessments refer to Maximum Sustainable Yield (MSY) references; F_{MSY} for Fishing Mortality and MSYBtrigger for Spawning Stock Biomass. Optimally stocks should be at F_{MSY} and the Spawning Stock Biomass above MSYBtrigger.

There are also Precautionary Approach (PA) references, which represent safe biological limits; stocks exploited outside these limits are considered reproductively impaired or 'depleted', see Link for a full explanation of both these reference points.

Whitefish stocks

Figure 2 shows the relative position of the main whitefish stocks in relation to the F_{MSY} and MSYBtrigger references in 2014. Haddock, plaice (both North Sea and Eastern Channel) and saithe are exploited at a rate below maximum sustainable yield as indicated by being below 1.0 (to the left of the blue line), which indicates that they could be exploited at a higher rate.

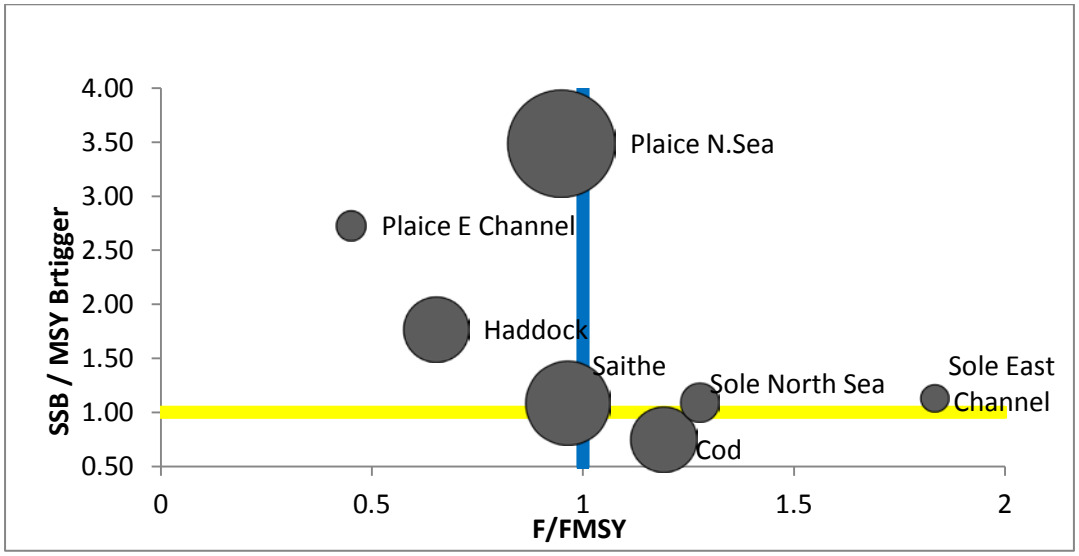

Figure 2 Relative positions of the main whitefish stocks in the North Sea and Eastern English Channel in relation to reference points F_{MSY} and MSYBtrigger, 2014 data. The sizes of the points are proportional to the total catch of that stock (including discards); plaice North Sea 133 kt, plaice East English Channel 7.1 kt, sole North Sea 12.8 kt, sole E Channel 5.3 kt, cod 45.9 kt haddock 46.3 kt and saithe 81.4 kt (kt = kilo tonnes= 1000 tonnes).

The spawning stock biomasses of plaice and haddock are high relative to MSYBtrigger (above the yellow line) and saithe is close to this level, indicating that these spawning stocks are at levels which correspond to sustainable harvesting at F_{MSY}. Cod and North Sea sole are exploited at a fishing mortality rate higher than that corresponding to maximum sustainable

yield and cod is below the MSYBtrigger; reduced fishing mortality is advised to reduce risk of depletion. The total catch including discards (as indicated by the size of the points) of those stocks harvested above MSYBtrigger and at or below F_{MSY} (haddock, plaice and saithe) is 286,500 tonnes out of a total of 332,500 tonnes or 80% of the total catch.

Fishing mortality of Eastern Channel sole has been assessed as at its safe biological limit, that is the stock is being exploited at a rate which is considered to be likely to deplete it in the long term. However, the spawning stock biomass is just above the MSYBtrigger reference level, so the spawning stock itself is healthy, but action should be taken to reduce fishing mortality. ICES has advised a reduction of 49% in catches in 2016.

Trends in whitefish stocks

Whilst the above analysis show a snapshot of the status of these stocks, trends over time are important. Figure 3 shows trends in time for fishing mortality and Figure 4 spawning stock biomass since 2000. For North Sea sole, cod, whiting, plaice (both North Sea and Eastern English Channel) and haddock the trend has been a decrease in fishing mortality since 2000, whereas fishing mortality on saithe has been close to that required for maximum sustainable yield for most of period since 2000. However, East Channel sole has shown an increasing trend in fishing mortality and the spawning stock biomass has been trending downward (Figure 4).

Trends in spawning stock biomass (Figure 4) of plaice, cod, whiting and North Sea sole have been positive since around 2008. Haddock biomass is very variable because of the highly variable strength of the year classes for this stock; there was a very large year class in 1999 which accounts for the spike in 2000-8. The haddock stock has been above the MSYBtrigger reference point for most of the time series and has trended upwards since 2008. These trends are likely to be related to fishery management measures and trends in effort levels (see p 26-30).

Table 1 summarises these trends in short 2013-2015 and medium 2000-2012 term trajectories of spawning stock biomass. The stocks are classified by their status in terms of the reference levels discussed above (see Link) and the table includes links to the ICES assessments for further information.

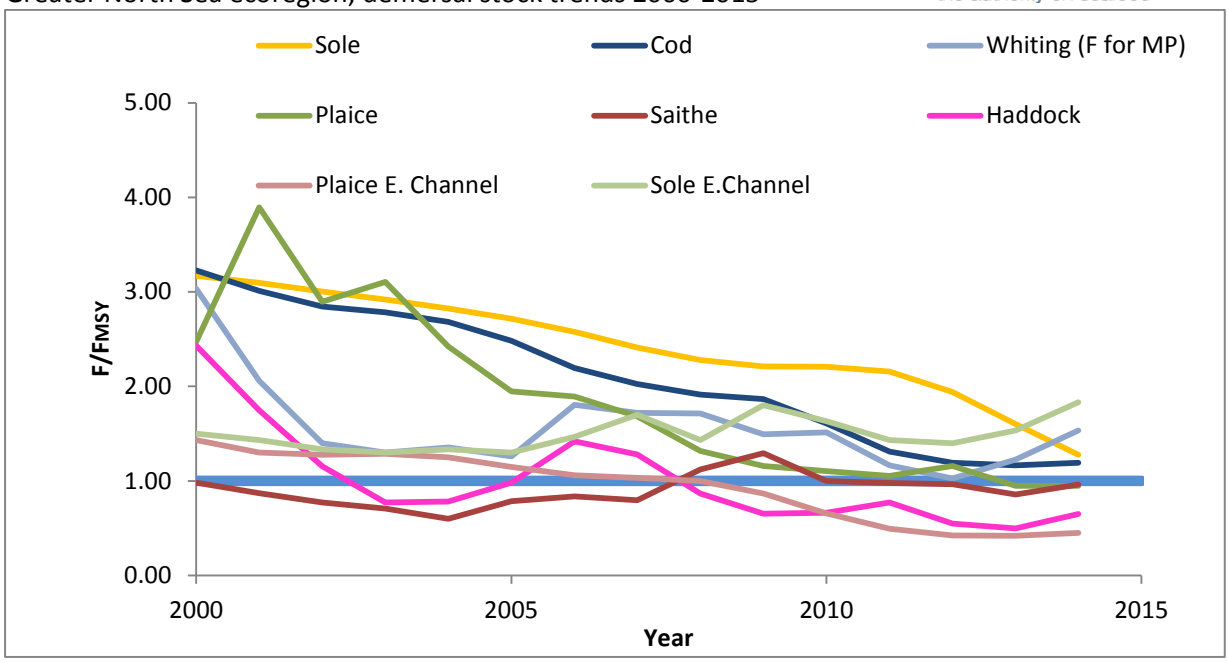

Figure 3 Trends in fishing mortality 2000-2014 for the main white fish stocks in relation to fishing mortality for Maximum Sustainable Yield (F_{MSY}). Note for whiting F_{MSY} is not defined, but there is a fishing mortality designated in the management plan (F for MP) so fishing mortality is referenced to this level.

