# ICES WGMIXFISH-NS REPORT 2014

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# Report of the Working Group on Mixed Fisheries Advice for the North Sea (WGMIXFISH-NS)

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# Contents

## Executive summary

The ICES Working Group on Mixed Fisheries Advice for the North Sea [WGMIXFISH-NS] (Chair: Paul Dolder (UK)) met at ICES HQ, 26—30 May 2014 to apply mixed fisheries forecasts to the draft North Sea single species advice formed by WGNSSK 2014.

The meeting has produced a North Sea Mixed Fisheries Advice sheet and included lines showing mixed fisheries scenario outcomes in the single species advice sheets (for those stocks considered) for consideration by the ACOM advice drafting group. It did not consider ToR c (application of the FCube methodology to the West of Scotland fisheries) due to a lack of available expertise in this geographic area or ToR d (application to the Iberian waters) which is deferred to the October meeting when relevant experts will be available.

The North Sea mixed fisheries runs followed the approach used by ICES; management plan where it exists and MSY approach otherwise. The species considered here as part of the demersal mixed fisheries of the North Sea are cod, haddock, whiting, saithe, plaice, sole, and *Nephrops norvegicus*, as well as plaice VIId and soleVIId. The North Sea (ICES area IV) turbot stock was also added to the full scenario calculations this year. All of these are now subject to multi-annual management plans apart from turbot, plaiceVIId, soleVIId and *Nephrops*. Following the decision to extend the definition of the haddock stock to include the west of Scotland (ICES Subarea VIa), ICES considered the north sea haddock management plan to no longer apply, and the MIXFISH forecasts similarly follow MSY approach advice for this stock. Five scenarios were considered.

1 ) **max**: The underlying assumption was that fishing stops when all quota species are fully utilized with respect to the upper limit corresponding to single-stock exploitation boundary.
2 ) **min**: The underlying assumption was that fishing stops when the catch for the first quota species meets the upper limit corresponding to single-stock exploitation boundary.
3 ) **cod**: The underlying assumption was that all fleets set their effort at the level corresponding to their cod quota share, regardless of other stocks.
4 ) **sq_E**: The effort was set as equal to the effort in the most recently recorded year for which there are landings and discard data.
5 ) **Ef_Mgt**: The effort in métiers that used gear controlled by the EU effort management regime had effort adjusted according to the regime.

The **max** and **min** scenarios were included to bracket the space of potential catch and SSB outcomes but for most fleets are considered unrealistic scenarios. Of the remaining scenarios none was picked as a preferred scenario. Effort limits under the EU effort management regime were left unchanged in 2013 and 2014 and the WG considered the relationship between F and effort changes under the long term management phase of the cod recovery plan open to interpretation but still included the scenario, having made its own interpretation of the control rule.

Exploratory analyses were undertaken to allow consideration of the level of cod avoidance required to be consistent with the single-stock exploitation boundaries for the cod stock in the absence of further adjustments to fishing effort ceilings. These are included as a 'cod catchability reduction' scenario.

The most limiting stocks (i.e. the stocks which are the first quota reached for most fleets) in the North Sea demersal mixed fisheries in 2015 were cod and *Nephrops* FU6 (Farn Deeps). The least limiting stocks (i.e. the stocks which were the last quotas to be fulfilled) were haddock and *Nephrops* FU7 (Fladen grounds). The 'cod catchability reduction' analysis indicates cod avoidance at the level of an additional 40—50% of 2013 level would be required in order to meet the cod single-stock target which the current level of fishing effort.

The impact of mixed fisheries scenarios on seven further stocks; brill, dab, flounder, hake, lemon sole, red mullet and witch were considered without their incorporation into the mixed fisheries projections. All TACs of these stocks except the North Sea component of the hake TAC were predicted to be underutilized under assumption of status quo effort, while hake was predicted to be subject to over-quota catches under all scenarios, including '**min**'.

In 2014 data for this WG was requested as part of a joint WGNSSK-WGMIXFISH-WGNEW data call which allows a greater consistency between catch totals supplied to WGMIXFISH, WGNSSK and WGNEW and additional stocks to be included in the mixed fishery forecasts. It is expected that further stocks will be able to be considered in the mixed fisheries projections as assessments become available.

# 1 Introduction

## 1.1 Background

The **Working Group on Mixed Fisheries Advice for the North Sea** [WGMIXFISH-NS] (Chair: Paul Dolder (UK)) met at ICES HQ, 26—30 May 2014 to apply mixed fisheries forecasts to the North Sea single species advice. As in 2013 WGMIXFISH advice is to be considered by ADGNS as for the single species advice and so the WG can only consider preliminary advice. The output from this group applies the methodology developed by the ICES Workshop on Mixed Fisheries Advice for the North Sea [WKMIXFISH] (ICES 2009a) and Ad hoc Group on Mixed Fisheries Advice for the North Sea [AGMIXNS] (ICES 2009b) which met in 2009.

The current interest in fleet- and fishery-based approaches has its origins around 2002, when the conflicting states of the various demersal stocks in the North Sea made the limitations of the traditional, single-species approach to advice particularly apparent. The history of the adoption and development of the Fcube approach (after Fleet and Fishery Forecast) used by this WG is detailed in ICES (2009a). At WGMIXFISH 2011 the WG considered steps to fuller integration of mixed fisheries forecasts into stock advice. Most of the steps recommended have been implemented starting in 2012.

The mixed fishery advice will be based on the CFP TAC regime and is consistent with relative stability. The circumstances of 2002 have also lead to the introduction of effort restrictions alongside TACs as a management measure within EU fisheries and there has been an increasing use of single-species multi-annual management plans, partly in relation to cod recovery, but also more generally. These developments are of key importance for the general approach to mixed-fisheries advice, which must build on the existing legal and management system. The species considered here as part of the demersal mixed fisheries of the North Sea are cod, haddock, whiting, saithe, plaice, sole, and *Nephrops norvegicus*, as well as plaice VIId and soleVIId. The North Sea (ICES area IV) turbot stock was also added to the full scenario calculations this year.

All of these stocks are now subject to multi-annual management plans apart from turbot, plaice VIId, sole VIId and *Nephrops*. Following the decision to extend the definition of the haddock stock to include the west of Scotland (ICES Subarea VIa), ICES considered the north sea haddock management plan to no longer apply, and the MIXFISH forecasts similarly follow MSY approach advice for this stock.

With the revised CFP introducing a landings obligation in EU demersal fisheries from 2016 other stocks have been raised as a concern in terms of their ability to limit fishing opportunities for other stocks. Among these are brill, dab, flounder, hake, lemon sole, red mullet and witch. The working group considers technical issues prevent these stocks from being incorporated into the mixed fisheries projections but, using landings per unit effort measured in 2013, landings of these stocks were calculated once the mixed fisheries projections had determined fleet effort levels in order to provide an indication of the levels of under- and over-quota landings of these stocks under a plausible range of effort levels.

# 2 Effort limitations

For vessels registered in EU member states, effort restrictions in terms of days at sea were introduced in Annex XVII of Council Regulation 2341/2002 and amended by Council on an annual basis. In 2008 the system was radically redesigned. For 2009 effort limits were changed to be on the basis of kWdays effort pots assigned per nation per fleet effort category. The baselines assigned in 2009 were based on track record per fleet effort category averaged over 2004—2006 or 2005—2007 depending on national preference. The latest effort allocations available by nation and gear are given in Appendix 1 of Annex IIa of Council Regulation (EU) 43/2014. The totals in 2014 are unchanged from those in 2012. Member states are permitted slightly larger allocations of effort in cases where that effort involves low cod catches, e.g. through the implementation of more selective gears or cod avoidance measures. Full details are given in Article 13 of Council Regulation (EC) 1342/2008.

## 2.1 Stock-based management plans

The majority of the stocks considered here as part of the demersal mixed fisheries of the North Sea are subject to multi-annual management plans[1]. These plans all consist of harvest rules to derive annual TACs depending on the state of the stock relative to biomass reference points and target fishing mortality. The harvest rules also impose constraints on the annual percentage change in TAC.

These plans have been discussed, evaluated and adopted on a stock-by-stock basis, involving different timing, procedures, stakeholders and scientists, and as such have never been evaluated in an integrated approach.

In 2014, the assessment for haddock in areas IV and IIIa incorporated area VI, which was previously a separate stock, as evidence suggests they should be managed together as a single unit. This has implications for the implementation of the current management plan for haddock in areas IV and IIIa and the current management plan is considered no longer appropriate. ICES advice in 2014 is given in terms of the newly estimated MSY for the whole stock.

The full details and references of these plans are not always easy to find. The most important points of these plans are therefore reproduced in Annex 4.

## 2.2 Definitions

Two basic concepts are of primary importance when dealing with mixed-fisheries, the Fleet (or fleet segment), and the Métier. Their definition has evolved with time, but the most recent official definitions are those from the CEC's Data Collection Framework (DCF, Reg. (EC) No 949/2008 and Commission Decision 2010/93/UE), which we adopt here:

- ***A Fleet segment*** is a group of vessels with the same length class and predominant fishing gear during the year. Vessels may have different fishing

[1] The exceptions are plaice VIId, sole VIId, turbot IV and the *Nephrops* stocks. For these stocks the ICES MSY approach or Data Limited Stock (DLS) approach is used as the basis of advice.

activities during the reference period, but might be classified in only one fleet segment.

- ***A Métier*** is a group of fishing operations targeting a similar (assemblage of) species, using similar gear, during the same period of the year and/or within the same area and which are characterized by a similar exploitation pattern.

From 2012 WGMIXFISH has requested data according to aggregations based on the definitions of the EU Data Collection Framework (DCF). The data call allowed merging across DCF métiers (see Section 3.2 and Annex 2) and as such national data entries were sometimes not by métier in the strict sense. Merging of métiers to reduce to a manageable number going forwards in the forecasts further leads to the formation of combined or 'supra-métiers'.

## 2.3 Terms of Reference

The terms of reference for WGMIXFISH were as follows

2013/2/ACOM22 The **Working Group on Mixed Fisheries Advice** (WGMIXFISH-ADVICE), chaired by Paul Dolder, UK, will meet at ICES Headquarters, 26–30 May 2014 to:

a ) Carry out mixed demersal fisheries projections for the North Sea taking into account the single species advice for cod, haddock, whiting, saithe, plaice, sole and *Nephrops* that is produced by WGNSSK in April 2014, and the management measures in place for 2015;

b ) Produce a draft North Sea mixed-fisheries section for the ICES advisory report 2014 that includes a presentation of the fleet and fisheries data and forecasts;

c ) Depending on the availability of expertise, undertake preliminary compilation and review of available fleet and fisheries data for West of Scotland fisheries. Consider the feasibility and best timing for producing a draft West of Scotland mixed-fisheries section for the ICES advisory report 2014 that includes a presentation of the fleet and fisheries data and forecasts for the west of Scotland region, taking into account advice released for *Nephrops* stocks in autumn;

d ) Depending on the availability of expertise, undertake preliminary compilation and review of available fleet and fisheries data for Iberian fisheries. Consider the feasibility of, and identify the steps needed to, accomplish a mixed-fisheries approach in Iberian waters taking account of the timing of relevant expert groups (WGBIE, WGHANSA, WGWIDE).

WGMIXFISH will report by 2 June 2014 for the attention of ACOM.

# 3 Software

All analyses were conducted using the FLR framework (Kell *et al.* (2007); www.flr-project.org; FLCore 2.5.0, FLAssess 2.5.0, Flash 2.5.0) running with R2.15.1 (R Development Core Team, 2011). All forecasts were projected using the same fwd() function in the Flash Package. The Fcube method is developed as a stand-alone script using FLR objects as inputs and outputs.

The Fcube model has been presented and described in Ulrich *et al.* (2008; 2011). Brief details are presented below and a summary of the methodology is incorporated in the Mixed Fisheries Annex:

https://groupnet.ices.dk/WGMIXFISH2013/Report%202013/Forms/AllItems.aspx

## 3.1 Fcube

The basis of the model is to estimate the potential future levels of effort by a fleet corresponding to the fishing opportunities (TACs by stock and/or effort allocations by fleet) available to that fleet, based on fleet effort distribution and catchability by métier. This level of effort was used to estimate landings and catches by fleet and stock, using standard forecasting procedures.

In 2014, single-species ICES advice was given according to a single preferred option; management plan if implemented, MSY approach otherwise. The basis for each single-stock advice was retained in the current mixed-fisheries framework.

A complicating factor when incorporating *Nephrops* is the fact that the species is found in a number of distinct areas or functional units (FU), only some of which receive an abundance estimate (necessary to calculate a catchability). This WG followed the approach adopted by ICES (2009b) which is to perform the normal Fcube prediction for those FUs with absolute abundance estimates, then to calculate a ratio (R) of the yields to the ICES advice for the same FUs. For those FUs without absolute abundance estimates, landings resulting from the Fcube run were simply taken to be the most recently recorded landings multiplied by the same ratio R. To do this, landings for each métier had to be apportioned across the FUs. This was facilitated by the supply of effort and catch data by FU.

Prior to 2009, precursors to WGMIXFISH compiled age-disaggregated data over a large number of categories. Analyses in 2008 highlighted that the age composition of landings showed distinct differences to that supplied to the single species stock assessment working group (WGNSSK) and therefore WGMIXFISH runs projections on the basis of total landings and discards alone. From 2012 age distribution by métier and area is available to WGNSSK in InterCatch and it is ultimately the aim of WGMIXFISH to include age specific data in the projections.

As in previous years, the following five options (or scenarios) were included in the advice:

1 ) **max**: The underlying assumption was that fishing stops when all quota species are fully utilized with respect to the upper limit corresponding to single-stock exploitation boundary.

2 ) **min**: The underlying assumption was that fishing stops when the catch for the first quota species meets the upper limit corresponding to single-stock exploitation boundary.

3 ) **cod**: The underlying assumption was that all fleets set their effort at the level corresponding to their cod quota share, regardless of other stocks.

4 ) **sq_E**: The effort was set as equal to the effort in the most recently recorded year for which landings and discard data were available.

5 ) **Ef_Mgt**: The scenario was set up so that métiers controlled by the EU effort management regimes had effort adjusted according to the regimes. In 2013 and 2014 all effort totals were left unaltered and whether effort controls are reintroduced in 2015 is undecided. In 2014 the cod single species advice entered the long-term management phase for the first time and the relationship between the stipuled reductions in F and reductions in fishing effort required by the plan becomes open to interpretation. The WG implemented the scenario using the assumption that the % change in effort from 2014 to 2015 is the same as the % change in F. Possible effort reductions resulting from the application of the EU flatfish management plan were not considered this year partly because the WG was unsure how to invoke country-specific changes based on share of flatfish catches.

Given the strongly limiting effect of cod as a choke stock on the overall North Sea fisheries an additional exploratory run was performed, 'cod catchability reduction' which considered the level of cod catchability reduction required (for example, by changes in selectivity or cod avoidance) to meet the singles-stock exploitation target given the level of fishing effort required to fully utilize quotas of other stocks. This analysis was performed by decreasing the cod catchability parameter for all métiers by a factor ranging from 10 % (little avoidance) to 100% (full avoidance).

# 4 Input data and recent trends

## 4.1 Stocks

### 4.1.1 Data

The assessment data for the different stocks were taken from ICES WGNSSK (2014). This year for the first time, all stock inputs formatted as FLStock objects were directly provided to WGMIXFISH by the respective stock coordinators, and this eased greatly the quality of the process of collecting stock data. No corrections had to be performed afterwards.

An increasing number of WGNSSK stocks are being assessed using stochastic assessments (SAM model for North Sea cod, TSA for Northern shelf haddock, SCA for North Sea turbot). These also make use of stochastic projections, which cannot easily be fully replicated in the deterministic Fcube software. However, Fcube projections are routinely compared to the median projections of the single species stochastic forecasts on which single-stock advice is based and results are very similar (see Section 5.2.1); as such WGMIXFISH does not consider the difference impacts significantly on the mixed fisheries advice.

*Nephrops* stocks were incorporated in the evaluation by functional unit. For the *Nephrops* stocks in FU 5, FU6, FU7, FU8, FU9, FU32, FU33, FU34 and *Nephrops* from areas outside the functional units, the ICES advices were taken for the Fmsy approach.

The functional units with separate stock indices from underwater surveys (FU6, FU7, FU8 and FU9) were treated as separate *Nephrops* identities in the projections whereas the five other functional units (FU 5, 10, 32, 33 and 34) and catches outside the functional units in the North Sea were omitted in the projections.

The final dataset extracted from InterCatch for use by WGNSSK includes discards estimates (either imported or raised) for all stocks and métiers. These Intercatch estimates have been used to estimate a discard ratio by métier, which allows allocating discards for all WGMIXFISH fleets and métiers with matching names, such that;

$$d^* = \frac{Dl}{L}$$

Where d* is the discard value for the métier used by Fcube, l is the weight of landings for the métier used by Fcube and L and D are the weight of landings and discards entered for the (vessel length aggregated) métier in InterCatch.