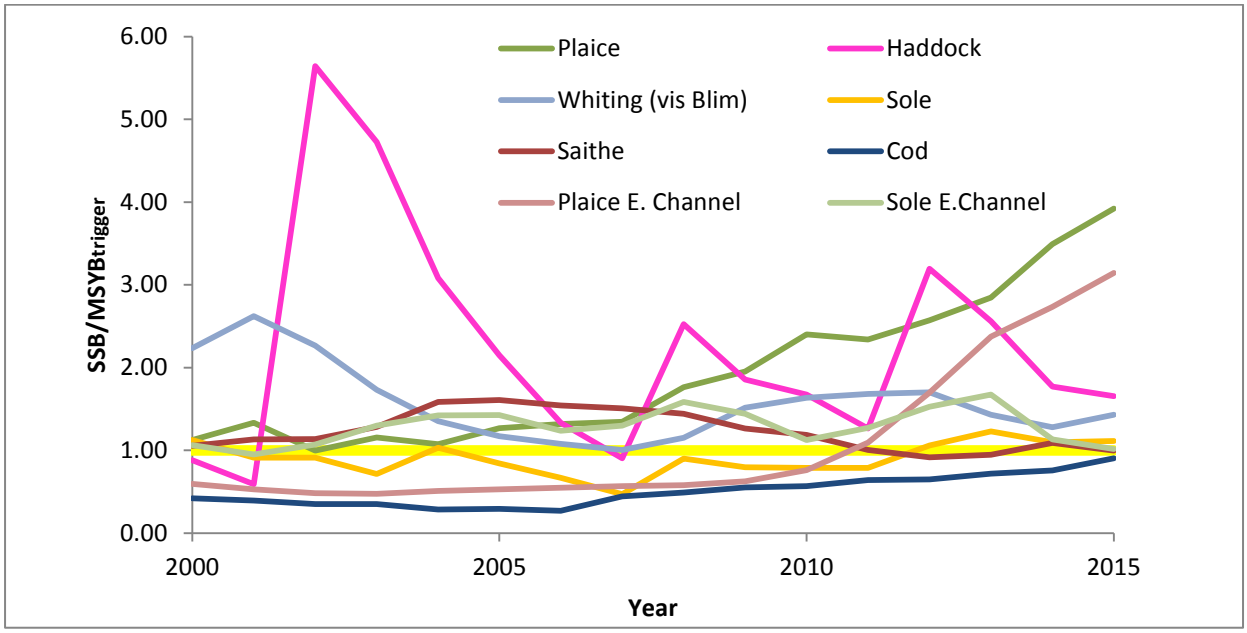

Figure 4 Trends in spawning stock biomass over time for the main North Sea white fish stocks. The stocks are considered to be capable of supporting fishing mortality at F_{MSY} when Spawning Stock Biomass is above the MSYBtrigger reference level (yellow line). Below this level fishing mortality should be reduced. Note that MSYBtrigger is not designated for whiting so spawning stock biomass is shown relative to safe biological limits (Blim); where reproduction would be impaired.

Sea bass

Sea bass is considered separately here because the stock extends outside the area of the Greater North Sea including the Central and South North Sea, Irish Sea, English Channel, Bristol Channel and Celtic Sea and the directed bass fishery uses specialised gears; fixed and drift nets, lines, specialised demersal trawling and pelagic pair trawls. There is also a substantial recreational component.

The stock has been declining since 2010 due to poor recruitment of young fish into the stock and the stock is now below MSYBtrigger, which means there is an increased risk of depletion. There has been a corresponding increase in fishing mortality which is now well above F_{MSY}. ICES advise that a management plan is urgently needed to develop and implement measures to substantially reduce fishing mortality throughout the range of the stock; a number of management measures have been introduced http://ec.europa.eu/fisheries/cfp/fishing_rules/sea-bass/index_en.htm.

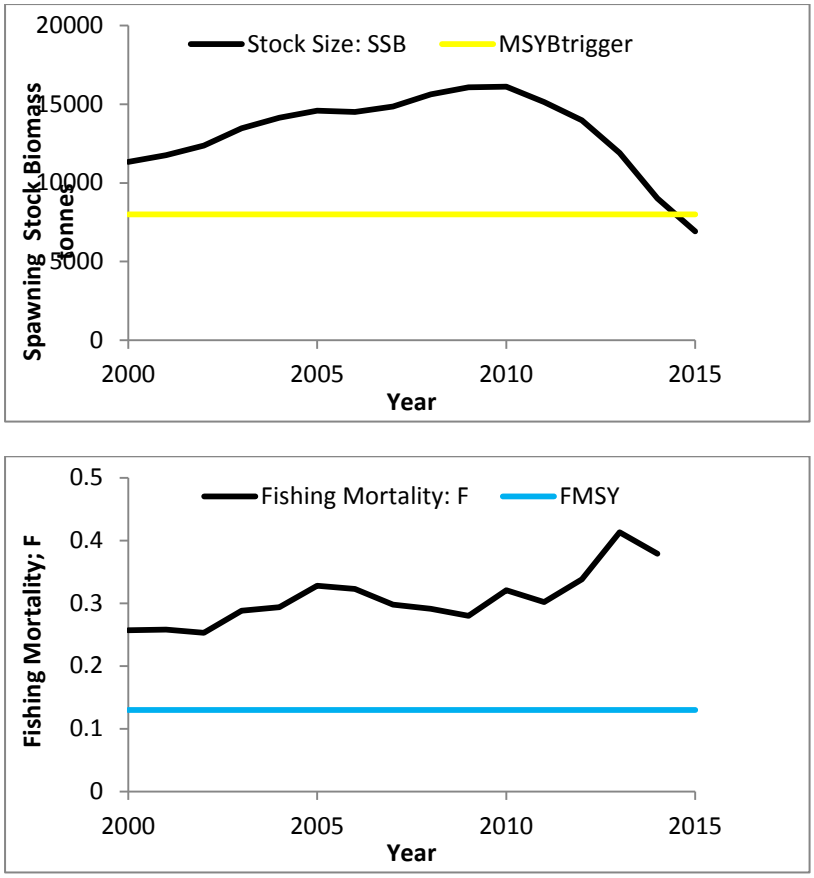

Figure 5 Time series of spawning stock biomass and fishing mortality for sea bass in in Divisions IVb and c, VIIa, and VIId–h (Central and South North Sea, Irish Sea, English Channel, Bristol Channel, Celtic Sea)

Table 1 Summary of stock status and links to assessments for assessed stocks

Label Figs 2, 3 & 4	Stock and link to ICES assessment	ICES Advised TAC for 2016 tonnes		TAC for 2015 tonnes	Trends in spawning stock biomass years	
		Total Catch[1]	Landings[2]		00-12	13-15
Spawning Stock Biomass inside safe biological limits and exploited at $\leq F_{MSY}$						
Haddock	Haddock in Subarea IV and Divisions IIIa West and VIa (North Sea. Skagerrak and West of Scotland) http://www.ices.dk/sites/pub/Publication%20Reports/Advice/2015/2015/had-346a.pdf	74,854	61,930	40,711	Variable	↓
Plaice	Plaice Subarea IV (North Sea) and Division IIIa (Skagerrak) http://www.ices.dk/sites/pub/Publication%20Reports/Advice/2015/2015/ple-nsea.pdf	213,440	159,197	128,376	↑	↑
Saithe	Saithe in Subarea IV (North Sea) Division IIIa West (Skagerrak) and Subarea VI (West of Scotland and Rockall) http://www.ices.dk/sites/pub/Publication%20Reports/Advice/2015/2015/sai-3a46.pdf	75,049	68,061	66,006	→	→
Plaice E. Channel	Plaice in Division VIId (Eastern Channel) http://www.ices.dk/sites/pub/Publication%20Reports/Advice/2015/2015/ple-eche.pdf	17,250	12,789	4,787 incl.Div. VIIe[3]	↑	↑
Spawning Stock Biomass inside safe biological limits but exploited at $\geq F_{MSY}$; Flim Fishing mortality for safe biological limits not defined						
Sole	Sole in Subarea IV (North Sea) http://www.ices.dk/sites/pub/Publication%20Reports/Advice/2015/2015/sol-nsea.pdf	12,835	11,921	11,900	↑	→

[1] Includes discarded or 'unwanted' catch
[2] Calculated from advised total catch if discarding remains the average rate as previous years
[3] The TAC combines both east and west Channel ICES Divisons VIId and e

Greater North Sea ecoregion; demersal stock trends 2000-2015

Label Figs 2, 3 & 4	Stock and link to ICES assessment	ICES Advised TAC for 2016 tonnes		TAC for 2015 tonnes	Trends in spawning stock biomass years	
		Total Catch[1]	Landings [2]		00-12	13-15
Spawning Stock Biomass at risk of being outside safe biological limits and exploited at >F_{MSY}						
Cod	Cod (*Gadus morhua*) in Subarea IV and Divisions VIId and IIIa West (North Sea. Eastern English Channel and West Skagerrak) http://www.ices.dk/sites/pub/Publication%20Reports/Advice/2015/2015/cod-347d.pdf	49,259	40,419	35,100	↑	↑
Spawning Stock Biomass at risk of being outside safe biological limits and exploited at >F_{MSY}						
See Figure 5	Sea bass (*Dicentrarchus labrax*) in Divisions IVb and c, VIIa, and VIId–h (Central and South North Sea, Irish Sea, English Channel, Bristol Channel, Celtic Sea) http://www.ices.dk/sites/pub/Publication%20Reports/Advice/2015/2015/Bss-47.pdf	Not quantified	541	No agreed TAC	↑	↓
Spawning stock biomass inside safe biological limits but exploited at >Flim; outside safe biological limits						
Sole E.Channel	Sole in Division VIId (Eastern Channel) http://www.ices.dk/sites/pub/Publication%20Reports/Advice/2015/2015/sol-eche.pdf	2,685	2,376	3,483	↑	↓
Reference points not fully defined						
Whiting	Whiting (*Merlangius merlangus*) in Subarea IV and Division VIId (North Sea and Eastern English Channel) http://www.ices.dk/sites/pub/Publication%20Reports/Advice/2015/2015/whg-47d-reopen.pdf	30,510	14,853	31,420 Includes Div VIIe	↓	→

Nephrops stocks

North Sea Nephrops are divided into "Functional Units" or FUs (Nephrops on a particular area of muddy ground) and effectively these FUs are considered to be discrete biological stocks. In the North Sea Nephrops are predominantly caught by demersal trawling and are assessed against the a similar framework of reference points as the whitefish stocks, the only difference being that the index of abundance as a stock size indicator instead of spawning stock biomass; see link for explanation of reference points.

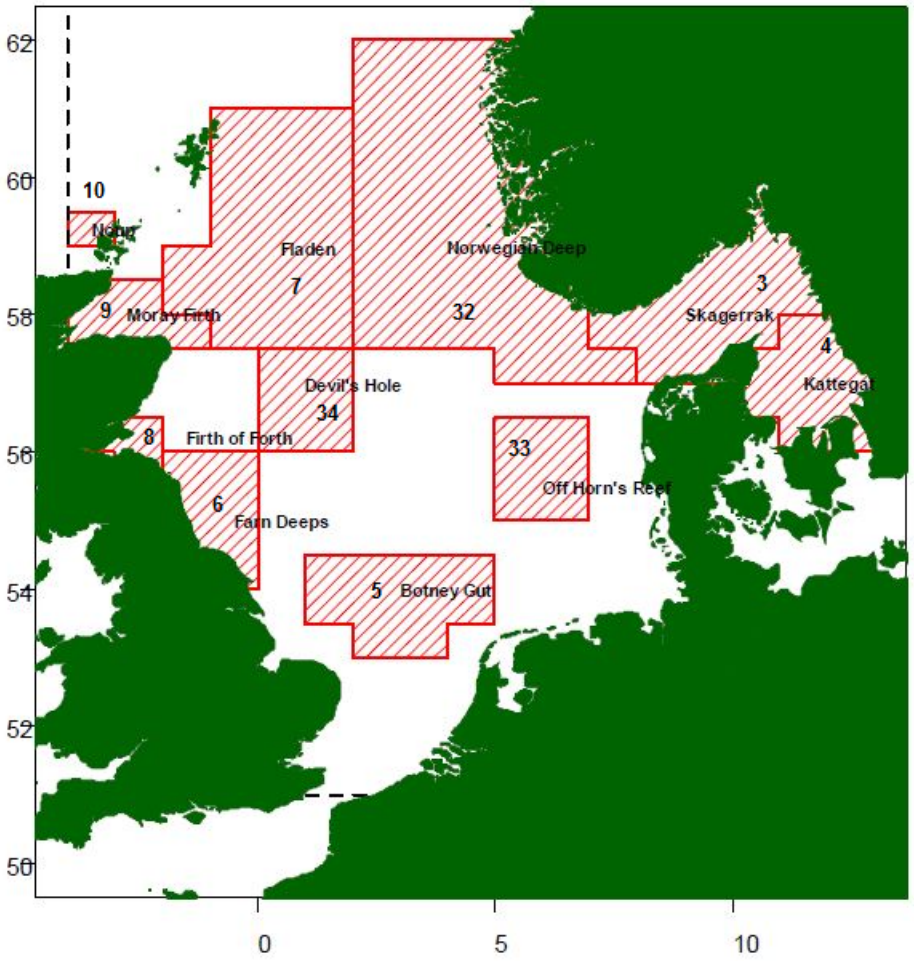

Figure 6; Locations of Nephrops Functional Units (FUs) in the Greater North Sea ecoregion; Main assessed units; FU6; Farn Deeps; FU7, Fladen, FU8; Firth of Forth, FU9; Moray Firth. Data limited assessments; FU 5; Botney Gut–Silver Pit; FU 3 and 4 Norway lobster in Division IIIa (Skagerrak and Kattegat), FU 32; Norwegian Deep in Division IVa, FU 33; Off Horn's Reef, FU 10; Noup

Figure 7 shows the relative position of the assessed Nephrops stocks or functional units (FUs) in relation to F_{MSY} and MSYBtrigger references in 2014. These results show that the Fladen ground stock is relatively lightly exploited at a rate around half of $F_{MSY,}$ whilst the Moray Firth and Firth of Forth stocks are exploited at a rate higher than that required for $F_{MSY,}$ their Spawning Stock Biomasses are above MSYBtrigger. However, the Farn Deeps

stock is below MSYBtrigger, hence at risk of depletion (see Trends in Nephrops stocks below).

Of the 10,253 tonnes of Nephrops landed from these stocks 4,146 tonnes or 40% are harvested from the Fladen stock, the spawning stock biomass of which is above MSYBtrigger and the Fishing mortality is below F_{MSY}. However, 75% of the landings are from stocks whose biomass is above MSYBtrigger, although the Fishing Mortality rate is above F_{MSY}.

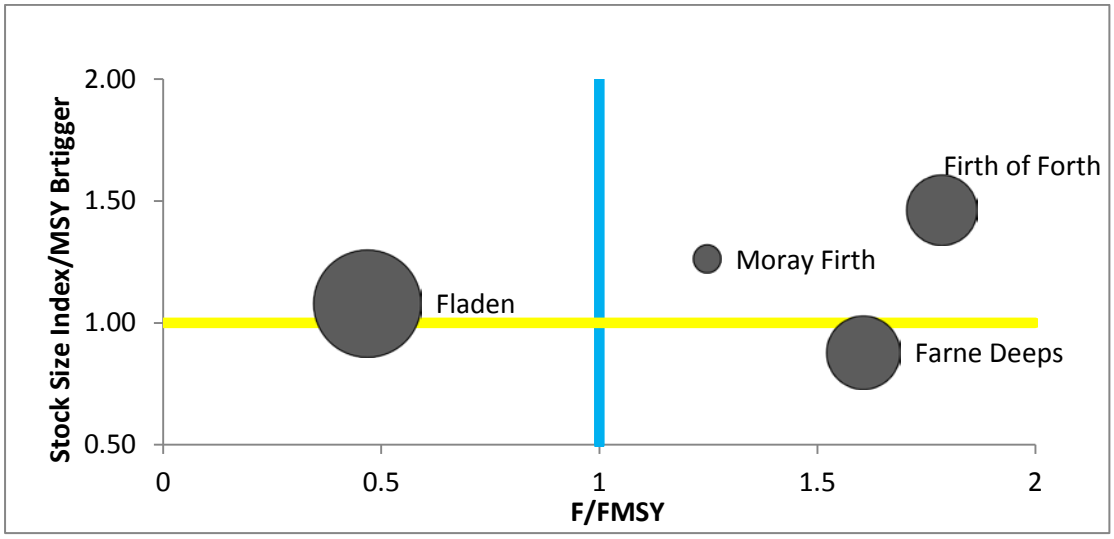

Figure 7 Relative position of Nephrops functional units stocks in relation to reference points F_{MSY} and MSYBtrigger in the North Sea, 2014 data. The sizes of the points are related to the landings Fladen 4.1kt, Farn Deeps 2.5 kt, Firth of Forth 2.4 kt, Moray Firth 1.2 kt. (1 kilo tonne (kt) = 1000 tonnes)

Trends in Nephrops stocks

Figure 8 shows the time-series 2001-14 for fishing mortality relative to $F_{MSY,}$ and Figure 9 shows the time series 2001-14 of abundance relative to MSYBtrigger for the four Nephrops functional units subject to full assessments. Moray Firth and Fladen ground show a fluctuating trend in fishing mortality close to F_{MSY}, until about 2010 when there is declining trend in the fishing mortality on the Fladen stock, whilst Moray Firth continues to fluctuate around F_{MSY}. Abundance for both these functional units is well above MSYBtrigger reference level. Although the Firth of Forth stock has been harvested at a rate above F_{MSY} yields have held up for this productive stock, and the abundance is well above the MSYBtrigger reference level. In general abundance of these stocks has shown a declining trend in the medium term (2005-11) but has stabilised in more recent years (2012-14) see Table 2 with the exception of Farn Deeps (see below).