### 4.1.2 Trends and advice

**This advice is drafted by the WGNSSK-2014 before considerations by ACOM.**

Recent trends are described on a stock-by-stock basis in ICES (2014), and latest advice by stock is available on the ICES website. In order to give a global overview of all North Sea demersal stocks at one time, this information is summarized below. It should be noted that although there is only one advice, additional management considerations are also listed in the single species advice. Table 4.1.2.1 lists the final advised TACs for 2015 and expected SSBs in 2016.

### 4.1.2.1 Analytical stocks

| Species | Area | Stock status | Summary | Advice 2015 |
|---|---|---|---|---|
| cod | Subarea IV (North Sea) and Divisions VIId (Eastern Channel) and IIIa West (Skagerrak) | **Stock status**<br>**Fishing pressure**<br>2011 2012 **2013**<br>MSY ($F_{MSY}$) ✗ ✗ ✗ Above target<br>Precautionary approach ($F_{pa}$,$F_{lim}$) ✓ ✓ ✓ Harvested sustainably<br>Management plan ($F_{MP}$) ✗ ✗ ✓ Below target<br>**Stock size**<br>2012 2013 **2014**<br>MSY ($B_{trigger}$) ✗ ✗ ✗ Below trigger<br>Precautionary approach ($B_{pa}$,$B_{lim}$) ✗ ✗ ✗ Increased risk<br>Management plan ($SSB_{MP}$) ✗ ✗ ✗ Below trigger | Fishing mortality declined from 2000 and is now estimated to be around 0.4, between Fpa and the FMSY proxy. There has been a gradual improvement in the status of the stock over the last few years. SSB has increased from the historical low in 2006, and is now in the vicinity of Blim. Recruitment since 2000 has been poor. | ICES advises on the basis of the EU–Norway management plan that catches in 2015 should be no more than 35 486 tonnes. If discard rates do not change from those in 2013, this implies landings of no more than 26 713 tonnes. |
| Haddock | Subarea IV (North Sea), Division IIIa West (Skagerrak) and Division VIa (West of Scotland) | **Stock status**<br>**Fishing pressure**<br>2011 2012 **2013**<br>MSY ($F_{MSY}$) ✓ ✓ ✓ Appropriate<br>Precautionary approach ($F_{pa}$,$F_{lim}$) ? ? ? Not defined<br>**Stock size**<br>2012 2013 **2014**<br>MSY ($B_{trigger}$) ✓ ✓ ✓ Above trigger<br>Precautionary approach ($B_{pa}$,$B_{lim}$) ✓ ✓ ✓ Full reproductive capacity | Fishing mortality has been below FMSY since 2008 and SSB has been above the MSY Btrigger since 2001. Recruitment is characterized by occasional large year classes, the last of which was the strong 1999 year class. Apart from the 2005 and 2009 year classes, which are around the long-term average, recent recruitment has been poor. | ICES advises on the basis of the MSY approach that catches should be no more than 54 580 t for the whole assessment area. If rates of discards and industrial bycatch do not change from the average of the last three years (2011–2013), this implies human consumption landings of no more than 48 176 t. |
| Plaice | Subarea IV (North Sea) | **Stock status**<br>**Fishing pressure**<br>2011 2012 **2013**<br>MSY ($F_{MSY}$) ✓ ✓ ✓ Appropriate<br>Precautionary approach ($F_{pa}$,$F_{lim}$) ✓ ✓ ✓ Harvested sustainably<br>Management plan ($F_{MP}$) ✓ ✓ ✓ Below target<br>**Stock size**<br>2012 2013 **2014**<br>MSY ($B_{trigger}$) ✓ ✓ ✓ Above trigger<br>Precautionary approach ($B_{pa}$,$B_{lim}$) ✓ ✓ ✓ Full reproductive capacity<br>Management plan ($SSB_{MP}$) ✓ ✓ ✓ Above target | The stock is well within precautionary limits, has increased in the past ten years, and has reached a record-high level in 2014. Recruitment has been around the long-term average since the mid-2000's. In recent years, fishing mortality has been estimated below $F_{MSY}$ and below the target specified in the management plan. | ICES advises on the basis of stage two of the EU management plan (Council Regulation No. 676/2007) that catches should be no more than 179 301 t. If discard rates do not change from the average of the last three years (2011–2013), this implies landings of no more than 128 376 t. |
| Sole | Subarea IV (North Sea) | **Stock status**<br>**Fishing pressure**<br>2011 2012 **2013**<br>MSY ($F_{MSY}$) ✗ ✗ ✗ Above target<br>Precautionary approach ($F_{pa}$,$F_{lim}$) ✓ ✓ ✓ Harvested sustainably<br>Management plan ($F_{MP}$) ✓ ✓ ✓ Appropriate<br>**Stock size**<br>2012 2013 **2014**<br>MSY ($B_{trigger}$) ✓ ✓ ✓ Above trigger<br>Precautionary approach ($B_{pa}$,$B_{lim}$) ✓ ✓ ✓ Full reproductive capacity<br>Management plan ($SSB_{MP}$) ✓ ✓ ✓ Above target | SSB is increasing since 2011 and is estimated to be above Bpa in 2014. Fishing mortality has shown a declining trend since 1995 and is estimated to be close to Fmsy in 2013. There are recently several above average recruitments in the stock. | ICES advises on the basis of stage two of the EU management plan (Council Regulation No. 676/2007),but cannot quantify the resulting catches. The implied landings should be no more than 11 000 t. |
| Saithe | Subarea IV (North Sea), Division IIIa (Skagerrak), and Subarea VI (West of Scotland and Rockall) | **Stock status**<br>**Fishing pressure**<br>2011 2012 **2013**<br>MSY ($F_{MSY}$) ✗ ✗ ✓ Appropriate<br>Precautionary approach ($F_{pa}$,$F_{lim}$) ✓ ✓ ✓ Harvested sustainably<br>Management plan ($F_{MP}$) ✗ ✗ ✓ At limit<br>**Stock size**<br>2012 2013 **2014**<br>MSY ($B_{trigger}$) ✗ ✗ ✗ Below trigger<br>Precautionary approach ($B_{pa}$,$B_{lim}$) ○ ○ ○ Increased risk<br>Management plan ($SSB_{MP}$) ✗ ✗ ✗ Below trigger | Landings have been relatively constant since the late 1980s. Recruitment has been below average since 2006. Fishing mortality has fluctuated around FMSY since 1997. SSB has declined since 2005 and has been below Bpa for the last 3 years. The latest SSB estimate is close to Bpa | ICES advises on the basis of the EU–Norway management plan, that catches should be no more than 81 490 t. If discard rates do not change from the average of the last 2 years (2012-2013), this implies commercial landings of no more than 72 854 t. |
| Whiting | Subarea IV (North Sea) and Division VIId (Eastern Channel) | **Stock status**<br>**Fishing pressure**<br>2011 2012 **2013**<br>MSY ($F_{MSY}$) ? ? ? Undefined<br>Precautionary approach ($F_{pa}$,$F_{lim}$) ? ? ? Undefined<br>**Stock size**<br>2012 2013 **2014**<br>MSY ($B_{trigger}$) ? ? ? Undefined<br>Precautionary approach ($B_{pa}$,$B_{lim}$) ? ? ? Undefined<br>Qualitative evaluation → → Below recent average | SSB has declined in recent years and is close to the minimum value of the time-series., while fishing mortality has been declining over most of the time-series. The average level of recruitment has been low since 2003. | ICES advises on the basis of the EU-Norway management plan that total catches should be no more than 28 317 tonnes. If rates of discards and industrial bycatch do not change from the average of the last three years (2011–2013), this implies human consumption landings of no more than 17 190 tonnes (13 678 tonnes in the North Sea and 3 512 tonnes in Division VIId). Management for Division VIId should be separated from the rest of Subarea VII. |

### 4.1.2.2 Analytical stocks cont.

| Species | Area | Stock status | Summary | Advice 2015 |
|---|---|---|---|---|
| Sole | Division VIId (Eastern Channel) | Stock status<br>Fishing pressure<br>2011 2012 2013<br>MSY ($F_{MSY}$) Above target<br>Precautionary approach ($F_{pa}$,$F_{lim}$) Increased risk<br>Stock size<br>2012 2013 2014<br>MSY ($B_{trigger}$) Above trigger<br>Precautionary approach ($B_{pa}$,$B_{lim}$) Full reproductive capacity | The spawning-stock biomass has fluctuated without trend and is above MSY Btrigger since 2002. Fishing mortality has always been above FMSY, and has been above Fpa since 2005. Recruitment has been fluctuating without trend. Recruitment in 2012 and 2013 are the lowest of the time series. | ICES advises on the basis of the MSY approach but cannot quantify the resulting catches. The implied landings should be no more than 854 t. |
| Plaice | Division VIId (Eastern Channel) | Stock status<br>Fishing pressure<br>2011–2013<br>MSY ($F_{MSY}$) Above target<br>Precautionary approach ($F_{pa}$,$F_{lim}$) Unknown<br>Stock size<br>2011–2013<br>MSY ($B_{trigger}$) Unknown<br>Precautionary approach ($B_{pa}$,$B_{lim}$) Unknown<br>Qualitative evaluation Increasing | Fishing mortality has declined since the mid-1990s and is presently among the lowest in the time-series. Spawning-stock biomass has increased in 2003 and is currently around the highest level. | ICES advises on the basis of the MSY approach but cannot quantify the resulting catches. The implied landings of the Division VIId plaice stock should be no more than 2657 t. |
| Tubot | Subarea IV (North Sea) | Stock status<br>Fishing pressure<br>2011 2012 2013<br>MSY ($F_{MSY}$) Above target<br>Precautionary approach ($F_{pa}$,$F_{lim}$) Unknown<br>Qualitative evaluation Declining<br>Stock size<br>2012 2013 2014<br>MSY ($B_{trigger}$) Unknown<br>Precautionary approach ($B_{pa}$,$B_{lim}$) Unknown<br>Qualitative evaluation Increasing from low level | Recruitment is variable around the long-term average. The sudden increase in F in 2002 is because of a reduction of the minimum landing size in The Netherlands in 2001. Since then fishing mortality has declined. Spawning-stock biomass is at a low level, but has been gradually increasing in recent years. | ICES advises on the basis of the data-limited approach that catches should be no more than 2406 t. All catches are assumed to be landed. |

### 4.1.2.3 Nephrops stocks

| Species | Area | Stock status | Summary | Advice 2015 |
|---|---|---|---|---|
| Nephrops | Farn Deeps (FU 6) | Stock status<br>Fishing pressure<br>2011 2012 2013<br>MSY ($F_{MSY}$) Above<br>Precautionary approach ($F_{pa}$,$F_{lim}$) Undefined<br>Stock size<br>2011 2012 2013<br>MSY ($B_{trigger}$) Below trigger<br>Precautionary approach ($B_{pa}$,$B_{lim}$) Undefined | The stock size has declined since 2005 and has been fluctuating near MSY Btrigger since 2007. Changes in survey methodology in 2007 make exact comparisons with the preceding series difficult, but the general trend is considered reliable. | ICES advises on the basis of the MSY approach ,and considering that no discard ban is in place in 2015, that landings should be no more than 983 t, assuming that discard rates do not change from the average of the last 3 years (2011-2013) and a fixed proportion of discards survive. |
| Nephrops | Fladen Ground (FU 7) | Stock status<br>Fishing pressure<br>2011 2012 2013<br>MSY ($F_{MSY}$) Below target<br>Precautionary approach ($F_{pa}$,$F_{lim}$) Undefined<br>Stock size<br>2011 2012 2013<br>MSY ($B_{trigger}$) Above trigger<br>Precautionary approach ($B_{pa}$,$B_{lim}$) Undefined | The stock size has declined from the highest observed value in 2008 and is just above the MSY Btrigger. The harvest rate has declined in recent years, and fell to approximately 3% in 2013 which is below FMSY. | ICES advises on the basis of the MSY approach, and considering that no discard ban is in place in 2015, that landings should be no more than 10759 t, assuming that discard rates do not change from the average of the last 3 years (2011-2013) and a fixed proportion of discards survive. |
| Nephrops | Firth of Forth (FU 8) | Stock status<br>Fishing pressure<br>2011 2012 2013<br>MSY ($F_{MSY}$) Below target<br>Precautionary approach ($F_{pa}$,$F_{lim}$) Undefined<br>Stock size<br>2011 2012 2013<br>MSY ($B_{trigger}$) Above trigger<br>Precautionary approach ($B_{pa}$,$B_{lim}$) Undefined | The stock size declined in 2008-2012 but has increased around 25% in 2013. The harvest rate decreased in 2013 to 15.6% and is now below FMSY. | ICES advises on the basis of the MSY approach, and considering that no discard ban is in place in 2015, that landings should be no more than 1769 t, assuming that discard rates do not change from the average of the last 3 years (2011-2013) and a fixed proportion of discards survive. |
| Nephrops | Moray Firth (FU 9) | Stock status<br>Fishing pressure<br>2011 2012 2013<br>MSY ($F_{MSY}$) Below target<br>Precautionary approach ($F_{pa}$,$F_{lim}$) Undefined<br>Stock size<br>2011 2012 2013<br>MSY ($B_{trigger}$) Above trigger<br>Precautionary approach ($B_{pa}$,$B_{lim}$) Undefined | The stock size declined in 2008-2012 but has increased around 25% in 2013. The harvest rate decreased in 2013 to 15.6% and is now below FMSY. | ICES advises on the basis of the MSY approach and considering that no discard ban is in place in 2015, that landings should be no more than 1185 t, assuming that discard rates do not change from the average of the last 3 years (2011-2013) and a fixed proportion of discards survive. |
| Nephrops | Noup (FU 10) | Stock status<br>Fishing pressure<br>2011–2013<br>MSY ($F_{MSY}$) Unknown<br>Precautionary approach ($F_{pa}$,$F_{lim}$) Unknown<br>Qualitative evaluation Below possible reference points<br>Stock size<br>2011–2013<br>MSY ($B_{trigger}$) Unknown<br>Precautionary approach ($B_{pa}$,$B_{lim}$) Unknown<br>Qualitative evaluation Unknown | The state of the stock is unknown. UWTV surveys in FU 10 have been conducted sporadically indicating the density is relatively low (0.1 Nephrops/m2). Landings in FU 10 are at a historical minimum suggesting harvest rates below those associated with MSY for other North Sea Nephrops stocks | ICES advises on the basis of the ICES approach for data-limited stocks that catches should be no more than 33 t. If discard rates do not change from the assumed rate of 7.9%, this implies landings of no more than 32 t. |

### 4.1.2.4 Nephrops stocks cont...

| Species | Area | Stock status | Summary | Advice 2015 |
|---|---|---|---|---|
| Nephrops | Norwegian Deep (FU 32) | State of the stock<br>Fishing pressure<br>2011–2013<br>MSY ($F_{MSY}$) ? Unknown<br>Precautionary approach ($F_{pa}$,$F_{lim}$) ? Unknown<br>Qualitative evaluation ✓ below poss refpoints<br>Stock size<br>2011–2013<br>MSY ($B_{trigge}$) ? Unknown<br>Precautionary approach ($B_{pa}$,$B_{lim}$) ? Unknown<br>Qualitative evaluation → stableUnknown | The state of this stock is unknown. The new landings per unit effort index (lpue) (in kg/kW day opposed to former kg/day) shows a stepwise decreasing trend. However, due to changes in management regulations in 2002 and 2007 it is not known whether this decrease in lpue is due only to regulation changes or if it also to some degree reflects stock changes. Harvest rates are considered low for this stock | ICES advises on the basis of the data-limited approach but cannot quantify the resulting catches. The implied landings should be no more than 625 t. |
| Nephrops | Horn's Reef (FU 33) | State of the stock<br>Fishing pressure<br>2011–2013<br>MSY ($F_{MSY}$) ? Unknown<br>Precautionary approach ($F_{pa}$,$F_{lim}$) ? Unknown<br>Stock size<br>2011–2013<br>MSY ($B_{trigge}$) ? Unknown<br>Precautionary approach ($B_{pa}$,$B_{lim}$) ? Unknown<br>Qualitative evaluation ↗ Increasing | The state of this stock is unknown. There is an increase in abundance over the whole period, although part of the increase may be due to an increase in gear efficiency (technological creep) in the last years. | ICES advises on the basis of the data-limited approach, but cannot quantify the resulting catches. The implied landings should be no more than 1136 t. |
| Nephrops | Devil's Hole (FU 34) | Stock status<br>Fishing pressure<br>2011–2013<br>MSY ($F_{MSY}$) ? Unknown<br>Precautionary approach ($F_{pa}$,$F_{lim}$) ? Unknown<br>Qualitative evaluation ✓ Below possible reference points<br>Stock size<br>2011–2013<br>MSY ($B_{trigge}$) ? Unknown<br>Precautionary approach ($B_{pa}$,$B_{lim}$) ? Unknown<br>Qualitative evaluation ↘ Declining | The state of the stock is unknown. Decreasing effort in combination with the recent decrease in landings per unit effort and the mean survey density indicate the stock may be declining. The TV assessment series is too short (no survey in 2013) and the ancillary data too limited to provide a full UWTV assessment for this area at the present time. | ICES advises on the basis of ICES approach to data-limited stocks that catches should be no more than 410 t. If discard rates do not change from the recent average (2008–2011), this implies landings of no more than 383 t. |

### 4.1.2.5 Ancillary stocks

| Species | Area | Stock status | Summary | Advice 2015 |
|---|---|---|---|---|
| Brill | Subarea IV and Divisions IIIa and VIId,e | Stock status<br>F (Fishing Mortality)<br>2010–2012<br>Qualitative evaluation ? Insufficient information<br>SSB (Spawning-Stock Biomass)<br>2005–2012<br>Qualitative evaluation →/↗ Stable to increasing | Landings have been relatively stable and above historical values since 1998 and considered a reliable approximation of catches as only little discarding of brill occurs. The stock size indicator (lpue) in the last three years (2010–2012) is 56% higher (North Sea) or 2 % lower (Kattegat) than the average of the five previous years (2005–2009). The survey is noisy and landings and lpue may be also influenced by the turbot uptake of the TAC. | ICES advises on the basis of the ICES approach to data limited stocks that catches should be no more than 2727 tonnes. All catches are assumed to be landed. |
| Dab | Subarea IV and Division IIIa | Stock status<br>F (Fishing Mortality)<br>2010 – 2012<br>Qualitative evaluation ? Insufficient information<br>TSB (Total Stock Biomass)<br>2005 – 2012<br>Qualitative evaluation → Stable in the main area | Landing data are not complete and are not indicative for catches since discard rates are high. Survey indices show a stable abundance in the last decades in Subarea IV which is the main part of the distribution area and an increasing abundance for Division IIIa. The stock size indicator (number/hour) in the last three years (2010–2012) is 7% higher (North Sea) or 16% higher (Skagerrak–Kattegat) than the average of the five previous years (2005–2009). | Based on the ICES approach for data limited stocks, ICES advises that landings should be no more than 7795 tonnes. Discards are known to take place, but the data are insufficient to estimate a discard proportion that could be applied to give catch advice; therefore total catches cannot be calculated. |
| Flouder | Division IIIa and Subarea IV | Stock status<br>F (Fishing Mortality)<br>2010 - 2012<br>Qualitative evaluation ? Insufficient information<br>TSB (Total Stock Biomass)<br>2005 – 2012<br>Qualitative evaluation ↗ Increase in the main area | The available survey information indicates stable stock abundance since the mid nineties. Landings are declining, with the lowest landings for IIIa in 2012. Landing data are not indicative for catches since discard rates are variable. The stock size indicator (number/hour) for the whole area in the last three years (2010–2012) is 7% higher than the average of the five previous years (2005–2009). | Based on the ICES approach for data limited stocks, ICES advises that landings should be no more than 3160 tonnes. Discards are known to take place, but the data are insufficient to estimate a discard proportion that could be applied to give catch advice; therefore total catches cannot be calculated. |

## 4.1.3 Software

In the mixed-fisheries runs, all forecasts run were done with the same FLR forecast method (see Section 3), using the Flash package.

Software used in the single species assessments and forecasts was as outlined in the text table below.

| Species | Assessment | Forecast |
|---|---|---|
| COD IV, IIIa and VIId | SAM | SAM |
| HADDOCK IV, IIIa and VIId | TSA | MFDP |
| PLAICE IV | FLR 2.3, FLXSA | FLR2.3, FLSTF |
| SAITHE IV, IIIa and VI | FLR 2.x, FLXSA | FLR 2.x, FLSTF |
| SOLE IV | FLR 2.3, FLXSA | FLR 2.3, FLSTF |
| WHITING IV and VIId | FLR 2.x, FLXSA | MFDP |
| PLAICE VIId | FLR 2.x, FLXSA | FLR 2.x, FLSTF |
| SOLE VIId | XSA | MFDP |
| TURBOT IV | ADMB, Trends-based SCA | ADMB |

## 4.2 Fleets and métiers

### 4.2.1 Catch and effort Data

Prior to 2012 catch (landings and discards) and effort data were submitted to WGMIXFISH as comma separated files structured around the distinction of gear, mesh size and vessel length categories (based to a large extent on the format used by the STECF for the evaluation of effort management). From 2012 onwards the data were requested consistent with the definition of DCF métiers and with data submitted to InterCatch (though with additional vessel length disaggregation), as specified by a joint WGNSSK/WGMIXFISH data call.

In 2014 the joint data call also included WGNEW stocks (Annex 2), while a separate data call requested information on WGCSE stocks of interest to WGMIXFISH. The WGMIXFISH information was requested with the same DCF métier-based definitions, but separated into vessel length categories specified to match fleet segments from the STECF AER (Annual Economic Report) and provided directly as comma separated files. Discard data for the data year 2013 were no longer requested by vessel length categories, as national observer sampling programmes do not distinguish between vessel lengths, so discard ratios for the various métiers aggregated across all vessel lengths could be extracted from InterCatch and applied to the landings of the corresponding métiers in the vessel length specific data. Age distribution by métier and area, which is now available in InterCatch, was not integrated in the MIXFISH data, but it is ultimately the aim that these will be included in future. The relative size of catches of the stocks incorporated in the mixed fisheries projections is shown in Figure 4.2.1.1.

Despite the data now being available according to DCF categorization, WGMIXFISH was of the opinion to continue using the categorization following the EU Cod management plan as used in previous years, both in order to maintain the consistency of the MIXFISH time-series and in order to continue addressing management-oriented scenarios and issues. WGMIXFISH métiers are thus defined as combinations of gear, mesh size and area (North Sea (area 4), Skagerrak (area 3AN) or Eastern Channel (area 7D)).

The consistency between DCF and EU Cod plan categories had been investigated by WGMIXFISH 2011 and during the pilot data call performed in autumn 2011. There it had been shown that most DCF métiers as sampled by individual nations could automatically be allocated to a corresponding EU Cod plan métier, with two exceptions: the TBB_DEF_70-99_0_0 métier in the North Sea (as the corresponding BT2 métier is only defined for the mesh sizes 80—99) and the OTB_DEF (or CRU)_90-119_0_0 métier in the Skagerrak, which straddles the TR1 (>=100 mm) and TR2 (70—99 mm) categories.

The proportion of effort and landings in the various mesh size classes for these two métiers was investigated. It was shown that the TBB fisheries with mesh size 70—79 were very small compared to the 80—99 fisheries, and therefore the whole DCF métier was considered equivalent to BT2. Similarly, in the Skagerrak the OTB fishery is dominated by the 90 mm fishery targeting *Nephrops*, and therefore the whole DCF métier was considered a TR2 métier. It was therefore possible to maintain consistency with previous data. One exception is that from 2012 the Swedish *Nephrops* fishery with an escapement grid, OTB_CRU_70-89_2_35 has been kept distinct from the other DCF métiers.

As previously, data for 2009 was not available from France and had to be assumed equal to 2008 values. Points of note regarding data by nation are contained in Annex 3.

A major improvement from 2012 has been the increase of discard coverage in the MIXFISH data. Up to 2011 discards data by fleet/métier were only available for the strata reported by Member States, and these represented only a part (around 50% on average) of the total discards estimates used by WGNSSK (after discard rates had been assigned to unsampled fleets within nations and/or between national 'fleets'). From 2012, the assignments are done by WGNSSK at the métier level through Intercatch. The final dataset extracted from InterCatch for use by WGNSSK therefore, while still including cases where discard estimates have been assigned to métiers with only landings data by allocation from other métiers, it is in such a way that the data remains consistent with the categories in the MIXFISH csv files. It is therefore possible to make the data for Fcube more compatible with the WGNSSK InterCatch output, by applying the InterCatch discards ratio by métier to the corresponding MIXFISH métiers, using the following adjustment:

$$d^* = \frac{Dl}{L}$$

Where d* is the revised discard value for the métier used by MIXFISH, l is the weight of landings for the métier used by MIXFISH and L and D are the weight of landings and discards entered for the (vessel length aggregated) métier in InterCatch. Because InterCatch data are aggregated over all vessel lengths the same adjustment is applied to all vessel length categories of otherwise comparable MIXFISH métiers.

Before 2014 the discard ratios in InterCatch were only used for métiers that were missing discard estimates in the MIXFISH csv-fles. For the data year 2013 all discard estimates were retrieved from Intercatch and assigned to the same métiers within the WGMIXFISH .csv files, further improved the consistency of discard estimates between WGNSSK and WGMIXFISH. However, this method relies on being able to match métier definitions between the two datasets. The conformity of métiers in MIXFISH and InterCatch was generally high, but it was still not possible to match a few métiers. It would be desirable for Member States to keep improving the consistency between data uploaded to InterCatch and data submitted to WGMIXFISH.

A significant deficiency with the fleet data were discovered subsequent to the working group, but prior to the advice release. The data were corrected, though it highlighted the need for additional data quality checks (in the form of visual plots which can identify any outliers), and code was generated that can routinely produce these checks early during future meeting. However, such quality assurance is mainly reliant on the availability of expertise from the countries with significant fleet activity in order to identify any data issues based on expert knowledge. For this reason active participation from those with a regional interest is the fisheries is vital to the success of the working group

because understanding of the data and interpreting the model outputs requires regional expertise. The working group encourages participation from those countries with significant interests in the regional fisheries at future working groups.

### 4.2.2 Definitions of fleets and métiers

The starting point for defining fleets and métiers was to match definitions used in the cod long-term management plan (Table 4.2.2.1). Fleets were further split by nation, and sometimes further by vessel length category. The decision to split by vessel length category was initially dependent on the availability of cost data from the Annual Economic Report (AER, cf ICES 2009a), and then to the overall importance of the fleet in terms of total effort. The latter consideration was to prevent imbalance in the relative size of fleets in the model. In 2012, more in-depth consideration had been given to the relevance of the current groupings of the fleet segments with regards to known national fishing patterns, for example with regards to saithe fisheries and to Fully Documented Fisheries (FDF). This had led to some changes in the fleet definition compared to previous years. Fleet definitions have remained the same in 2013 and 2014 and the final choices can be summarized as follows:

- Belgium: Distinction between <24m and >=24m beam trawlers, and shrimp fisheries with 16—31 mm excluded
- Denmark: Distinction of the <10m vessels (trawlers only); separation of the trawlers at <24m, 24—40m and >=40m; FDF trawler vessels in a separate fleet
- England: Distinction of the <10m vessels; Otter trawlers and seiners pooled together, with separation at <24m, 24—40m and >=40m; FDF trawler vessels in a separate fleet,
- France: Distinction of the <10m vessels; separation of the trawlers at <40m and >=40m, specific gill- and trammelnet fleet.
- Germany: Distinction between <24m and >=24m beam trawlers, and shrimp fisheries with 16—31 mm excluded; Otter trawlers and seiners pooled together with separation at <24m, 24—40m and >=40m; FDF trawler vessels in a separate fleet
- Netherlands: Distinction between <24m, 24—40m and >=40m beam trawlers; Otter trawlers and seiners pooled together
- Norway: Otter trawlers and seiners pooled together, with separation at <40m and >=40m.
- Scotland: Distinction of the <10m vessels (trawlers only), separation of the trawlers at <24m and >=24m, FDF vessels in a separate fleet, Otter trawlers and seiners pooled together.
- Sweden: No distinction of vessel size. Selective devices included in métiers definition.

As a second step, a matching procedure is run in order to have consistency between effort and catches. Fleets and métiers for which there is effort but no catches for the stocks included in the MIXFISH projections are considered as irrelevant and removed from the database. Catches for which there is no corresponding effort are pooled into a single "other" OTH métier in the OTH fleet, in order not to lose that part of fishing mortality.

Finally, a third step aims at reducing the number of fleets and métiers categories involved in modelling. An aggregation threshold, established back in time through trial and error is used to determine 'small' métiers. A métier failing to catch at least 1.0% of

at least one of the stocks considered in the most recent data year is classified as small. Within each fleet, all these small métiers are then aggregated by fleet in one "Other" métier (OTH). Further, all small fleets (i.e. containing only the "OTH" métier), are aggregated into one single "OTH" fleet.

In 2014, further progresses were made by national data providers for improving the consistency between the métiers categories imported in InterCatch and those used in the .csv fleet files. This has thus reduced the number of métiers compared to last year. The final data used contained 36 national fleets (plus the OTH fleet) from nine countries, from 2003 to 2013. These fleets engage in one to six different métiers each, resulting in 95 combinations (against 118 in 2013) of country*fleet*métier*area catching cod, haddock, whiting, saithe, plaice, sole, *Nephrops* and turbot (Table 4.2.2.2). The balance of landings of the stocks across gear categories is shown in Figure 4.2.2.1.

As a cross check of the data the total landings and discards across all fleets was compared to the values estimated from the single species stock assessments (Figure 4.2.2.2). Some landings may not be allocated to fleets, due to for example missing countries or areas (e.g. area VIa for saithe and haddock) or national landings with missing logbook information that cannot be allocated to a fleet. The landings coverage for all fish stocks is very high (between 90 and 100% of landings of each fish stock could be allocated to one of the fleets) but more variable for the *Nephrops* stocks (between 69 and 100%). To address the remaining small inconsistencies between fleet data used by WGMIXFISH and stock data, the differences between them were pooled into the "OTH" fleet (both landings and discards).

### 4.2.3 Trends

A number of overview graphs (using the Lattice package in R) were produced to aid quality checking of the data once compiled into the final fleets object. Some are useful to show the relative importance of the fleets chosen and trends in their effort and catches. Effort by fleet in absolute levels (Figure 4.2.3.1) and relative trends (Figure 4.2.3.2), effort share by métier and fleet (Figure 4.2.3.3) and landings by fleet and stock (Figure 4.2.3.4) are included in this report.

# 5 Mixed fisheries forecasts

## 5.1 Description of scenarios

### 5.1.1 Baseline Runs

The objectives of the single species stock baseline runs were to:

1 ) reproduce as closely as possible the single species advice produced by ACOM, and

2 ) act as the reference scenario for subsequent mixed fisheries analyses.

The various single-stock forecasts presented by WGNSSK are performed using different software and setups (see 3.1.3 above). However, for the purpose of the mixed-fisheries analyses, it is necessary to gather all forecasts into a single unified framework, which builds on the 'fwd()' method in FLR (Flash R add-on package). The same forecast settings as in WGNSSK are used for each stock regarding weight-at-age, selectivity and recruitment, as well as assumptions on the F in the intermediate year and basis for advice (LTMP or MSY approach).

Some differences can occur in the forecast calculations, (sometimes because of the diversity of single-stock assessment methods used) and the WG always investigates in depth the reasons for potential discrepancies. Adjustments to the Fcube forecasts are made if necessary to minimize discrepancies to the largest extent possible.

The intention of the baseline runs was thus mainly to act as a check to ensure that the projections were set up correctly within the Fcube script, but these runs also have the incidental benefit of acting as a quality control check on the WGNSSK projections themselves.

### 5.1.2 Mixed fisheries runs

#### 5.1.2.1 Fcube analyses of the intermediate year (2014)

As a status quo effort assumption was used an FCube scenario analysis was not performed for the intermediate year. This change (implemented for the first time last year (ICES, 2013a)), results in the application of FCube to the TAC year only. It was considered a more appropriate than two successive FCube scenario years as it is consistent with recent observed trends in fishing effort and assumptions in the single-stock advice (see next Section).