The stock causing most concern is the Farn Deeps stock which has been subject to fishing mortality well above the F_{MSY} reference level since the start of the time series, and whose abundance has declined to below MSYBtrigger for the past four years. The stock is showing signs of biological stress with the presence of un-mated female Nephrops in the catches,

indicating a shortage of male Nephrops. Male Nephrops spend more time outside their burrows and are therefore subject to more fishing mortality than females, so a shortage of males is a sign of reproductive impairment.

Table 2 summarises these trends in short 2013-2015 and medium 2000-2012 term trajectories of Nephrops stock abundance. The stocks are classified by their status in terms of the reference levels discussed above and the table includes links to the ICES assessments for further information.

Data limited Nephrops stocks

There are seven other functional units of Nephrops in the Greater North Sea which are not subject to full assessments. Two in Skagerrak and Kattegat (FUs 3 and 4), Norwegian Deeps (FU 32), Botney Gut-Silver Pit (FU 5), Off Horn's reef (FU 33), Devil's Hole (FU 34), Noup (FU 10) and also some Nephrops are fished outside of the Functional Unit areas. Of these Skagerrak and Kattegat is the most important in terms of catch with landings of 4,150 tonnes in 2014, this stock is subject to an assessment although the MSYBtrigger reference point has not been defined. The rest of the stocks, which amount to an advised catch of around 3,000 tonnes, in 2016 are subject to data limited assessments. For these stocks full assessments are not available, but for some of them exploitation rates (ie fishing mortality) and stock abundance indicators are estimated, and their status is summarised in Table 2 and links are given to the assessments.

For all Nephrops stocks, the advice is that management should be implemented at the functional unit level; currently TACs are set for the whole North Sea, whereas biological stocks are Functional Units. This means that additional fishing pressure is placed on the accessible Functional Units such as the Farn Deeps stock, with the result that there is a higher risk of depletion.

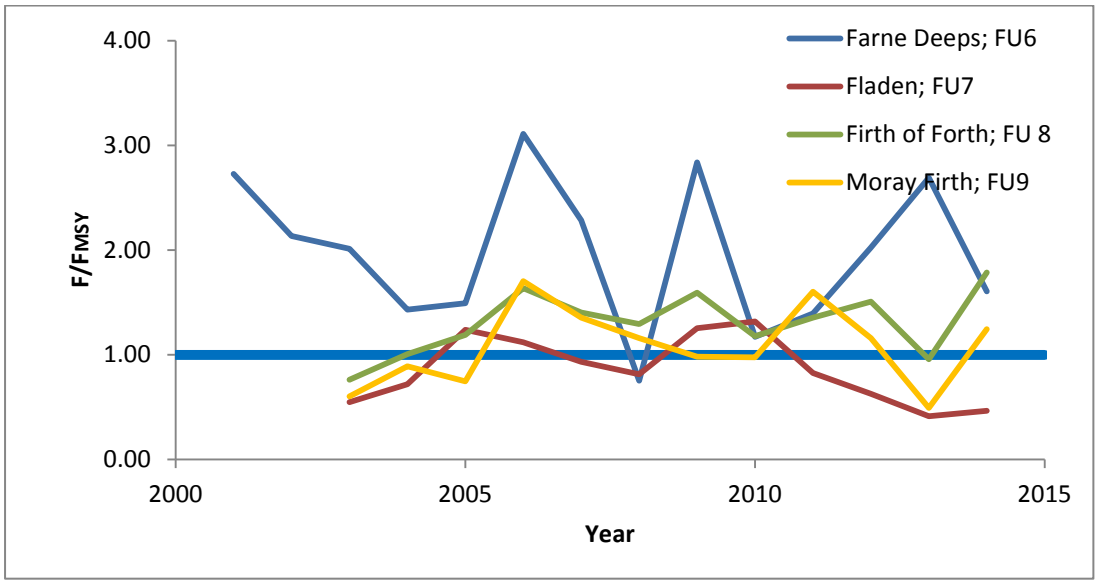

Figure 8 Trends in fishing mortality 2000-2014 for the main Nephrops Functional Units (FU) in relation to fishing mortality for Maximum Sustainable Yield (F_{MSY}); blue line.

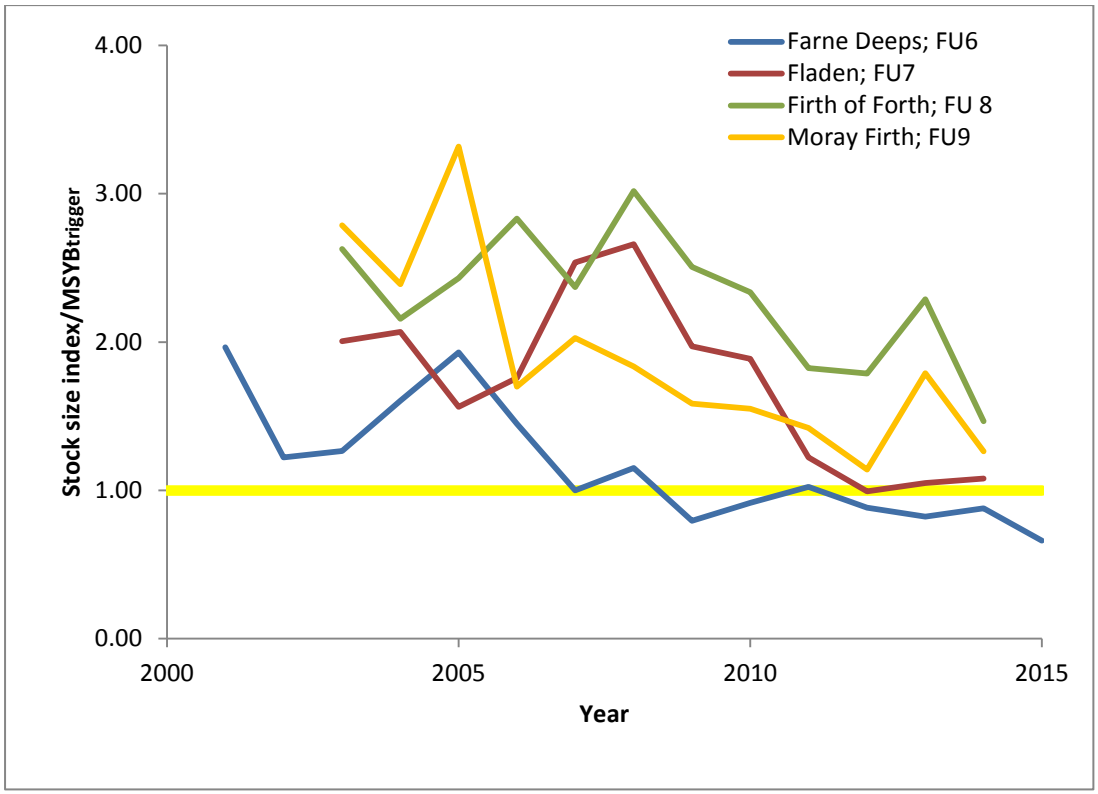

Figure 9 Trends in stock size index over time for the main North Sea Nephrops Functional Units. The stocks are considered to be capable of supporting fishing mortality at F_{MSY} when stock size index is above the MSYBtrigger reference level (yellow line). Below this level fishing mortality should be reduced

Table 2 Summary of stock status and trends; Nephrops stocks in the Greater North Sea; Note that the TAC for all the functional units in Division IV combined for 2015 was set at 18,468 tonnes landed catch