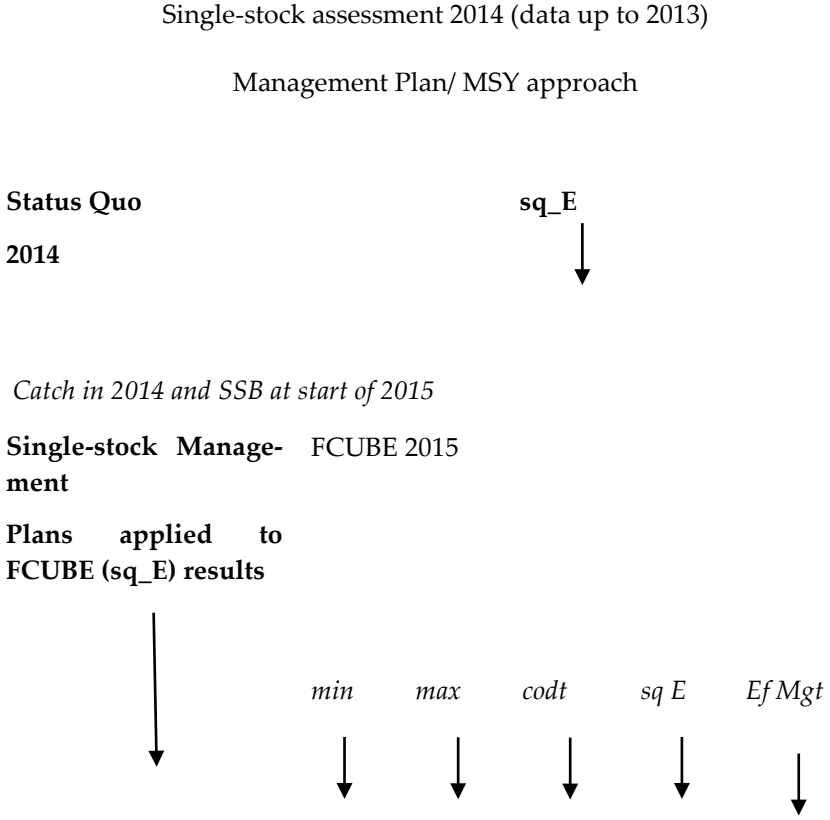
#### 5.1.2.2 Fcube analyses for the TAC year (2015)

Prior to 2013, projections were run applying the Fcube scenarios two years in a row, i.e. both for the intermediate year and the TAC year. This allowed WGMIXFISH to analyse why management plans often did not deliver their expected results and why some short-term forecasts had been overoptimistic in the past (see Kraak *et al*. 2013), by evaluating the impact of the assumptions in the intermediate year.

However, in 2013 and 2014 the working group adopted a forecast approach for the intermediate year on the basis of Status Quo effort. As a roll-over of effort limitations from the cod management plan was adopted by the EC in 2013 (and subsequently in 2014), a status quo effort assumption was considered a plausible assumption and is more in line with the standard single-stock short-term forecasting approach. Therefore

the mixed fishery analysis used a status quo effort assumption for the intermediate year (2014), with the Fcube scenarios used for the TAC year (2015).

In summary, the Fcube runs followed the scheme below:




## 5.2 Results of Fcube runs

### 5.2.1 Baseline run

The rationale behind the single species baseline runs is given in Section 4.1.1. Table 5.2.1.1 contains the outputs from these runs.

The issues and problems encountered in replicating the single species advice for each species are given below. The results from these baseline runs are compared with the results from the corresponding ICES runs in Tables 5.2.1.2 and 5.2.1.3, and summarized at Figure 5.2.1.1.

**Cod**: The entire basis for North Sea assessment and forecast was changed from the B-Adapt to the SAM assessment package in early 2011 (ICES WKCOD 2011), and this had important consequences for the WG's ability to reproduce it in Fcube. The cod forecast is produced internally in the SAM assessment method using 1000 stochastic replicates drawn within the confidence interval of the F, N and Catch multiplier estimates, while

the WGMIXFISH forecast is only a deterministic projection. As the median of the forecasted assessment may be slightly different from the forecast of the median assessment, small discrepancies may appear. In the 2014 cod assessment, only estimates of unallocated removals for the years 1993-2005 were included, similarly to the 2013 cod assessment, on the basis that not including unallocated removals in recent years reduced the retrospective pattern in F observed in previous assessments and that catch information has vastly improved. This change was reflected in the FCube code; the unallocated component was removed from future projections.

In 2014, the F assumption in the intermediate year was status quo F on the basis that there has been no reduction in effort ceiling in 2013 and 2014 compared to 2012 for EU fisheries (Council Regulation (EC) 43/2014). For the TAC year, the F target was set according to the management plan, which switched to the Long-term Phase last year (as the TAC under the Long-term Phase calculation (paragraph 4 and 5 of EC 1342/2008) was greater than the TAC derived from applying the Recovery Phase calculations (paragraph 3 and 5 of Article 8 of EC 1342/2008)). The Long-term Phase of the Management Plan applies a sliding rule where F is reduced from the management plan target of 0.4 when SSB is below Bpa on 1 January in the year preceding application of the TAC (paragraph 4 of Article 8 of EC 1342/2008), with a TAC constraint that limits the change in TAC (2015) to within 20% of TAC (2014). These same assumptions were carried across into the Fcube simulations.

The final discrepancy between the ICES cod advice and the WGMIXFISH replicate was considered not to impact on the FCube analysis (4.1% in estimated 2014 landings and 0% in 2015). The cause of the discrepancies in 2014 landings were investigated but could not be fully resolved, likely coming from the difference in assessment and forecast procedure coming from the SAM model as discussed above. Nevertheless, the FLR forecast was considered sufficiently close that it could be used as a satisfactory basis for the mixed-fisheries projection. Future SSB projections were -0.8% difference in 2015 and -2.2% difference for 2016.

**Haddock:** In 2014 the haddock assessment incorporating area VIa, but continued to use TSA as the assessment basis and MDFP as the forecasting software. The methods developed in WGNSSK to parameterize future selectivity and weight-at-age for haddock are sometimes quite specific and do not always follow common standards, and therefore some input data had been entered manually rather than through automation. Afterwards the results were very similar to a 0% discrepancy between SSB projections in 2015 and a -0.5% difference for 2016. Forecast landings in 2014 showed a 3.4% difference and in 2015, a -0.7% discrepancy. The FLR forecast was considered sufficiently close for use in the mixed-fisheries projection.

**Whiting:** There were issues replicating the future selectivity and weight-at-age for whiting, therefore selectivity information was entered manually and catch weights were recalculated. In addition, discrepancies between WGMIXFISH and WGNSSK forecasts in landings may be attributed to differences in the way the industrial bycatch is handled by the two approaches. In the WGNSSK forecast this is handled as a separate fleet with a fixed multiplier, whereas in the FLR forecasts, it is included within the landings component. The difference in landings was -1.9% for 2014 and -0.5% for 2015; this was not considered significant in terms of outturn results. Discrepancies in SSB in 2015 and 2016 were -2.9% and -1.8%, respectively.

**Saithe:** Straightforward, no problems encountered.

**North Sea Plaice:** Straightforward, no problems encountered.

**English Channel Plaice:** The forecast was complicated by the fact that there is known to be significant migration of plaice between the North Sea, Eastern Channel and Western Channel; the forecast (and assessment) attempts to take account of the expected quantity of plaice caught in the eastern channel adjusting for these migrations. Nevertheless, there were no problems encountered.

**North Sea Sole:** Straightforward, no problems encountered.

**North Sea Sole:** Straightforward, no problems encountered.

**English Channel Sole:** Straightforward, no problems encountered.

**Turbot:** The inclusion of this stock was new for 2014. The turbot assessment is a trends-based statistical catch-at-age model, with the output being relative fishing mortality and spawning-stock biomass estimates. The fishing mortality of turbot in 2014 was Fsq, with landings of 3414 t, while in 2015 it was set to the relative Fmsy value, with a 20% TAC constraint, resulting in a TAC of 2406 t (20% lower than catches in 2013). This was replicated well in the baseline forecast, with landings differences in 2014 and 2015 of -1.3% and 0%, respectively, and SSB differences of 0.8% and 1.1%, respectively. This was not considered significant problematic for use in the mixed-fisheries projections.

***Nephrops*:** The forecasts applied the recommended harvest rates to the most recent abundance estimates available for the relevant FUs; hence the process replicated precisely the ICES advice for all but 3 stocks (NEP6, NEP8, and NEP9; with differences in landings $\leqq$ 1.6%).

It should be noted, that in the mixed fisheries forecasts *Nephrops* are treated slightly differently to the approach taken by WGNSSK. The following two changes are made:

First, there is a difference in the assumed harvest ratio in the intermediate year. Whereas WGNSSK assumes that the harvest ratio is equivalent to the average ratio of the most recent three years, the WGMIXFISH value is based on a share of the 2014 TAC applied to the abundance estimates in 2014 for that particular FU (equal to proportion of the North Sea TAC that was taken from the FU in the most recent year). This can cause pronounced differences if the harvest ratio has a steep decrease or increase in the most recent year. The assumption taken in WGMIXFISH may be more appropriate, as it is quicker to react to changes in biomass or exploitation patterns where activity moves between FUs; however, it has no consequence either for WGNSSK or WGMIXFISH TAC year harvest ratio or TAC advice as the harvest ratio in 2014 is not used in the forecasts for 2015.

Second, the TAC result for FUs may be different between WGNSSK and WGMIXFISH. This results because the TAC advice from the single species assessments is an advised landing per FU. However, because management is currently by a combined TAC, not FU, WGMIXFISH assumes that the total TAC is taken in proportion to the ratio of last year's landings by FU, distributing the landings differently to the advice. Such an approach assumes the same catchability as last year, as for other stocks in the Fcube simulations.

### 5.2.2 Mixed fisheries analyses

The full overview of the Fcube projections to 2015 is presented in Table 5.2.2.1 and Figures 5.2.2.1 to 5.2.2.5. The results for 2015 can be compared to each other as in a single-species option table. For ease of comparison, it was decided to also include a table with the landings relative to the single-stock advice. This is presented as Table 5.2.2.2.

For example, the baseline run for **cod**, which follows the single-stock ICES advice, assumes landings of 40 536 tonnes in 2014 (F2014 assumed to equal F2013), and 26 713 tonnes in 2015. The resulting SSB in 2016 is estimated to be 106 726 tonnes. WGMIXFISH assumes status quo effort (**sq_E**) in 2014 resulting in a slight increase in F compared to 2014 and landings of 41 791 tonnes in 2014. If it is assumed the **sq_E** scenario was used as the basis for the single species advice instead of the actual single species basis the rules of the management plan would lead to TAC advice of 26 713 tonnes, representing the same F value but applied to a smaller biomass than in the baseline. The resulting SSB in 2016 is estimated to be 104 855 tonnes, 2% lower than the resulting SSB following the single species advice according to the cod Management Plan.

If we now assume that the fleets fish in line with the effort reductions in 2015 that the cod plan would imply, **Ef_Mgt** Fcube scenario (45% reduction for TR1, TR2), then the landings in 2015 would be estimated at 27 597 tonnes, 3.3% above the initial single-stock baseline. The **Ef_Mgt** Fcube scenario (following the effort reduction from the Management Plan) estimates SSB in 2016 as 103 913 tonnes or 2.6% lower than the baseline (full compliance with the MP).

The outcomes of the "minimum" and "maximum" scenarios are driven by which of the stocks will be most and least limiting for each individual fleet. In 2015, 25 fleets are estimated to be limited by their cod quota, 11 fleets by their NEP6 quota and 1 fleet by their eastern channel sole quota (~73%, ~27% and <1% of the effort in 2013 respectively, **min** scenario). Conversely, haddock is least limiting quota for 22 fleets, NEP7 for 8 fleets, north Sea plaice for 5 fleets and NEP9 for 2 fleets (representing 66%, 22%, 7% and 5% of the effort in 2013 respectively, **max** scenario). It is also noted that the implied F would exceed $F_{pa}$ for cod, saithe, and sole in the Eastern Channel in this scenario, which is therefore not considered precautionary for those species.

The **min** scenario assumes that fleets would stop fishing when their first quota share is exhausted, regardless of the actual importance of this quota share, thus leading to a distorted perception of plausible fleet behaviour. It is included to demonstrate the lower bound of potential fleet effort and stock catches. Similarly, the **max** scenario demonstrates the upper bound of potential fleet effort and stock catches but, through assuming all fleets continue fishing until all their quotas are exhausted irrespective of the economic viability of such actions, this is also considered a scenario with low plausibility. The **min** and **cod** scenarios do, however, give similar results (Table 5.2.2.1 and Figure 5.2.2.1) because cod is the limiting species for such a high percentage of fleet effort.

The three other scenarios represent intermediate plausible scenarios reflecting basic current management measures and also the *status quo* option. ICES WGMIXFISH has not conducted work to assess which of these scenarios may represent the most likely outcome, but hindcasting projections have been run previously (Ulrich *et al.*, 2011) and should be reiterated.

The **cod** scenario presents the expected outcome if the F reductions on cod stipulated in the cod long-term management plan were achieved in full and the catchability of different species by fleets and métiers remained constant. According to the single-stock advice a reduction of 45% in cod F is required (from 0.39 in 2014 to 0.21 in 2015). In this scenario it is assumed that effort reductions in fleets (to achieve new partial Fs) apply equally to all fleets with any cod catch, including those where it represents a small bycatch component. In 2015 the most pronounced example of this effect is for saithe-

targeted fisheries where application of the "cod" scenario leads to small reductions in cod catch for these fisheries, but very large reductions in saithe catches.

As was the case last year, the single species advice for a reduction in cod TAC in light of an increasing biomass means that catchability would likely increase whilst quota decreases, implying significantly lower activity or changes to catchability required in order to achieve the cod target in 2015. If this is achieved through effort reductions alone (**Ef_Mgt** scenario) it would also have strong negative impacts on the ability of the fleets to catch all other 2015 TACs, particularly haddock, north sea plaice and *Nephrops* (Table 5.2.2.1; Figure 5.2.2.1).

The **Ef_Mgt** scenario does, however, reduce the underutilization of saithe quota compared to the **cod** scenario. While the **cod** scenario affects almost all métiers, thus sharing the burden of F reduction across most fleets and countries, the **Ef_Mgt** scenario affects uniquely the trawl métiers, which catch the bulk of cod, haddock and whiting landings. The **Ef_Mgt** scenario leads to slightly greater underutilization of whiting quota compared to the **cod** scenario.

The stocks of sole and plaice in the Eastern English Channel and turbot in the North Sea have low landings compared to other stocks and the results for these stocks are presented in detail in Figure 5.2.2.2. The decrease in the 2015 single-stock advice for eastern channel sole and eastern channel plaice are likely to be restrictive for the fishery at *status quo* effort. Both stocks show an undershoot of the quota in the **cod** scenario, suggesting that the fleets catching sole and plaice are restricted by their cod (by)catches.

Mixed-fisheries results for *Nephrops* are displayed after combining over functional units (FUs) in plots, but stock status and fishing opportunities differ widely across FUs. In particular, FU6 (Farn Deep) is currently exploited over the MSY target, and this FU acts therefore as a limiting stock for some fleets in the mixed-fisheries advice 2014. Conversely, FU7 (Fladen Ground) is exploited well below the MSY target, and acts as a least limiting stock. In order to ensure *Nephrops* stocks are exploited sustainably in the different FUs, management should therefore be implemented at the FU level. Potential undershoot of catch opportunities for FU7 should not be transferred to other FUs.

To get an overview of the amount of total catches for the various scenarios, Figure 5.2.2.3 displays the catch by scenario for each of the species. Importantly, Figure 5.2.2.1 displays only information on *landings*, i.e. the share of predicted catches that corresponds to landed fish, according to the discards ratio observed in assessment data (as in the single-stock forecast). Potential overshoot/undershoot on this figure are calculated by comparing the single species TAC advice for 2015 with the mixed-fisheries landings estimates. Figure 5.2.2.3 displays catch by category; potential 'legal' landings (i.e. below the 2015 TAC advice, which in practice acts as a TAL), potential 'over TAC' landings, i.e. estimated landings above this TAC, if any, and discards, as calculated according to the discards ratio observed in assessment data (as in the single-stock forecast).

The anticipated SSBs in 2016 of the Fcube scenarios are shown in Figure 5.2.2.4. Cod, turbot and eastern channel sole suffer the greatest shortfall in SSB compared to the level predicted compatible with the single species advice if status quo effort and catchabilities are assumed (**sq_E** scenario).

Figures 5.2.2.5 and 5.2.2.6 show the level of effort required by each fleet to catch their quota share of the single species TAC advice for each stock for finfish species and

*Nephrops* FUs respectively. From Figure 5.2.2.5 it is clear cod is the limiting species by some margin for many of the fleets.

The 'cod catchability reduction' scenario shows the level of reduction in catchability required in order to exploit the cod stock consistently with the single –stock target without the level of effort reduction implied by the management plan (and therefore without the implied foregone catches of other stocks). Figure 5.2.2.7 show a series of scenarios where cod catchability is increasingly reduced for each fleet in steps of 10%, while 'cod' as the limiting stock for the fisheries. The results indicate that reductions in catchability of 40 – 50 % would be required in 2015 if fishing effort levels remain at around the 2013 level in order to fully utilize other quotas in the mixed fisheries.

#### 5.2.2.1 Ancillary stocks

The revised CFP includes a commitment to introduce a landing obligation (excepting some defined exceptions) in EU demersal fisheries in a phased approach from 2016 until 2019. As such, there is increasing interest in the potential other stocks which may limit fishing activity under the new regulatory regime, The impact of mixed fisheries scenarios on seven further stocks; brill, dab, flounder, hake, lemon sole, red mullet and witch were considered without their incorporation into the mixed fisheries projections. Figure 5.2.2.1.1 shows the outcome. All TACs of these stocks except the North Sea component of the hake TAC were predicted to be underutilized under assumption of status quo effort, while hake was predicted to be subject to over-quota catches under all scenarios, including '**min**'.

#### 5.2.2.2 Relative stability

Relative stability as such is not directly included as an input to the model. Instead, an assumption that the relative landings share of the fleets are constant is used as a proxy, and in the scenarios above, this input is calculated as the average landing share by fleet and stock in 2013. As a cross check, the landings by national fleets were summed over nation for each scenario, and the share by country was compared with this initial input (Figure 5.2.2.2.1). The results show only minor deviations across all scenarios, except for the **Ef_Mgt** scenario. Here the fact the majority of Scottish vessels come under the scope of the EU effort management regime whereas Norwegian vessels are unaffected by the same regime leads to a shift of landings share from the former to the latter under the assumptions of the model.

# 6 New Developments

## 6.1 Inclusion of new stocks and consequences of introduction of the EU landings obligation

The EU landings obligation for demersal species is due to be implemented from 2016 in a phased approach with all quota stocks subject to the landings obligation from 2019 onwards, while Norwegian fisheries have been subject to a landing obligation for cod since 1987 and for most finfish species since 2009.

At present the mixed fisheries projections are presented in terms of landings and overshoots or undershoots of the retained portion of the catch. Discards are not presented but are forecast according to the same method as the single species advice (i.e. a constant landings to discards ratio) and cover under legal landings size fish and may also include additional over legal landings size fish (e.g. those fish high-graded or subject to regulatory discards). Given the recent improvements in data, catch based mixed fisheries forecasts could be provided in the near future after some developments of the FCube model.

The mixed fisheries forecasts have been including an increasing number of stocks (from 20 in 2012 to 23 stocks in 2014). In addition, methods to include data-limited stocks in the mixed fisheries forecasts based on catch per unit of effort are being developed. This is in order to take account of the potential 'choke' species for fleets operating under a landings obligation. In this year's WGNSSK/WGMIXFISH data call data limited stocks as dab, flounder, brill, lemon sole and witch were included for the first time. For some of these stocks discards have been raised during WGNSSK 2014 in Intercatch but further checking is needed before these data can be used by WGMIXFISH as basis for advice.

WGMIXFISH notes that the landing obligation will mean a significant change in the management and therefore exploitation patterns of fleets will most likely change. Predictions of such changes (gear used, areas and times fished) are challenging due to the multitude of economic, social and regulatory drivers and such a fleet behavioural model is not currently incorporated within the mixed fisheries advice forecast. Changes in fishers behavior will likely lead to an increased uncertainty in MIXFISH forecasts until information becomes available after some years with the landing obligation implemented.

## 6.2 Development of mixed fishery Management Strategy Evaluation (MSE) approaches and mixed-fishery Harvest Control Rules (HCRs)

Further work was undertaken during the working group to develop a stochastic MSE implementation of FCube for medium-term FCube mixed fishery scenarios. As part of that, the working group explored where more flexible harvest control rules based on Fmsy ranges could minimize the mismatch between quotas in the mixed fisheries on a year-to-year basis. This was implemented through a genetic algorithm optimization technique to minimize the difference between the 'min' and the 'max' scenario (the plausible range of fishing effort levels). As the work is preliminary and ongoing, no results are presented here, but further detail on the MSE implementation approach can be found in ICES (2013b).

## 6.3 Revisions to the data call in future years

The data call for WGNSSK and MIXFISH (and latterly WGNEW) is under permanent development. This year new species as listed in Table 6.3.1 (Annex 2) have been added to the data call to allow for mixed fisheries scenarios under the landing obligation taking into account potential choke species besides the main targeted stocks. The list of species will be evaluated every year to ensure that all important species are part of the data call. Next to this the quality of data are an important topic. The WGNSSK/WGMIXFISH data call will include quantitative and qualitative measures to be able to describe the sampling effort and data basis behind raised discard estimates in more detail. Finally, a better harmonization between the different ICES data calls is needed. For some stocks the North Sea belongs to their stock definition but they are assessed in other working groups (e.g. megrim, sea bass in WGCSE) and vice versa (e.g. haddock in VIa; data call WGCSE this year but assessed in WGNSSK).

There was discussion during the meeting of the need to consider how the data call could be adapted in future to include both fleet (economic) and métier (activity) data. The current data call requests métier-based information which is then aggregated to 'pseudo-fleets', and while this is sufficient for current application, inclusion of a fleet identifier would provide for economic and biological data that are based on consistent definitions, allowing improved economic indicators from the mixed fisheries models and further the development and application of bioeconomic methods (e.g. Jardim *et al.*, 2013). It was recognized this was not a straightforward task, and should be considered during the methods working group and in conjunction with other relevant groups (e.g. STECF expert working group on fishing effort).

Finally, it was noted that given the changes to the data call in recent years, the year-to-year consistency of the data (and the processing of the data into fleet objects each year) would be improved by an update data call which requests data in the MIXFISH format for the last three years (the years for which métier based data are available in InterCatch). It was agreed this is something that should be considered for next year, and it would be discussed at the Methods meeting in October.

## 6.4 MIXFISH methodology meeting (WGMIXFISH-METH)

Since 2012 a further WGMIXFISH meeting (the ICES Working Group on mixed fishery methods; WGMIXFISH-METH) has taken place in the autumn to develop application of the FCube methodology to new ecoregions, and to further work on developing new approaches (e;g. age-based forecasts, medium term MSE projections) which could be incorporated into advice for the North Sea. In 2013, the focus of the meeting, as set down by the ToR, was application of the FCube methodology to the West of Scotland and Iberian waters. While significant progress was made in this regard (ICES, 2013b), it was considered that there was no certainty the expertise for the West of Scotland was going to be available going forward (as it wasn't for that meeting), and therefore there was no clear route to transitioning to the regular provision of mixed fisheries advice for the region. While significant progress was made on developing mixed fisheries advice for the Iberian waters, it was recognized that further work was required in order to develop routine annual advice. Given this consideration, it was concluded that a more general ToR should be developed for the WGMIXFISH-METH meeting in 2014, without precluding development of the current approaches in new ecoregions where expertise is available. As a corollary it was proposed to highlight to ACOM the need for consideration of the regional make up of the mixed fishery working group given future advisory needs.

The terms of reference for the WGMIXFISH-METH meeting in October are as follows:

**WGMIXFISH-METH – Working Group on Mixed Fisheries Advice Methodology**

2013/2/ACOM23 The Working Group on Mixed Fisheries Advice Methodology (WGMIXFISH-METH), chaired by Paul Dolder, UK, will meet in London, 20—24 October 2014 to:

a ) Review progress on mixed fisheries methodologies and consider how they might be taken forward and incorporated into the advisory process. Issues to consider include; short-term catch forecasting methods, including methods to incorporate data-poor stocks taking account of uncertainties; medium term MSE approaches to mixed fisheries, in order to evaluate the performance of mixed-fishery models within a management strategy evaluation framework; alternative or additional indictors and metrics encapsulating key indicators from mixed fisheries outputs; scenarios incorporating more realistic assumptions in relation to fleet dynamics; and application of methodology to other ICES regions, fisheries and stocks.

b ) In conjunction with WGSAM, consider how models providing advice on multispecies interactions and models providing advice on mixed fisheries interactions might complement or inform each other with a view to providing more holistic ecosystem advice.

WGMIXFISH-METH will report by 15 November 2014 for the attention of ACOM.

# 7 Conclusions and Recommendations

WGMIXFISH-NS has produced a draft North Sea Mixed Fisheries advice for use by ACOM. Since 2012 WGMIXFISH-NS is held so that mixed fisheries advice can be available alongside ICES single species advice in June. No methodological problems were encountered with the Fcube package and this year one additional stock was fully incorporated and seven more considered partially. As last year, however, problems were encountered because of the close proximity of this WG to that of WGNSSK with revisions of single species advice taking place during the North Sea ADG requiring a revised run of the mixed fishery analysis.

From 2012 a joint WGNSSK-WGMIXFISH data call has allowed a greater consistency between catch totals supplied to WGMIXFISH and WGNSSK. In 2014, the data call was extended to include WGNEW species which allowed for consideration of a greater number of stocks in the mixed fisheries forecasts. Further alignment was achieved this year through directly using métier-specific discard estimates from the InterCatch database and applying these rates to raise the MIXFISH landings to total catch. To date, however, WGMIXFISH data cannot directly be obtained through an extraction from the ICES database (InterCatch) of the data compiled for WGNSSK, primarily because the level of fleet disaggregation best suited to the mixed fisheries projections are incompatible with national sampling schemes and the need to keep the number of fleet-métier combinations used in InterCatch to a manageable number.

Separate files containing vessel length specific data were requested and as in previous years, one of the major tasks for the working group was to quality check data submissions and revise any data errors, where found. This year, mistakes in data submissions were discovered after the meeting meaning the final dataset for the Fcube software was only completed subsequent to the working group. In order to catch irregularities in the data earlier, further code to enable visual quality checks on the data was developed and will be used at an early stage of the working group next year, so that any discrepancies can be identified and addressed as early as possible. However, given the quantity and complexity of data required for the mixed fishery forecasts, the task of checking data is mainly reliant on the availability of expertise from the countries with significant fleet activity in order to identify any issues based on expert knowledge. For this reason active participation from those with a regional interest is the fisheries, and an understanding of the data is vital to ensure data is as accurate as possible and the context of model outputs can be accurately characterised. The working group encourages participation from those countries with significant interests in the regional fisheries at future working groups.

The joint WGNSSK-WGMIXFISH data call is similar to, but separate from, data submissions to STECF. WGMIXFISH recommends to the EU commission that métier classes be made compatible between the effort, catch and economic datasets requested of nations by STECF as soon as possible.

The use of multiple Fcube scenarios leads to a very data rich set of results although a change to only using the **sq_E** scenario in the intermediate year leads to welcome simplification. For the TAC year the **max** and **min** scenarios were included to bracket the space of potential catch and SSB outcomes but for most fleets are considered unrealistic scenarios.

Scenarios are based on central assumptions that fishing patterns and catchability in 2014 and 2015 are the same as those in 2013 (similar to procedures in single-stock forecasts where growth and selectivity are assumed constant). Options that result in under-

or overutilization are useful in identifying the main points of friction between the fishing opportunities of the various stocks. They indicate in which direction fleets may have to adapt to fully utilize these catch opportunities. However, the adaptation mechanisms themselves, which occur largely at the level of the individual vessels (e.g. changes in fishing patterns, catchability, or discarding practices), cannot be easily predicted. Improved mixed-fisheries management should act towards reducing these areas of friction, to limit risks of not achieving the single-stock management objectives.

The effect of fleet behaviours on

- The TAC set for 2015 (assuming perfect knowledge of catches in the intermediate year),
- The amount caught compared to single species TAC recommendations,
- The SSB remaining at the start of 2016,

all need to be considered when reviewing the results of mixed fisheries analysis and this process will continue beyond this WG. However, some initial conclusions are that:

The requirements of the cod management plan again make cod the limiting stock in most fleets in the TAC year (Figure 5.2.2.5; 73 % of the 2013 fishing effort is limited by cod in 2015). However, *Nephrops* FU6 (Farn Deeps) has also become a significant limiting stock (Figure 5.2.2.6; 27% of the fishing effort). The advised single-stock TACs for 2015 cannot be said to be consistent given the current landings compositions of North Sea fleets as can be seen from Figure 4.2.2.1.

If the cod TAC is assumed to limit the activity of fleets (**cod** scenario) the forecasts predict considerable underutilization of other TACs, particularly those for haddock, *Nephrops* and plaice (all < 50 % utilisation).

Implementation of the **Ef_Mgt** scenario as modelled, while leading to catches of cod consistent with the single-stock advice, would have strong negative impacts on the ability of the fleets to catch most other 2015 TACs, particularly haddock, whiting, *Nephrops* (principally from FU7, Fladen grounds) (all < 50 % utilisation) and to a lesser extent North sea plaice (< 70 % utilisation).

In the **sq_E** scenario estimated 2015 landings are also below the baseline for haddock, North Sea plaice and most *Nephrops* FUs (except FU6, Farn Deeps), while cod landings are well above the single-stock advice. Turbot in the North Sea (included for the first time this year) and Sole in the eastern channel were also forecast to have overquota landings under the sq_E scenario.

In the past two years (2013 and 2014) the effort reductions implied by the cod management plan have not been implemented by the EU. As it's unclear whether they will be applied again in 2015, the working group undertook an exploratory analysis to investigate the level of reduction in cod catchability that would be required to be consistent with the single-stock advice for cod without the significant underutilisation of other stocks implied by the **Ef_Mgt** scenario (Figure 5.2.2.7). The results indicated that cod avoidance (either through increased selectivity, or spatial-temporal decoupling of fishing activity from cod) would need to occur at 40 – 50 % above 2013 levels if the singe-stock catch advice is going to be achieved in 2015. The exact mechanism to achieve this reduction in catchability is likely to occur at the individual vessel level and therefore no specific advice is given as to how this should be achieved. Focus should be on reducing areas of tension between the exploitation of cod and other stocks (e.g. haddock, whiting) in the mixed fisheries where possible.

Applying fleet effort resulting from the **sq_E** scenario leads to prediction of over-quota landings of northern hake compared to the North Sea component of this stock's TAC, while there is underutilization of the other ancillary stocks; brill, dab, flounder, lemon sole, witch, red mullet. This suggests an incompatibility of the hake quota with other fishing opportunities in the North Sea. These ancillary stocks were included as a supplementary analysis following the mixed fisheries forecasts on the basis of landings per unit effort. It was considered that the stocks could not be included in the projections and therefore not influence the **max** and **min** scenarios, because of a lack of underlying biological model. However, such analysis may indicate potential further management conflicts in the North Sea mixed fisheries in 2015.

Turbot was included in the mixed fisheries forecasts for the first time this year and seven additional ancillary stocks were also added to the mixed fisheries analyses. Given the introduction of the EU landings obligation from 2016, the working group recognised the need to include as many of the stocks subject to the landings obligation as possible, whether through incorporation in the full scenarios (where an assessment is available) or as ancillary stocks, in order to highlight areas of tension in the mixed demersal fisheries. As such, further stocks are likely to be included in future years as the data becomes available to the working group.

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**Table 1.2.1, Mixed-fisheries advice North Sea. Effort reductions in 2014 compared to 2013, by EU-regulated fleet segment (Council Regulation (EC) No. 43/2014), and the assumed reduction between 2015 and 2014 for the "Effort" scenario.**

| Gear description | Code | % effort reduction in 2014 compared to 2013 | % effort reduction in 2015 compared to 2014 |
|---|---|---|---|
| Bottom trawls and seines ≥100 mm | TR1 | 0% | 45.0% |
| Bottom trawls and seines ≥70 mm and < 100 mm | TR2 | 0% | 45.0% |
| Bottom trawls and seines ≥16 mm and < 32 mm | TR3 | 0% | 0% |
| Beam trawls ≥120 mm | BT1 | 0% | 0% |
| Beam trawls ≥80 mm and < 120 mm | BT2 | 0% | 0% |
| Gillnets and entangling nets, excluding trammelnets | GN1 | 0% | 0% |
| Trammelnets | TN1 | 0% | 0% |
| Longlines | LL1 | 0% | 0% |
| Non-regulated gear | None | 0% | 0% |