Label Figs 7,8,9	Stock	ICES Advice for 2016 tonnes		TAC for 2015 tonnes	Trends in stock abundance index	
		[4]Total Catch	Landings[5]		05-11	12-14
Abundance index inside safe biological limits and exploited at <F_{MSY}						
Fladen; FU7	Norway lobster in Division IVa, FU 7; Fladen http://www.ices.dk/sites/pub/Publication%20Reports/Advice/2015/2015/nep-7.pdf	8,549	8,539	See caption		
Fishing mortality appropriate for F_{MSY} but MSYBtrigger not defined						
Not applicable	Norway lobster in Division IIIa (Skagerrak and Kattegat); FUs 3 & 4 http://www.ices.dk/sites/pub/Publication%20Reports/Advice/2015/2015/nep-3-4.pdf	11,793	7,827	5,318	Not available	
Abundance index inside safe biological limits and exploited at >F_{MSY} Fishing mortality (Flim) for safe biological limits not defined						
Moray Firth; FU9	Norway lobster in Division IVb, FU 9. Moray Firth http://www.ices.dk/sites/pub/Publication%20Reports/Advice/2015/2015/nep-9.pdf	1,316	1,203	See caption		
Firth of Forth FU8	Norway lobster (Nephrops norvegicus) in Division IVb, FU 8 (Central North Sea, Firth of Forth) http://www.ices.dk/sites/pub/Publication%20Reports/Advice/2015/2015/nep-8-reopen.pdf	2,040	1,866			

[4] Includes discarded or 'unwanted catch'

[5] Calculated from advised total catch if discarding remains the average rate as previous years

Greater North Sea ecoregion; demersal stock trends 2000-2015

Label Figs 7,8,9	Stock	ICES Advice for 2016 tonnes		TAC for 2015 tonnes	Trends in stock abundance index	
		[4]Total Catch	Landings[5]		05-11	12-14
Abundance index at risk of being outside safe biological limits and exploited at >F_{MSY} Fishing mortality (Flim) for safe biological limits not defined						
FarnDeeps; FU6	Norway lobster (Nephrops spp.) in Division IVb, FU6 (Central North Sea, Farn Deeps) http://www.ices.dk/sites/pub/Publication%20Reports/Advice/2015/2015/nep-6.pdf	738	680	See caption	↓	↓
Data limited assessment; fishing mortality considered to be below F_{MSY}						
Not applicable	Norway lobster (Nephrops spp.) in Division IVa, (Northern North Sea, Norwegian Deep);FU32 http://www.ices.dk/sites/pub/Publication%20Reports/Advice/2015/2015/nep-32.pdf	642	554	1000	Not available	Not available
Not applicable	Nephrops in Botney Gut–Silver Pit (FU 5) http://www.ices.dk/sites/pub/Publication%20Reports/Advice/2014/2014/nep-5.pdf	1,159	1,143	See caption	Not available	Not available
Not applicable	Off Horn's Reef; FU 33 http://www.ices.dk/sites/pub/Publication%20Reports/Advice/2014/2014/nep-33.pdf	N/A	1,136		Not available	Not available
Not applicable	Devil's Hole (FU 34) http://www.ices.dk/sites/pub/Publication%20Reports/Advice/2014/2014/nep-34.pdf	410	383		Not available	↓
Not applicable	Noup; FU 10 http://www.ices.dk/sites/pub/Publication%20Reports/Advice/2014/2014/nep-10.pdf	33	32		Not available	Not available
Data limited assessment; no information on stock status; advice based on previous catches						
Not applicable	Norway lobster (*Nephrops* spp.) in Division IV outside the Functional Units. http://www.ices.dk/sites/pub/Publication%20Reports/Advice/2015/2015/nep-oth.pdf	NA	376	See caption	Not available	Not available

Data limited stocks

There are a range of assessment methods used for these stocks dependent on how much information there is available. The last few years have seen considerable development in ICES' methodology for the assessment of these 'data limited' stocks for which there are no full population assessments in terms of spawning stock biomass and fishing mortality as discussed above. Broadly for the North Sea they are classified into:

- Stocks for which there is a biomass index (from either research vessel surveys or commercial catches),
- Stocks for which other indicators are used; where catches may be based on previous levels of catch or other indicators

There is also scope for including an element of precaution in the assessments where through the implementation of the precautionary buffer, that is a reduction of 20% in catches.

Whilst these assessments may be considered suitable for keeping stocks at equilibrium in the medium term, there is a requirement to improve the methodology to enable assessment of the fishing mortality on the stocks; this is the subject of ongoing research by ICES.

In most cases these stock are assessed every two years, and the advice is valid for two years, therefore the TAC advice is the same for each of those years. Table 3 summarises biomass trends where available for flatfish, angler fish and skate and ray stocks where available, and includes links to assessments for further reading.

Flatfish stocks

The mature biomass index for all North Sea flatfish stocks relative to the mean for the time series 2000-2015 is shown in Figure 10 and is summarised in the short and medium term in **Error! Reference source not found.**. With the exception of turbot all these stocks are considered stable and the precautionary buffer of -20% is not advised for 2016. However for turbot;

"*The SSB index shows a strong decline from historical levels. Current F is likely to be above* F_{MSY} *proxies and the overall trend in F is increasing. Therefore, a precautionary buffer needs to be applied*."

ICES advises that all these stocks which are managed under a combined TACs; turbot with brill, dab with flounder, and lemon sole with witch[6] prevents effective control of the single species exploitation rates (ie Fishing Mortality) and could lead to the overexploitation of either species.

[6] Also known as witch flounder

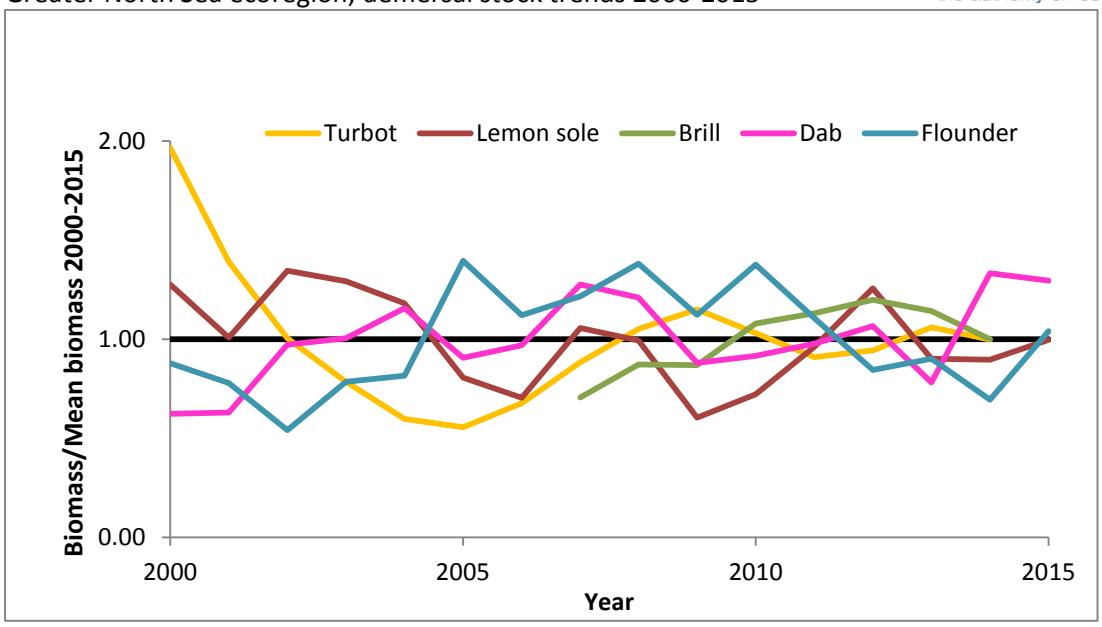

Figure 10 Trends in mature biomass related to mean value 2000-2015 (black line) for data limited North Sea flatfish stocks

Anglerfish

The management stock of anglerfish in the Greater North Sea; is a combined stock of *Lophius piscatorius* (predominantly) and *L. budegassa* in North Sea, Rockall and West of Scotland, Skagerrak and Kattegat. The stock size indicator Figure 11 has been trending upwards since 2011 and there has been no perceived need to apply a precautionary buffer .