**Table 4.1.2.1: Summary of the 2015 landings and target Fs/harvest ratios, resulting from the Advice Approaches considered by ICES. Target Fs are left justified; harvest ratios are right justified. Where a stock/Functional Unit does not have a management plan the landings follow ICES advice.**

| Species | Agreed TAC (summed TAC's) - 2014 | Catch-advice for 2015 | Landings-advice for 2015 | F / Harvest ratio for 2014 | F / Harvest ratio for 2015 | SSB 2015 | SSB 2016 | Rational |
|---|---|---|---|---|---|---|---|---|
| Cod IIIa-IV-VIId | 3972 + 27799 + 1080 = 32851 (IIIa+IV+VIId) | < 35 486 t | < 26 713 t | 0.4 | 0.22 | 80 569 t | 109 100 t | MP |
| Haddock IIa-IV-IIIa-VIa* | 1579 + 38284 + 3988 = 43851 (IIIa+IIa+IV+VIa) | < 54 580 t | < 48 176 t | 0.189 | 0.35 | 164 031 t | 117 426 t | MSY approach |
| Plaice IV | 111631 | < 179 301 t | < 128 376 t | 0.21 | 0.287 | 731 845 t | 735 259 t | MP |
| Sole IV | 11900 | | < 10 973 t | 0.232 | 0.22 | 43 800 t | 53 800 t | MP |
| Saithe IIIa-IV-VI | 77536 + 8045= 85581 (IV+VI) | < 81 490 t | < 72 854 t | 0.33 | 0.28 | 173 960 t | 178 867 t | MP |
| Whiting IV-VIId | 16092 / 0.8 = 20115 (Landings ratio IV-VIId) | < 28 317 t | < 17 190 t | 0.185 | 0.186 | 230 000 t | 266 012 t | MP (modified)[1] |
| Sole VIId | 4838 | | < 1 931 t | 0.43 | 0.27 | 7 394 t | 9 065 t | MSY approach |
| Plaice VIId | 5322 X 0.77 = 4098 (Landings ratio VIId-VIIe) | | < 2 657 t (3 279 t plaic e | 0.44 (Relative) | 0.33 (Relative) | 1.92 (Relative) | 2.34 (Relative) | Data limited approach |
| Turbot IV | 4642 X 0.69 = 3200 (Landings ratio Turbot-Brill)** | < 2406 t | < 2406 t | 0.82 (Relative) | 0.54 (Relative) | 0.86 (Relative) | 1.15 (Relative) | Data limited approach |
| Brill IV | 4643 X 0.31 = 1442 (Landings ratio Turbot-Brill)** | < 1820 t*** | < 1820 t *** | | +20% landings (2010-2012) | n/a | n/a | Data limited approach |
| Dab IV | 18434 X 0.76 = 14092 (Landings ratio Dab-Flounder)** | < 7 795 t*** | < 7 795 t*** | | +7% landings (2010-2012) | n/a | n/a | Data limited approach |
| Flounder IV | 18434 X 0.24 = 4342 (Landings ratio Dab-Flounder)** | < 3160 t*** | < 3160 t*** | | +7% landings (2010-2012) | n/a | n/a | Data limited approach |
| *Nephrops* in Botney Gut (FU 5) | | < 1 159 t | < 1043 t | | n/a | n/a | n/a | MSY approach |
| *Nephrops* in Farn Deeps (FU 6) | | | < 953 t | 16.5 | 6.7 | n/a | n/a | MSY approach |
| *Nephrops* Fladen Ground (FU 7) | | | < 10 759 t | 4.7 | 10.3 | n/a | n/a | MSY approach |
| *Nephrops* in Firth of Forth (FU 8) | | | < 1 769 t | 20.8 | 16.3 | n/a | n/a | MSY approach |
| *Nephrops* in Moray Firth (FU 9) | | | < 1 185 t | 12.8 | 11.8 | n/a | n/a | MSY approach |
| *Nephrops* in Noup (FU 10) | | < 33 t | < 32 t | | n/a | n/a | n/a | MSY approach |
| *Nephrops* in Norwegian Deep (FU 32) | | | < 625 t | | n/a | n/a | n/a | MSY approach |
| *Nephrops* of Horn's Reef (FU 33) | | | < 1 136 t | | n/a | n/a | n/a | MSY approach |
| Nehrops in Devil's Hole (FU 34) | | < 410 t | < 383 t | | n/a | n/a | n/a | MSY approach |
| *Nephrops* in Other rectangles (NEPOTH) | | | < 409 t | | n/a | n/a | n/a | |
| *Nephrops* in Division IIIa | 5019 | | < 5 318 t | 6.1 | 7.9 | n/a | n/a | MSY approach |

* Assessment area changed in 2014

** Proxy TAC based on landings split in 2013

*** based on split IIIa-IV-VIIde landings

**Table 4.2.2.1: Métiers consistent with the cod long-term management plan and AER database.**

| Gear | Mesh Size | fleet | Métier |
|---|---|---|---|
| Gillnet | | Static | GN1 |
| Pots | | | OTH |
| Longlines | | | LL1 |
| Trammel | | | GT1 |
| Pelagic Trawl | | Pelagic | OTH |
| Pelagic Seine | | | OTH |
| Demersale Seine | >=120 | Dseine | TR1 |
| | 110-119 | | |
| | 90-99 | | TR2 |
| | 80_89 | | |
| | 70-79 | | |
| | 16-31 | | TR3 |
| Otter | >=120 | Otter | TR1 |
| | 110-119 | | |
| | 90-99 | | TR2 |
| | 80_89 | | |
| | 70-79 | | |
| | 16-31 | | TR3 |
| Beam | >=120 | Beam | BT1 |
| | 110-119 | | |
| | 90-99 | | BT2 |
| | 80_89 | | |
| Dredge | | Dredge | OTH |

**Table 4.2.2.2: Final fleet and métier categories used in the mixed fishery analysis. 4, 3AN and 7D refer to ICES area.**

| Fleet | Metier | Effort | Catch |
|---|---|---|---|
| BE_Beam<24 | BT2.4 | 300 | 1295 |
| | BT2.7D | 213 | 937 |
| | OTH | 10 | 3 |
| BE_Beam>=24 | BT1.4 | 953 | 3469 |
| | BT2.4 | 961 | 3301 |
| | BT2.7D | 1248 | 1717 |
| BE_Otter | OTH | 135 | 296 |
| | TR2.4 | 401 | 964 |
| DK_Beam | BT1.3AN | 125 | 450 |
| | BT1.4 | 316 | 1014 |
| DK_FDF | OTH | 92 | 346 |
| | TR1.3AN | 257 | 2627 |
| | TR1.4 | 1886 | 9678 |
| | TR2.3AN | 50 | 273 |
| | TR2.4 | 53 | 102 |
| DK_Otter<24 | OTH | 392 | 109 |
| | TR1.3AN | 175 | 1026 |
| | TR1.4 | 560 | 3221 |
| | TR2.3AN | 2396 | 7811 |
| | TR2.4 | 150 | 584 |
| DK_Otter24-40 | OTH | 1067 | 156 |
| | TR1.3AN | 47 | 148 |
| | TR1.4 | 886 | 3920 |
| | TR2.3AN | 223 | 605 |
| | TR2.4 | 146 | 509 |
| DK_Seine | TR1.3AN | 270 | 3849 |
| | TR1.4 | 227 | 2108 |
| DK_Static | GN1.3AN | 287 | 1047 |
| | GN1.4 | 1317 | 4988 |
| | OTH | 6 | 37 |
| DK_U10_OTB | OTH | 8 | 51 |
| | TR1.3AN | 17 | 106 |
| | TR2.3AN | 30 | 126 |
| EN_Beam | BT1.4 | 425 | 1328 |
| | BT2.4 | 2491 | 7873 |
| | BT2.7D | 242 | 326 |
| EN_FDF | OTH | 36 | 188 |
| | TR1.4 | 582 | 3454 |
| EN_Otter<24 | OTH | 160 | 64 |
| | TR1.4 | 201 | 1237 |
| | TR2.4 | 1106 | 2830 |
| EN_Otter>=40 | OTH | 46 | 9 |
| | TR1.4 | 663 | 1608 |
| EN_Otter24-40 | OTH | 547 | 753 |
| | TR1.4 | 375 | 2348 |
| EN_Static | LL1.4 | 15 | 110 |
| | OTH | 200 | 44 |
| EN_U10 | GN1.7D | 583 | 287 |
| | GT1.7D | 471 | 306 |
| | OTH | 3199 | 464 |
| | TR1.4 | 176 | 325 |
| | TR1.7D | 136 | 124 |
| | TR2.4 | 550 | 1002 |
| | TR2.7D | 160 | 135 |
| FR_Beam | BT2.7D | 507 | 763 |
| | OTH | 38 | 78 |
| FR_Nets | GT1.4 | 671 | 851 |
| | GT1.7D | 2312 | 2526 |
| | OTH | 166 | 113 |

| Fleet | Metier | Effort | Catch |
|---|---|---|---|
| FR_OTH | OTH | 6818 | 1152 |
| | pelagic.4 | 1031 | 268 |
| | pelagic.7D | 1903 | 273 |
| FR_Otter>=40 | TR1.4 | 3473 | 9466 |
| FR_Otter10-40 | OTH | 194 | 22 |
| | TR2.4 | 893 | 2841 |
| | TR2.7D | 6096 | 7689 |
| FR_U10m | OTH | 69 | 4 |
| | TR2.7D | 114 | 202 |
| GE_Beam>=24 | BT2.4 | 1059 | 2750 |
| GE_FDF | OTH | 46 | 492 |
| | TR1.4 | 289 | 3605 |
| GE_Otter<24 | OTH | 9 | 36 |
| | TR1.4 | 82 | 1157 |
| | TR2.4 | 214 | 1486 |
| GE_Otter>=40 | OTH | 8 | 81 |
| | TR1.4 | 495 | 4228 |
| GE_Otter24-40 | OTH | 38 | 233 |
| | TR1.4 | 382 | 2605 |
| | TR2.4 | 122 | 448 |
| GE_Static | GN1.4 | 141 | 337 |
| | OTH | 17 | 175 |
| NL_Beam<24 | BT2.4 | 303 | 1940 |
| | OTH | 3200 | 5 |
| NL_Beam>=40 | BT1.4 | 925 | 3130 |
| | BT2.4 | 18309 | 46428 |
| | OTH | 5 | 25 |
| NL_Beam24-40 | BT2.4 | 2827 | 8652 |
| | OTH | 927 | 23 |
| NL_Otter | OTH | 26 | 44 |
| | TR1.4 | 1503 | 8402 |
| | TR2.4 | 1084 | 5314 |
| NL_Static | GN1.4 | 188 | 550 |
| | OTH | 20 | 83 |
| NO_Otter<40 | OTH | 1875 | 763 |
| | TR1.4 | 941 | 19413 |
| | TR3.4 | 75 | 379 |
| NO_Otter>=40 | OTH | 236 | 216 |
| | TR1.4 | 3484 | 5527 |
| NO_Static | GN1.4 | 701 | 5358 |
| | LL1.4 | 752 | 1040 |
| | OTH | 5 | 214 |
| OTH_OTH | OTH | | |
| SC_FDF | TR1.4 | 2586 | 19568 |
| SC_Otter<24 | OTH | 2 | 2 |
| | TR1.4 | 2291 | 12218 |
| | TR2.4 | 4570 | 14479 |
| SC_Otter>=24 | OTH | 146 | 50 |
| | TR1.4 | 4364 | 27832 |
| | TR2.4 | 638 | 1279 |
| SC_Static | LL1.4 | 223 | 511 |
| | OTH | 515 | 2 |
| | pots.4 | 3712 | 100 |
| SC_U10_OTB | TR1.4 | 20 | 70 |
| | TR2.4 | 318 | 504 |
| SW_Otter | OTH | 3048 | 793 |
| | TR1.4 | 178 | 1294 |
| | TR2.3AN | 516 | 1147 |
| | tr2_grid.3AN | 993 | 1124 |

**Table 5.2.1.1: Baseline run outputs from the Fcube FLR package.**

| | | COD–NS | HAD | PLE–EC | PLE–NS | POK | SOL–EC | SOL–NS | TUR–NS | WHG–NS |
|---|---|---|---|---|---|---|---|---|---|---|
| 2014 | Fbar | 0.40 | 0.18 | 0.45* | 0.21 | 0.33 | 0.43 | 0.23 | 0.78* | 0.19 |
| | FmultVsF13 | 1 | 1.03 | 0.85 | 1 | 1.10 | 0.91 | 1 | 1 | 1 |
| | landings | 40 536 | 33 308 | 3 335 | 93 090 | 85 581 | 3 415 | 11 660 | 3 369 | 18 991 |
| | ssb | 70 052 | 185 391 | 1.7 | 670 382 | 188 837 | 10 088 | 46 764 | 0.95* | 196 385 |
| 2015 | Fbar | 0.22 | 0.35 | 0.34* | 0.29 | 0.28 | 0.29 | 0.22 | 0.51* | 0.19 |
| | FmultVsF13 | 0.54 | 1.91 | 0.63 | 1.38 | 0.92 | 0.57 | 0.95 | 0.66 | 1 |
| | landings | 26 713 | 47 841 | 2 668 | 128 376 | 72 744 | 1 920 | 10 957 | 2 406 | 17 098 |
| | ssb | 79 888 | 162 749 | 1.95* | 731 804 | 173 093 | 7 394 | 43 819 | 0.97* | 223 285 |
| 2016 | ssb | 106 726 | 116 788 | 2.38* | 735 173 | 178 523 | 9 077 | 53 800 | 1.18* | 261 267 |

*** values relative to the long-term mean, as for single-stock advice**

| | | NEP5 | NEP6 | NEP7 | NEP8 | NEP9 | NEP10 | NEP32 | NEP33 | NEP34 | NEPOTH |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 2014 | Fbar | - | 0.286 | 0.041 | 0.195 | 0.093 | - | - | - | - | - |
| | FmultVsF13 | - | 1.431 | 1.431 | 1.431 | 1.431 | - | - | - | - | - |
| | landings | 1 503 | 4 268 | 4 235 | 2 148 | 937 | 21 | 273 | 1 354 | 173 | 585 |
| 2015 | Fbar | - | 0.067 | 0.103 | 0.163 | 0.118 | - | - | - | - | - |
| | FmultVsF13 | - | 0.335 | 3.636 | 1.196 | 1.816 | - | - | - | - | - |
| | landings | 1043 | 999 | 10758 | 1796 | 1189 | 32 | 625 | 1136 | 383 | 409 |

**Table 5.2.1.2: Comparison between baseline run and ICES advice for finfish. Figures for 2014 compare results from the baseline run to the ICES intermediate year results. The baseline run uses the same assumptions for F in the intermediate year as the forecasts leading to ICES advice.**

| | | COD–NS | HAD | PLE–EC | PLE–NS | POK | SOL–EC | SOL–NS | TUR–NS | WHG–NS |
|---|---|---|---|---|---|---|---|---|---|---|
| 2014 | Landings | | | | | | | | | |
| | Baseline | 40 536 | 33 308 | 3 335 | 93 090 | 85 581 | 3 415 | 11 660 | 3 369 | 18 991 |
| | ICES | 38 955 | 32 207 | 3 335 | 93 090 | 85 581 | 3 415 | 11 900 | 3 414 | 19 367 |
| | % difference | 4.1% | 3.4 % | 0.0 % | 0.0 % | 0.0 % | 0.0 % | −2.0 % | −1.3 % | −1.9 % |
| 2015 | Landings | | | | | | | | | |
| | Baseline | 26 713 | 47 841 | 2 668 | 128 376 | 72 744 | 1 920 | 10 957 | 2 406 | 17 098 |
| | ICES | 26 713 | 48 176 | 2 657 | 128 376 | 72 854 | 1 931 | 10 973 | 2 406 | 17 190 |
| | % difference | 0.0 % | −0.7 % | 0.4 % | 0.0 % | −0.2 % | -0.6 % | −0.1 % | 0.0 % | -0.5 % |

**Table 5.2.1.3: Comparison between baseline run and ICES advice for *Nephrops*. The values for *Nephrops* FUs that do not receive an absolute ICES abundance estimate are set according to the ICES approach for data-limited *Nephrops* stocks. No 'ICES advice' values are given for *Nephrops* in the intermediate year because the baseline run uses values based on recorded landings in the previous year which can vary significantly from the advice for each FU.**

| | | NEP5 | NEP6 | NEP7 | NEP8 | NEP9 | NEP10 | NEP32 | NEP33 | NEP34 | NEPOTH |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 2015 | Landings | | | | | | | | | | |
| | Baseline | 1043 | 999 | 10758 | 1796 | 1189 | 32 | 625 | 1136 | 383 | 409 |
| | ICES | 1043 | 983 | 10759 | 1769 | 1185 | 32 | 625 | 1136 | 383 | 409 |
| | % difference | 0.0 % | 0.6 % | 0.0 % | 1.5 % | 0.3 % | 0.0 % | 0.0 % | 0.0 % | 0.0 % | 0.0 % |