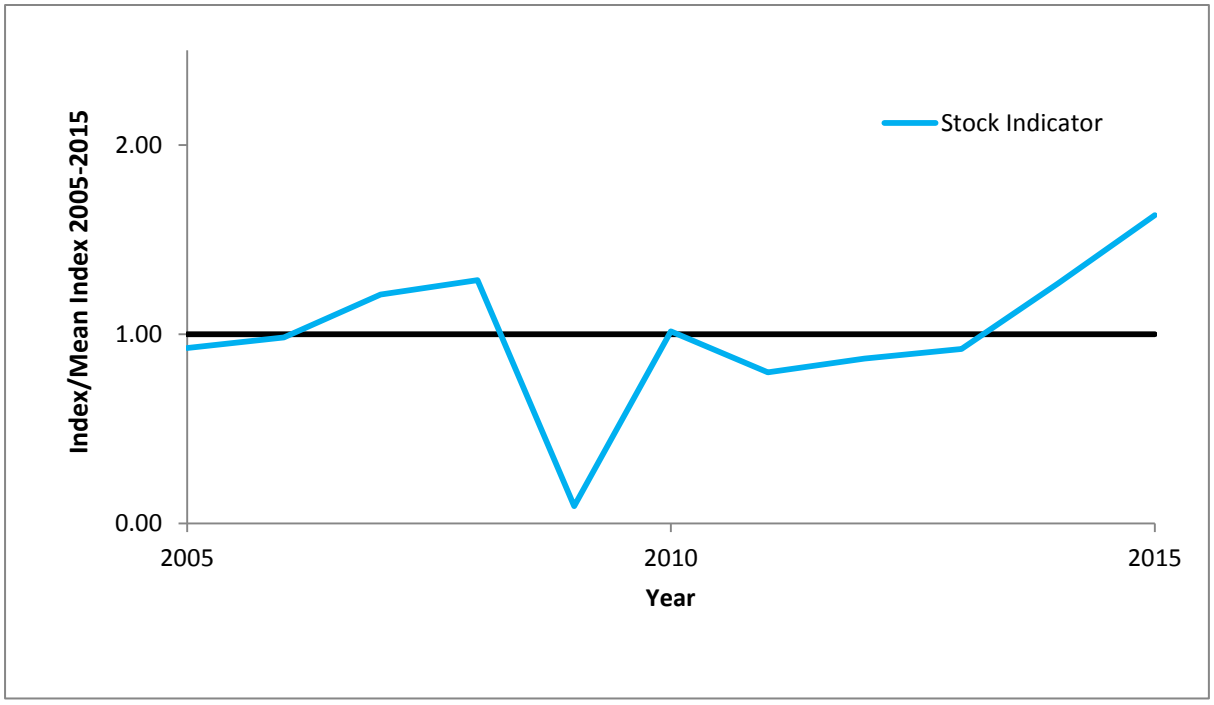

Figure 11 Trends in stock size indicator related to mean value 2000-2015 (black line) for anglerfish (*Lophius piscatorius* and L. *budegassa*) in Subareas IV and VI and Division IIIa

Skate and ray stocks

The latest advice for those species with a TAC is valid for two years 2016/17. Updated advice for elasmobranchs listed as prohibited species on TAC regulations were also provided this year, and advice for these stocks is valid for four years (2016–2019).

Trends in abundance for cuckoo, spotted and thornback rays are shown in Figure 12. For thornback ray and spotted ray, for which there are indices of relative abundance from research vessel data, there are clear indications of increasing abundance. The index of abundance for cuckoo ray has reduced slightly following an earlier increase over the past years. These abundance changes are reflected in the advice for these species with increases of up to 20% advised for thornback and spotted rays, and an 8.2% decrease for cuckoo ray. There was no application of the precautionary buffer (–20%) for these species.

For blonde ray, which is a relatively minor stock in the North Sea, a precautionary buffer reduction of -20% was advised because there was no clear indication of the level of exploitation and no reliable abundance index is available. Blonde rays tend to live in locations which are outside the broader survey area. The advice for starry ray is that there should not be a targeted fishery and measures should be taken to reduce bycatch; it is currently a prohibited species as is common skate.

An important issue for skate and ray stocks is the mixed species TAC which makes it difficult to control fishing mortality on individual stocks.

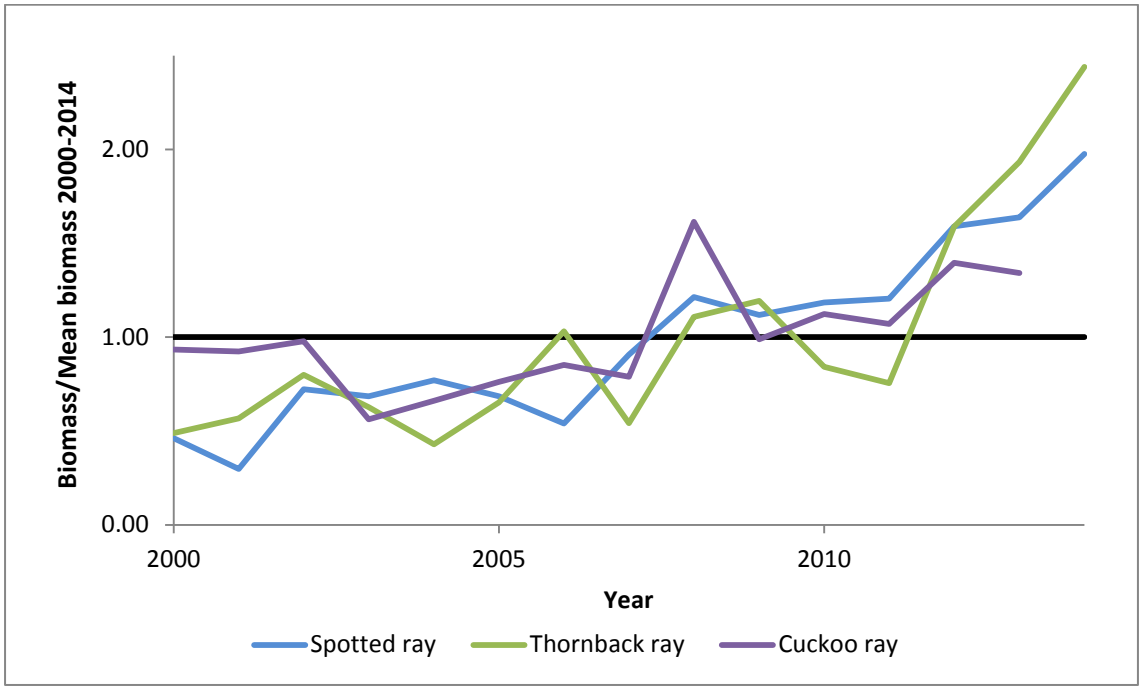

Figure 12 Trends in mature biomass related to mean value 2000-2015 (black line) for data limited North Sea ray stocks

Greater North Sea ecoregion; demersal stock trends 2000-2015

Table 3 Summary of data limited stock trends

Label Figs 10,12	Stock includes link to ICES advice	ICES Advice for 2016 tonnes		TAC for 2015 tonnes	Trend in stock size index	
		Catch	Landings		00-12	13-15
Turbot	Turbot (*Scophthalmus maximus*) in Subarea IV (North Sea) http://www.ices.dk/sites/pub/Publication%20Reports/Advice/2015/2015/tur-nsea.pdf	1,995	1,925	4,642	↓	→
Brill	Brill in Subarea IV and Divisions IIIa and VIId,e. http://www.ices.dk/sites/pub/Publication%20Reports/Advice/2015/2015/bll-nsea.pdf	2,756	2,563		Not Available	→
Not applicable	Turbot (*Scophthalmus maximus*) in Division IIIa (Skagerrak and Kattegat) http://www.ices.dk/sites/pub/Publication%20Reports/Advice/2015/2015/tur-kask.pdf	88	82	No agreed TAC	↓	↓
Lemon sole	Lemon sole in Sub area IV and divisons IIIa and VIId http://www.ices.dk/sites/pub/Publication%20Reports/Advice/2015/2015/lem-nsea.pdf	5,655	3,959	6,391	→	→
Not applicable	Witch (*Glyptocephalus cynoglossus*) in Subarea IV and Divisions IIIa and VIId (North Sea, Skagerrak and Kattegat, Eastern English Channel) http://www.ices.dk/sites/pub/Publication%20Reports/Advice/2015/2015/wit-nsea.pdf	2,212	1,889		↓	↑
Dab	Dab (*Limanda limanda*) in Subarea IV and Division IIIa http://www.ices.dk/sites/pub/Publication%20Reports/Advice/2015/2015/dab-nsea.pdf	76,075	7,608	18,434	→	→
Flounder	Flounder in Division IIIa and Subarea IV http://www.ices.dk/sites/pub/Publication%20Reports/Advice/2015/2015/fle-nsea.pdf	5,228	2876		→	→

Greater North Sea ecoregion; demersal stock trends 2000-2015

Label Figs 10,12	Stock includes link to ICES advice	ICES Advice for 2016 tonnes		TAC for 2015 tonnes	Trend in stock size index	
		Catch	Landings		00-12	13-15
Figure 11	Anglerfish (*Lophius piscatorius* and *L. budegassa*) in Subareas IV and VI and Division IIIa (North Sea, Rockall and West of Scotland, Skagerrak and Kattegat) http://www.ices.dk/sites/pub/Publication%20Reports/Advice/2015/2015/ang-ivvi.pdf	18,435	17,642	16,203	→	↑
Cuckoo ray	Cuckoo ray (*Leucoraja naevus*) in Subarea IV and Division IIIa (North Sea, Skagerrak, and Kattegat) http://www.ices.dk/sites/pub/Publication%20Reports/Advice/2015/2015/rjn-34.pdf		128	Combined TACs Sub Area IV and Divs.IIIa &VIId= 2,101	↑	→
Thornback ray	Thornback ray (*Raja clavata*) in Subarea IV and Divisions IIIa and VIId (North Sea, Skagerrak, Kattegat, and eastern English Channel) http://www.ices.dk/sites/pub/Publication%20Reports/Advice/2015/2015/rjc-347d.pdf		2,110		↑	↑
Spotted ray	Spotted ray (*Raja montagui*) in Subarea IV and Divisions IIIa and VIId (North Sea, Skagerrak, Kattegat, and eastern English Channel) http://www.ices.dk/sites/pub/Publication%20Reports/Advice/2015/2015/rjm-347d.pdf		292		↑	↑
Not applicable	Blonde ray (Raja brachyura) in Divisions IVc and VIId (southern North Sea and eastern English Channel) http://www.ices.dk/sites/pub/Publication%20Reports/Advice/2015/2015/rjh-4c7d.pdf		162		Unknown	
	Blonde ray (Raja brachyura) in Subarea VI and Division IVa (northern North Sea and west of Scotland) http://www.ices.dk/sites/pub/Publication%20Reports/Advice/2015/2015/rjh-4aVI.pdf		6		Unknown	

Greater North Sea ecoregion; demersal stock trends 2000-2015

Label Figs 10,12	Stock includes link to ICES advice	ICES Advice for 2016 tonnes		TAC for 2015 tonnes	Trend in stock size index	
		Catch	Landings		00-12	13-15
Not applicable	Common skate (*Dipturus batis*-complex) in Subarea IV and Division IIIa (North Sea,Skagerrak, and Kattegat) http://www.ices.dk/sites/pub/Publication%20Reports/Advice/2015/2015/rjb-34.pdf		No fishery, minimize bycatch	Prohibited species	Unknown	
Not applicable	Starry ray (*Amblyraja radiata*) in Subareas II and IV and Division IIIa (Norwegian Sea, North Sea, Skagerrak, and Kattegat) http://www.ices.dk/sites/pub/Publication%20Reports/Advice/2015/2015/rjr-234.pdf				↓	↓

Protected, Endangered or Threatened (PET) species

As part of ICES memorandum of understanding with the European Union to produce information on Ecosystem approach deliverables, ICES has produced information and advice on bycatches of protected, endangered and threatened species in response to EU requests. For sea birds this includes a list of fisheries from which bycatch information is lacking. For marine mammals this summarises the data on cetacean bycatch collected under the requirement to monitor bycatch of these species under the Council Regulation (EC) 812/2004. In this advice the rate of capture of the main bycatch species -harbour porpoise- is assessed, and found to be at levels considered sustainable, though this is caveated with there being unknown bias in the surveys. The regulation (812/2004) includes the requirement for use of active acoustic deterrents (pingers) designed to counter porpoise bycatch in static nets.

Link to Marine mammals in North West European waters advice

http://www.ices.dk/sites/pub/Publication%20Reports/Advice/2015/2015/Bycatch_of_PETS_Advice_2015.pdf

Trends in effort levels

The cod long term management plan (Council Regulation 1342/2008) requires that fishing effort in the main gear groups catching cod be reduced with the aim of reducing fishing mortality on this species and hence aiding recovery. Figure 13 (derived from STECF 2014) shows trends in fishing effort levels from 2004- 2013 in the main demersal gears used in the North Sea. The main demersal fleets; beam trawl, whitefish and Nephrops trawls have all seen a decline in fishing effort over the period 2004 to 2013. From 2008 effort in the main trawl fisheries has been regulated under the cod long term management plan. This has resulted in a resulted in reductions of effort of 25% per annum from 2009 to 2012 in the areas where scientific advice indicated the highest reductions in catches of cod were required, and significant reductions in effort in other areas with incentives in terms of additional days at sea for more selective gear.

However, in 2012 it was agreed to amend the cod long term management plan ending automatic reductions in fishing effort in under the plan (Council Regulation (EC) 1243/2012). This was because it is difficult to demonstrate that automatic reductions in effort lead to corresponding decreases in cod fishing mortality and in practice the automatic reductions in fishing effort removed or reduced the incentives for fishermen to reduce fishing mortality on cod by other means. These effort reductions would also have a significant social and economic impact on fisheries that did not target cod.

So from 2013, more flexibility has been introduced into the cod long term management plan. Effort adjustments are related to adjustments in the cod TAC compared with the TAC the previous year, rather than reducing effort in relation to the baseline, which was set in relation to effort during the early 2000s. Also the Council is permitted not to apply the annual adjustment if the fishing effort has been reduced for the previous four years.

This means that changes effort levels are more related to current TAC changes and there is more flexibility in the plan. Selective gears and fishing practices are also used to reduce fishing mortality (see below) as well as reductions in fishing effort.

Link to fishing effort information

https://stecf.jrc.ec.europa.eu/web/stecf/ewg1413

Figure 13 Trends fishing effort levels for the period 2004 to 2013 main towed gears, North Sea, Skaggerak and Eastern Channel; Otter trawls 80-99 mm predominantly targeting Nephrops but also species such as whiting , Beam trawls 80-120 mm targeting sole; TR1; Large mesh 100-120+mm otter trawls targeting whitefish

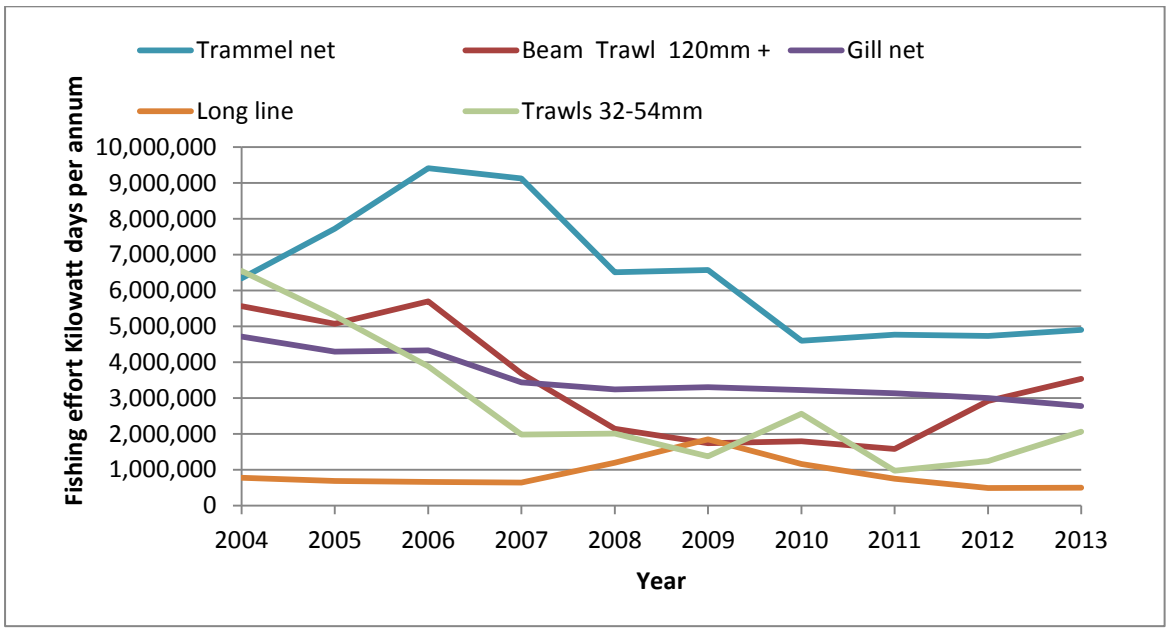

Figure 14 Trends fishing effort levels for the period 2004 to 2013, North Sea, Skaggerak and Eastern Channel; Trammel nets targeting Anglerfish, Beam trawls 120 mm + targeting plaice small mesh otter trawls (32-54 mm) targeting sand eels and pelagic Gill nets longlines F targeting whitefish rom STECF 2014 (Note different scales on Y axis Figs 13-14)

Link to fishing effort information

http://stecf.jrc.ec.europa.eu/web/stecf/ewg1413

Discard trends

Trends in percentage discarding by weight for North Sea demersal stocks, derived from the assessments discussed above, are shown in Figure 15. For cod, whiting and plaice the trend in terms of discarding by weight has been downwards over the last decade. The discard rate for haddock is highly variable, due to the large incoming year classes which result in high levels of discarding as these large year classes enter the fishery, but is currently relatively low in relation to earlier periods in the time series. For North Sea saithe and sole, the discard rates are at relatively low levels circa 10% by weight.