**Table 5.2.2.1. Results of Final Fcube runs.**

| | year | scenario | COD-NS | HAD | WHG-NS | POK | PLE-NS | SOL-NS | TUR | PLE-EC | SOL-EC | NEP5 | NEP6 | NEP7 | NEP8 | NEP9 | NEP10 | NEP32 | NEP33 | NEP34 | NEPOTH-NS | NEP-TOT |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **landings** | 2014 | baseline | 40536 | 33308 | 18991 | 85581 | 93090 | 11660 | 3369 | 3335 | 3415 | 1503 | 4268 | 4235 | 2148 | 937 | 21 | 273 | 1354 | 173 | 585 | 15497 |
| **Fbar** | 2014 | baseline | 0.40 | 0.19 | 0.19 | 0.33 | 0.21 | 0.23 | 0.46 | 0.32 | 0.43 | - | 0.29 | 0.04 | 0.20 | 0.09 | - | - | - | - | - | |
| | 2015 | baseline | 0.22 | 0.35 | 0.19 | 0.28 | 0.29 | 0.22 | 0.30 | 0.24 | 0.27 | - | 0.07 | 0.10 | 0.16 | 0.12 | - | - | - | - | - | |
| **FmultVsF13** | 2014 | baseline | 1.00 | 1.03 | 1.00 | 1.10 | 1.00 | 1.00 | 1.00 | 0.85 | 0.91 | - | 1.43 | 1.43 | 1.43 | 1.43 | - | - | - | - | - | |
| | 2014 | sq_E | 1.04 | 1.13 | 1.03 | 1.00 | 1.18 | 1.00 | 0.97 | 0.73 | 1.00 | - | 1.15 | 1.00 | 1.11 | 1.04 | - | - | - | - | - | |
| | 2015 | baseline | 0.54 | 1.91 | 1.00 | 0.92 | 1.38 | 0.95 | 0.66 | 0.63 | 0.57 | - | 0.34 | 3.64 | 1.20 | 1.82 | - | - | - | - | - | |
| | 2015 | cod-ns | 0.55 | 0.60 | 0.55 | 0.53 | 0.63 | 0.53 | 0.52 | 0.40 | 0.54 | - | 0.61 | 0.53 | 0.59 | 0.55 | - | - | - | - | - | |
| | 2015 | ef_Mgt | 0.57 | 0.50 | 0.47 | 0.72 | 0.90 | 0.98 | 0.85 | 0.58 | 0.90 | - | 0.42 | 0.31 | 0.37 | 0.33 | - | - | - | - | - | |
| | 2015 | max | 2.86 | 3.88 | 3.15 | 2.33 | 2.42 | 1.72 | 1.93 | 1.41 | 1.62 | - | 3.76 | 3.64 | 3.49 | 3.38 | - | - | - | - | - | |
| | 2015 | min | 0.45 | 0.41 | 0.38 | 0.47 | 0.55 | 0.51 | 0.47 | 0.34 | 0.48 | - | 0.34 | 0.29 | 0.32 | 0.31 | - | - | - | - | - | |
| | 2015 | sq_E | 1.04 | 1.13 | 1.03 | 1.00 | 1.18 | 1.00 | 0.97 | 0.73 | 1.00 | - | 1.15 | 1.00 | 1.11 | 1.04 | - | - | - | - | - | |
| **Fbar** | 2014 | sq_E | 0.41 | 0.21 | 0.19 | 0.3 | 0.25 | 0.23 | 0.45 | 0.27 | 0.47 | - | 0.23 | 0.03 | 0.15 | 0.07 | - | - | - | - | - | |
| | 2015 | cod-ns | 0.22 | 0.11 | 0.1 | 0.16 | 0.13 | 0.12 | 0.24 | 0.15 | 0.26 | - | 0.12 | 0.01 | 0.08 | 0.04 | - | - | - | - | - | |
| | 2015 | ef_Mgt | 0.23 | 0.09 | 0.09 | 0.22 | 0.19 | 0.23 | 0.39 | 0.22 | 0.43 | - | 0.08 | 0.01 | 0.05 | 0.02 | - | - | - | - | - | |
| | 2015 | max | 1.14 | 0.71 | 0.59 | 0.7 | 0.51 | 0.4 | 0.89 | 0.53 | 0.77 | - | 0.75 | 0.1 | 0.47 | 0.22 | - | - | - | - | - | |
| | 2015 | min | 0.18 | 0.08 | 0.07 | 0.14 | 0.11 | 0.12 | 0.22 | 0.13 | 0.23 | - | 0.07 | 0.01 | 0.04 | 0.02 | - | - | - | - | - | |
| | 2015 | sq_E | 0.41 | 0.21 | 0.19 | 0.3 | 0.25 | 0.23 | 0.45 | 0.27 | 0.47 | - | 0.23 | 0.03 | 0.15 | 0.07 | - | - | - | - | - | |
| **landings** | 2014 | baseline | 40536 | 33308 | 18991 | 85581 | 93090 | 11660 | 3369 | 3335 | 3415 | 1503 | 4268 | 4235 | 2148 | 937 | 21 | 273 | 1354 | 173 | 585 | 15497 |
| | 2014 | sq_E | 41791 | 36057 | 19563 | 78751 | 108011 | 11631 | 3290 | 2953 | 3670 | 1132 | 3425 | 2961 | 1660 | 684 | 16 | 206 | 1020 | 130 | 441 | 11676 |
| | 2015 | baseline | 26713 | 47841 | 17098 | 72744 | 128376 | 10957 | 2406 | 2668 | 1920 | 1043 | 999 | 10758 | 1796 | 1189 | 32 | 625 | 1136 | 383 | 409 | 18370 |
| | 2015 | cod-ns | 26713 | 16592 | 9654 | 45797 | 60175 | 6469 | 1972 | 1819 | 1790 | 328 | 1819 | 1572 | 881 | 363 | 10 | 197 | 357 | 120 | 129 | 5777 |
| | 2015 | ef_Mgt | 27597 | 14066 | 8299 | 59947 | 84387 | 11328 | 3026 | 2555 | 2758 | 207 | 1252 | 904 | 552 | 216 | 6 | 124 | 225 | 76 | 81 | 3644 |
| | 2015 | max | 91087 | 80792 | 45494 | 154343 | 199978 | 18156 | 5469 | 5433 | 4323 | 2082 | 11215 | 10758 | 5234 | 2215 | 64 | 1247 | 2267 | 764 | 816 | 36661 |
| | 2015 | min | 22267 | 11466 | 6798 | 40792 | 53520 | 6211 | 1803 | 1542 | 1606 | 181 | 999 | 867 | 484 | 205 | 6 | 108 | 197 | 66 | 71 | 3184 |
| | 2015 | sq_E | 45681 | 29759 | 17483 | 80221 | 107902 | 11460 | 3351 | 3145 | 3008 | 618 | 3425 | 2961 | 1660 | 684 | 19 | 370 | 673 | 227 | 242 | 10878 |
| **Ld_MgtPlan** | 2015 | sq_E | 26713 | 47026 | 17098 | 74651 | 128376 | 10964 | 2406 | 2668 | 1858 | 1043 | 999 | 10758 | 1796 | 1189 | 32 | 625 | 1136 | 383 | 409 | 18370 |
| **catches** | 2014 | sq_E | 53814 | 39395 | 28558 | 78751 | 156810 | 11631 | 3290 | 2953 | 3670 | 1132 | 3425 | 2961 | 1660 | 684 | 16 | 206 | 1020 | 130 | 441 | 11676 |
| | 2015 | cod-ns | 33528 | 18661 | 15699 | 45797 | 84667 | 6469 | 1972 | 1819 | 1790 | 328 | 1819 | 1572 | 881 | 363 | 10 | 197 | 357 | 120 | 129 | 5777 |
| | 2015 | ef_Mgt | 34647 | 15811 | 13479 | 59947 | 118610 | 11328 | 3026 | 2555 | 2758 | 207 | 1252 | 904 | 552 | 216 | 6 | 124 | 225 | 76 | 81 | 3644 |
| | 2015 | max | 117656 | 92735 | 76754 | 154343 | 279520 | 18156 | 5469 | 5433 | 4323 | 2082 | 11215 | 10758 | 5234 | 2215 | 64 | 1247 | 2267 | 764 | 816 | 36661 |
| | 2015 | min | 27910 | 12880 | 11027 | 40792 | 75325 | 6211 | 1803 | 1542 | 1606 | 181 | 999 | 867 | 484 | 205 | 6 | 108 | 197 | 66 | 71 | 3184 |
| | 2015 | sq_E | 57698 | 33578 | 28633 | 80221 | 151503 | 11460 | 3351 | 3145 | 3008 | 618 | 3425 | 2961 | 1660 | 684 | 19 | 370 | 673 | 227 | 242 | 10878 |
| **ssb** | 2015 | baseline | 79888 | 162749 | 223285 | 173093 | 731804 | 43819 | 5402 | 9802 | 7394 | - | - | - | - | - | - | - | - | - | - | |
| | 2016 | baseline | 106726 | 116788 | 261267 | 178523 | 735173 | 53800 | 6552 | 11966 | 9077 | - | - | - | - | - | - | - | - | - | - | |
| **ssb** | 2015 | sq_E | 78580 | 159772 | 222532 | 179249 | 709977 | 43850 | 5481 | 10161 | 7119 | - | - | - | - | - | - | - | - | - | - | |
| | 2016 | cod-ns | 104855 | 146776 | 270986 | 210160 | 803339 | 58524 | 7089 | 13239 | 8936 | - | - | - | - | - | - | - | - | - | - | |
| | 2016 | ef_Mgt | 103913 | 149426 | 272841 | 197218 | 769298 | 53444 | 6045 | 12539 | 7893 | - | - | - | - | - | - | - | - | - | - | |
| | 2016 | max | 39170 | 80374 | 221296 | 113460 | 608786 | 46333 | 3664 | 9828 | 6215 | - | - | - | - | - | - | - | - | - | - | |
| | 2016 | min | 109603 | 152156 | 274893 | 214756 | 812718 | 58793 | 7256 | 13503 | 9136 | - | - | - | - | - | - | - | - | - | - | |
| | 2016 | sq_E | 84826 | 132999 | 260239 | 178820 | 736365 | 53306 | 5724 | 11980 | 7624 | - | - | - | - | - | - | - | - | - | - | |
| **ssb_MgtPlan** | 2015 | sq_E | 78580 | 159772 | 222532 | 179249 | 709977 | 43850 | 5481 | 10161 | 7119 | - | - | - | - | - | - | - | - | - | - | |

**Table 5.2.2.2 Landings under the mixed fisheries scenarios relative to the single-stock advice.**

| Stock | Single-stock landings advice 2015* | Landings per mixed-fisheries scenario 2015 Relative to the single stock advice | | | | |
|---|---|---|---|---|---|---|
| | | "Max" | "Min" | "Cod" | "Sq_E" | "Ef_Mgt" |
| Cod IIIaN, IV, VIId | 26.713 | 3.41 | 0.83 | 1.00 | 1.71 | 1.03 |
| Haddock IIIaN, IV, VIa | 48.176 | 1.68 | 0.24 | 0.34 | 0.62 | 0.29 |
| Plaice IV | 128.376 | 1.56 | 0.42 | 0.47 | 0.84 | 0.66 |
| Saithe IIIaN, IV, VI | 72.854 | 2.12 | 0.56 | 0.63 | 1.10 | 0.82 |
| Sole IV | 10.973 | 1.65 | 0.57 | 0.59 | 1.04 | 1.03 |
| Turbot IV | 2.406 | 2.27 | 0.75 | 0.82 | 1.39 | 1.26 |
| Whiting IV, VIId | 17.19 | 2.65 | 0.40 | 0.56 | 1.02 | 0.48 |
| *Nephrops* FU 5 | 1.043 | 2.00 | 0.17 | 0.31 | 0.59 | 0.20 |
| *Nephrops* FU 6 | 0.983 | 11.41 | 1.02 | 1.85 | 3.48 | 1.27 |
| *Nephrops* FU 7 | 10.759 | 1.00 | 0.08 | 0.15 | 0.28 | 0.08 |
| *Nephrops* FU 8 | 1.769 | 2.96 | 0.27 | 0.50 | 0.94 | 0.31 |
| *Nephrops* FU 9 | 1.185 | 1.87 | 0.17 | 0.31 | 0.58 | 0.18 |
| *Nephrops* FU 10 | 0.032 | 2.00 | 0.19 | 0.31 | 0.59 | 0.19 |
| *Nephrops* FU 32 | 0.625 | 2.00 | 0.17 | 0.32 | 0.59 | 0.20 |
| *Nephrops* FU 33 | 1.136 | 2.00 | 0.17 | 0.31 | 0.59 | 0.20 |
| *Nephrops* FU 34 | 0.383 | 1.99 | 0.17 | 0.31 | 0.59 | 0.20 |
| *Nephrops* other IV | 0.409 | 2.00 | 0.17 | 0.32 | 0.59 | 0.04 |
| Plaice VIId | 2.657 | 2.04 | 0.57 | 0.68 | 1.18 | 0.96 |
| Sole VIId | 1.931 | 2.24 | 0.83 | 0.93 | 1.56 | 1.43 |

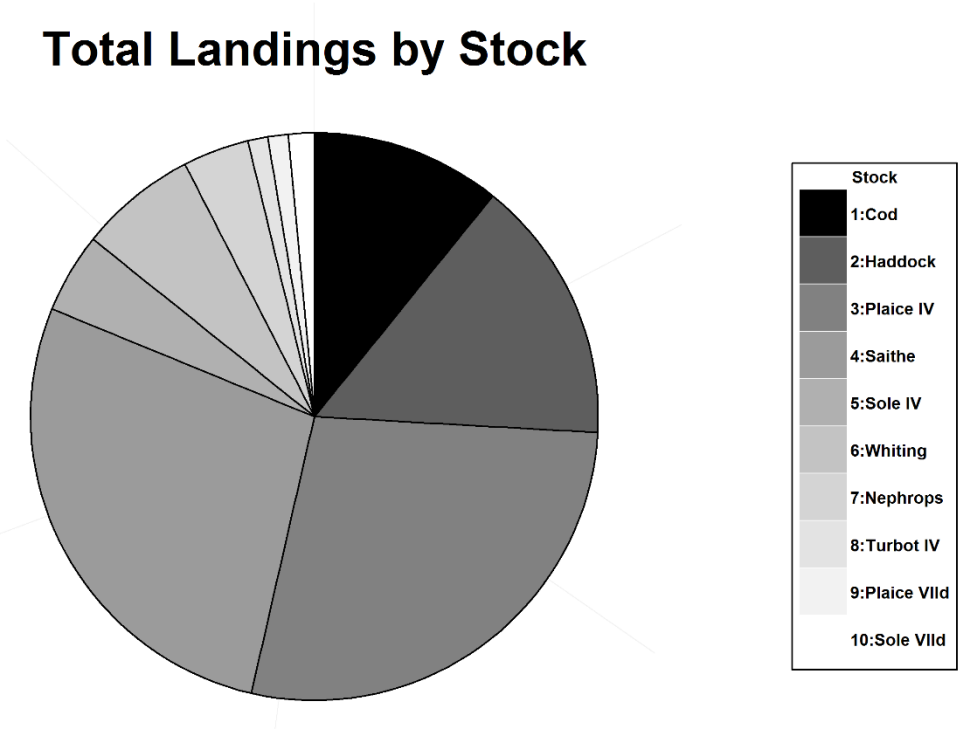



**Figure 4.2.1.1. Distribution of landings of those stocks included in the mixed fisheries projections.**

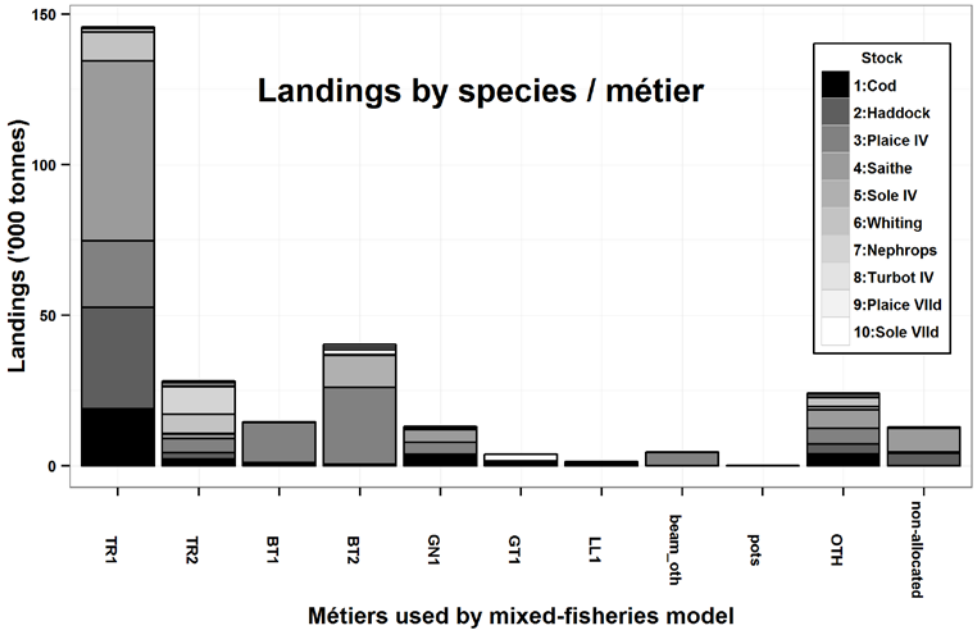



**Figure 4.2.2.1 Landings distribution of species by métier with landings consisting of ≥1% of any of the stocks 1–10 in 2013 Note: The "other" (OTH) displayed here is a mixed category consisting of (i) landings without corresponding effort and (ii) landings of any combination of fleet and métier with landings < 1% of any of the stocks 1–10 in 2013. The "non-allocated" is the differences between total landings used in single-stock advice and mixed-fisheries advice, such as saithe and haddock landings in Subarea VI and VIa respectively.**