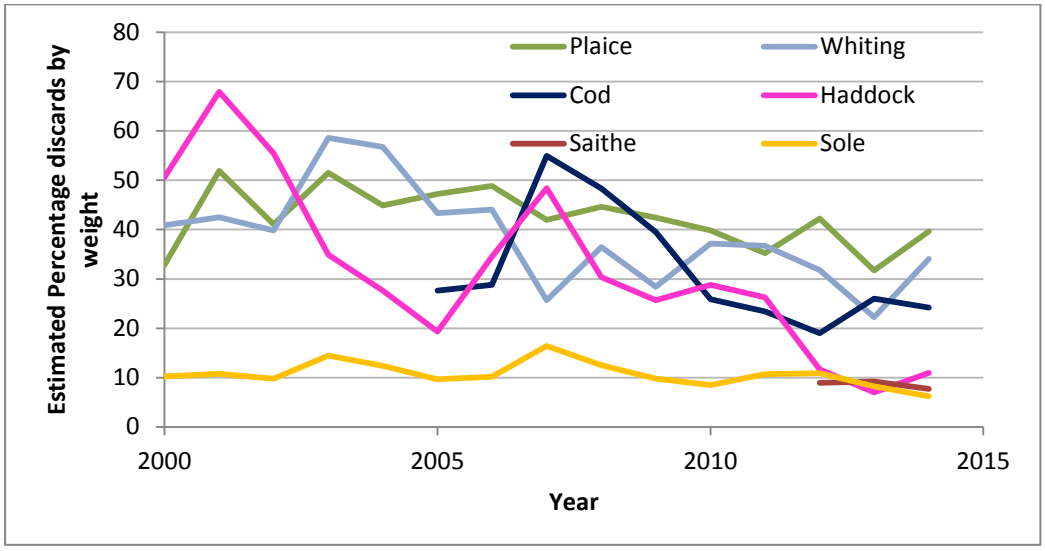

Figure 15 Trends in discarding in North Sea demersal stocks 2000-15

Whilst these trends are encouraging, it would be difficult to give a full account for each stock of the factors which influence these rates. Some possible factors are;

The North Sea and Skagerrak, Kattegat, Eastern Channel, West of Scotland and Irish Sea cod stocks are subject to a long-term management plan (Council Regulation (EC) No 1342/2008) with target levels of fishing mortality. Member States are empowered to provide incentives through additional fishing effort allowances to vessels which participate in good fishing practices aimed at reducing fishing's impact on the environment and conservation of cod.

Examples of these practices include the 'real time closure' scheme which closes areas where high concentrations of cod and juvenile cod, haddock, whiting and saithe are found in the catches, and the 'catch quota' scheme where catches are monitored using video recordings, all catches of cod including juveniles have to be landed and counted against the vessels' quota. There are also incentives to use more selective gear; larger mesh sized cod ends.

For sole fisheries the main gear used (beam trawl) shows good selectivity for sole, hence the relatively low discard rate for this species, although it is not as selective for plaice which

contributes to the high discard rate for plaice because the two species are caught together in mixed fisheries. There is good separation between the juvenile and adult saithe, which means that there is less capture of undersized saithe.

Mixed fisheries advice

Because North Sea fisheries catch a mixture of stocks, and each stock is likely to have a different optimal management regime, management decisions concerning the catch of one stock are likely to have an effect on the catches of other stocks. For example there may be more catch available of one stock in a mixed fishery even after the Total Allowable Catch of other stocks captured in the fishery have been used up. In order to understand these trade-offs ICES has been giving mixed fisheries advice for North Sea fisheries since 2013.

Mixed fisheries advice is based on the assumption that fishing patterns are the same from year to year and uses information from single stock assessments. It does not give a specific recommendation but it presents a range of scenarios enabling the managers to understand the trade-offs between stocks and which stocks are likely to become limiting, that is so called 'choke species'. For the North Sea, Skagerrak and Eastern English Channel, mixed fisheries advice incorporates cod, haddock, plaice saithe, sole, whiting and Nephrops and the fisheries using otter trawls, seines, beam trawls, static gear, longlines and other gears.

Key results from this year's assessment include;

- For the first time since 2006, North Sea cod is not the most limiting stock. Under circumstances of a fully implemented discard ban, it is likely that whiting and Eastern Channel sole would become limiting first for 46% and 17% of the 2014 effort respectively.
- The assessment highlighted the implications of the Nephrops stocks being managed an overall TAC for the North Sea and not separate TACs for the different functional units. If this was the case Nephrops on the Farn Deeps would become limiting for 34% of the 2014 effort. However, this stock is exploited at above maximum sustained yield and is beginning to show signs of stress (see above).

As implied in the above mixed fisheries advice is likely to become of more importance as the EU discard ban or landings obligation is implemented over the coming five years. The EU are preparing a long term management plan for the North Sea fisheries so we may expect that mixed fisheries advice will be an important component.

Links

Mixed-fisheries advice for Subarea IV (North Sea) and Divisions IIIa North (Skagerrak) and VIId (Eastern Channel)

http://www.ices.dk/sites/pub/Publication%20Reports/Advice/2015/2015/mix-nsea.pdf

Implications for North Sea fishery management

Fisheries management in the Greater North Sea has been dominated by the management of the cod stock, which has been considered to be outside safe biological limits from 1996 to 2013. It was recognised in the cod recovery and management plans that in order to recover cod stocks the North Sea it was essential that fishing effort was reduced. This has been achieved over the period since 2000. The cod stock reached a low point in 2006 after which the stock began to rebuild, with the current biomass being around three times what it was in 2006 although still in the at risk category. There appear to be corresponding improvement in terms of reducing fishing mortality and increasing biomass in the other North Sea stocks. Whilst the rate of reduction in effort has slowed since 2012, the emphasis is now more on improved selectivity and focussed reductions in effort and on the main cod catching fisheries. It is clear from this analysis that changes in fisheries management are more discernible over the long term; ten years and longer, than year on year changes.

Specific issues relating to stocks are;

- There is a clear need to find suitable measures for improving management of the sea bass stock, and this has been the subject of emergency measures this year, with longer term plans advised.

- Nephrops stocks are generally healthy except Farn Deeps (Functional Unit 7), however the management TAC is out of line with the assessed units. The main issue with these stocks is that there is a lack of control over catches at Functional Unit level which risks over exploitation of the individual Functional Units. Currently this puts Farn deep stocks at particular risk. The North Sea Advisory Council is developing a management plan for North Sea Nephrops fisheries.

- North Sea data limited flatfish stocks appear to be at equilibrium with relatively stable TACs. However, turbot is relatively low compared with long term averages, and a precautionary 20% reduction in catches is advised for this stock. An important management issue for all these stocks are the combined species TACs under which they are managed which means that TACs are not limiting on particular species.
- There are clear signs of improvement in North Sea anglerfish and ray stocks. The stock size indicators for these stocks are showing clearly positive signs for the main retained stocks of anglerfish, thornback, cuckoo and spotted rays although there is more uncertainty concerning blonde ray, which is a minor component in the catches. There is more uncertainty concerning the status of the prohibited species, starry ray and common skate. The main management challenge is that the combined TACs for all ray stocks means that control of catches on individual ray species is not feasible under current management.

Future Advice

As part of ICES memorandum of understanding with the European Union to produce information on Ecosystem approach deliverables, ICES will be expected to produce information and advice on other components of the ecosystem, such as sea mammals, sea birds and ecological communities. This will also contribute to the achievement of 'Good Environmental Status' by 2020 under the EU's Marine Strategy Framework Directive (Council Regulation (EC) 56/2008) and provide a useful information on the health of these components of the ecosystem.

The main challenge for the data limited stocks is to find methods to assess their exploitation status; that is fishing mortality and to develop management measures appropriate to these species within the mixed fisheries.

The mixed fisheries advice is of increasing importance particularly in relation to the landings obligation. Discard rates are falling, though remain high in some fisheries and a full implementation of the landings obligation would have implications for a high proportion of fisheries. The EU is in the process of formulating a long term management plan for all the demersal fisheries of the North Sea. To this end ICES has produced advice on fishing mortality for maximum sustainable yield ranges which would deliver a long term yield of no more than 5% reduction in long term yields compared with MSY. This would improve scope for flexibility in managing yields from stocks in a mixed fishery context.

Link

EU request to ICES to provide FMSY ranges for selected North Sea and Baltic Sea stocks

http://www.ices.dk/sites/pub/Publication%20Reports/Advice/2015/Special_Requests/EU_FMSY_ranges_for_selected_NS_and_BS_stocks.pdf