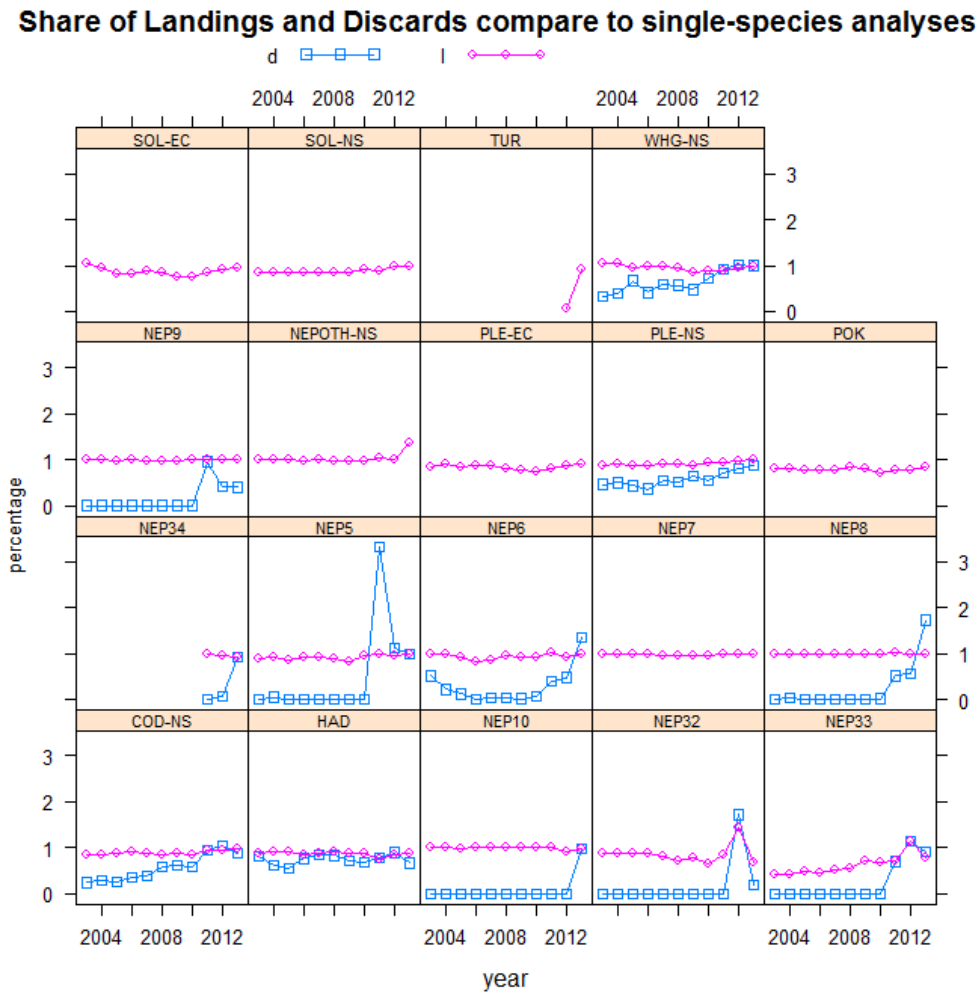



**Figure 4.2.2.2. Ratio between the sum of landings and discards across fleets used in the MIXFISH analysis and the landings and discards estimated by the WGNSSK stock assessments**

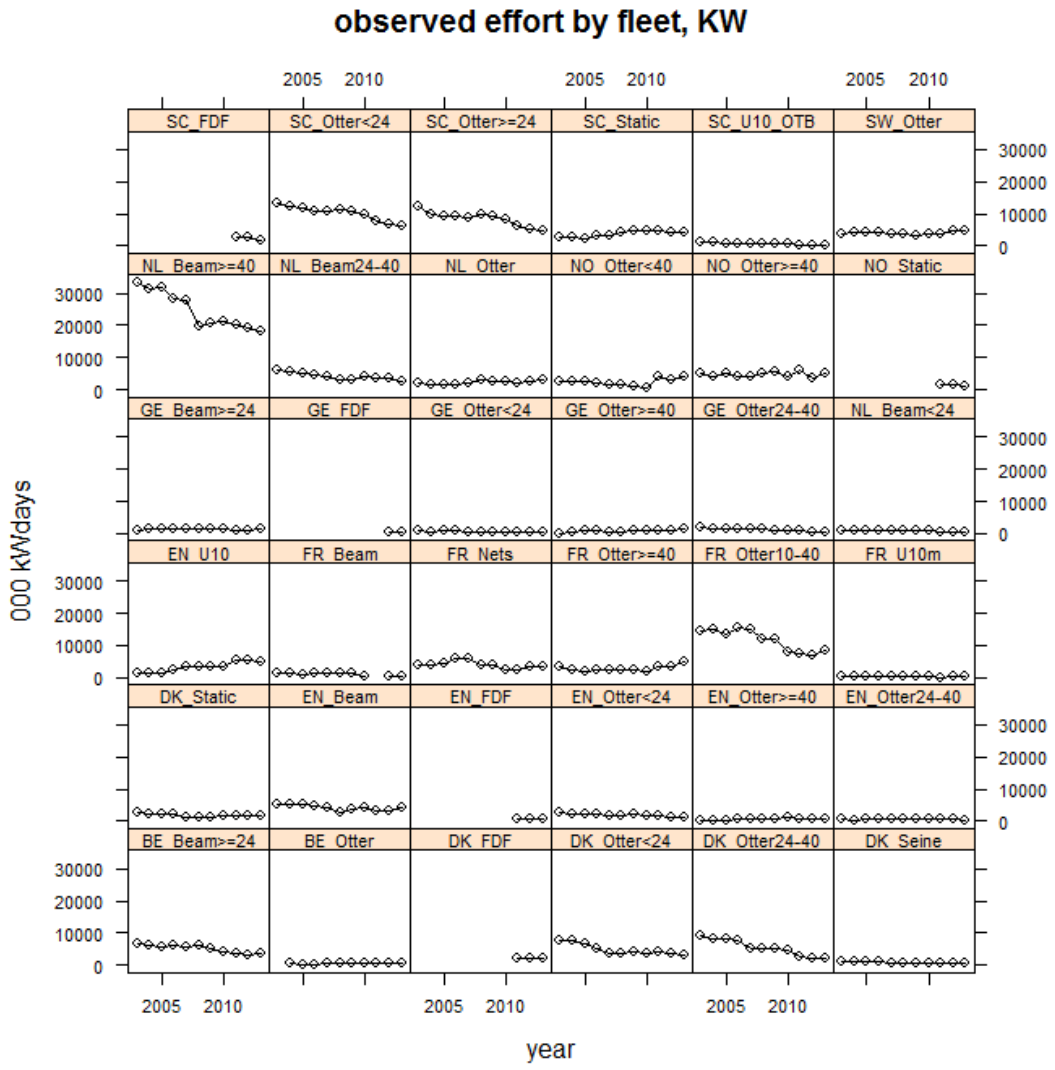



**Figure 4.2.3.1 – Effort by fleet and year for the North Sea demersal fleets, in '000 KWdays. Data for French fleets in 2009 were not available.**

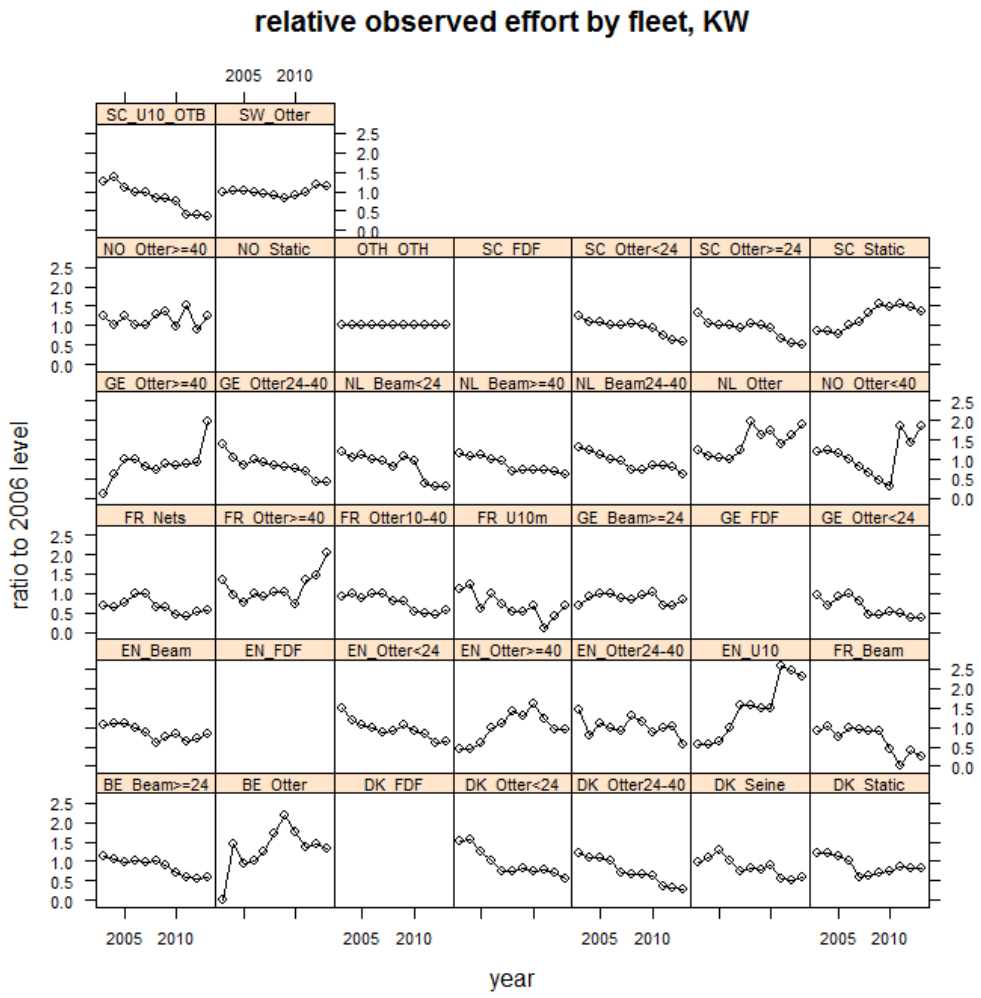



**Figure 4.2.3.2 – Relative trends (compared to the 2006 value) in effort (KW Days) by fleet and year for the North Sea demersal fleets. Data for French fleets in 2009 were not available.**

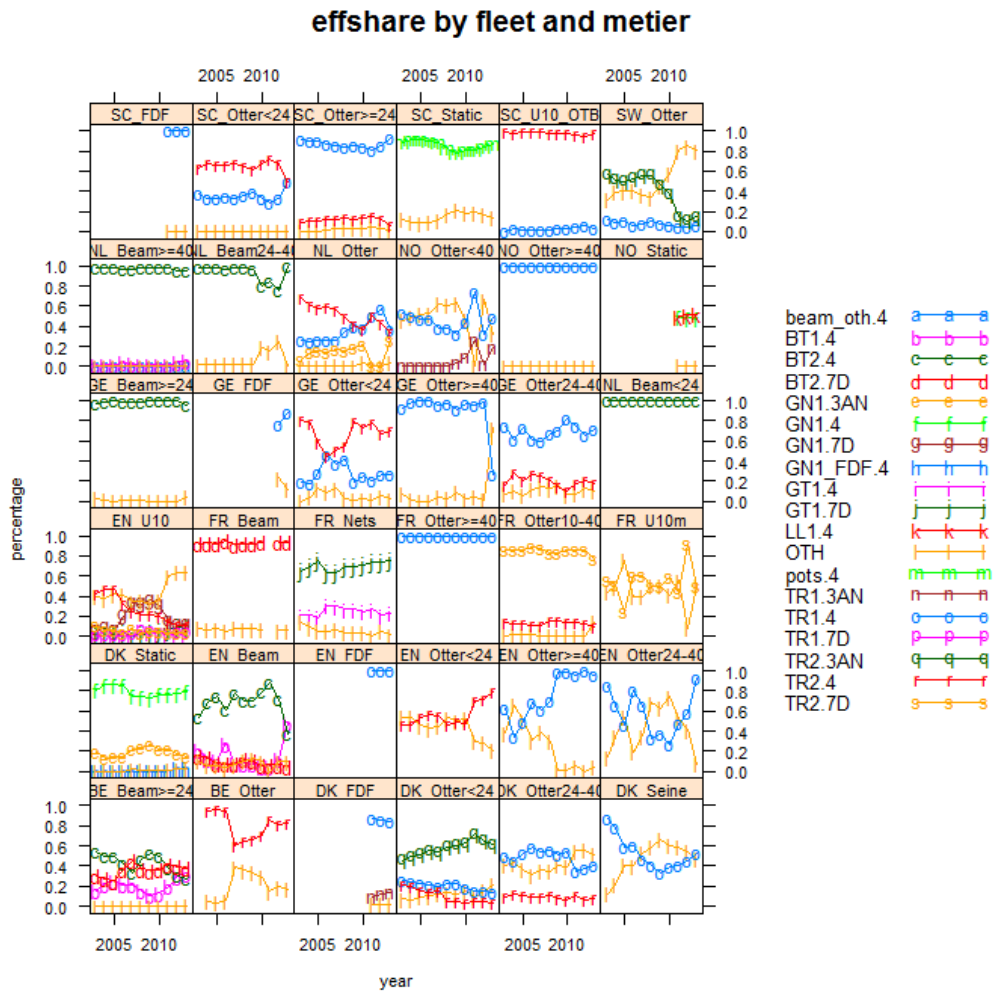



**Figure 4.2.3.3 – Effort share (in proportion) by métier for each fleet.**

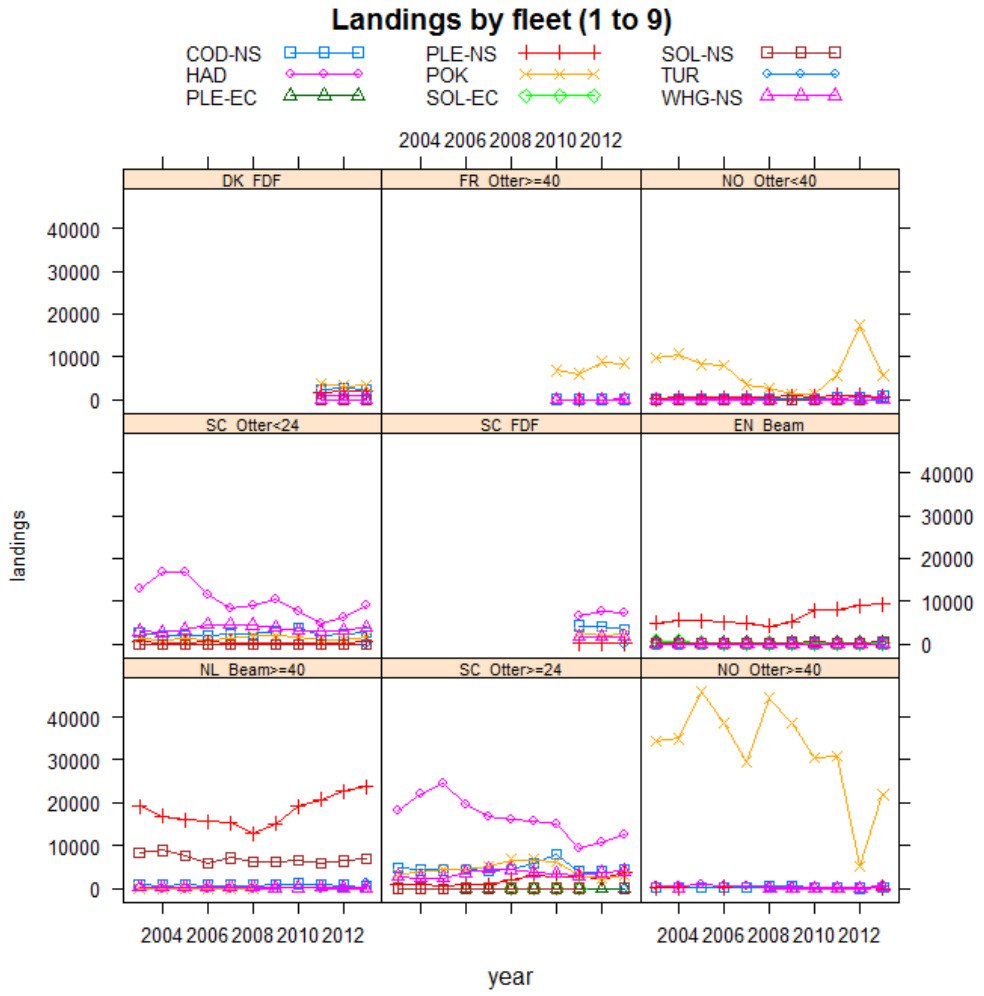



**Figure 4.2.3.4. Landings by fleet, stock and year. Fleets are shown in decreasing groups of total landings and with different scales.**

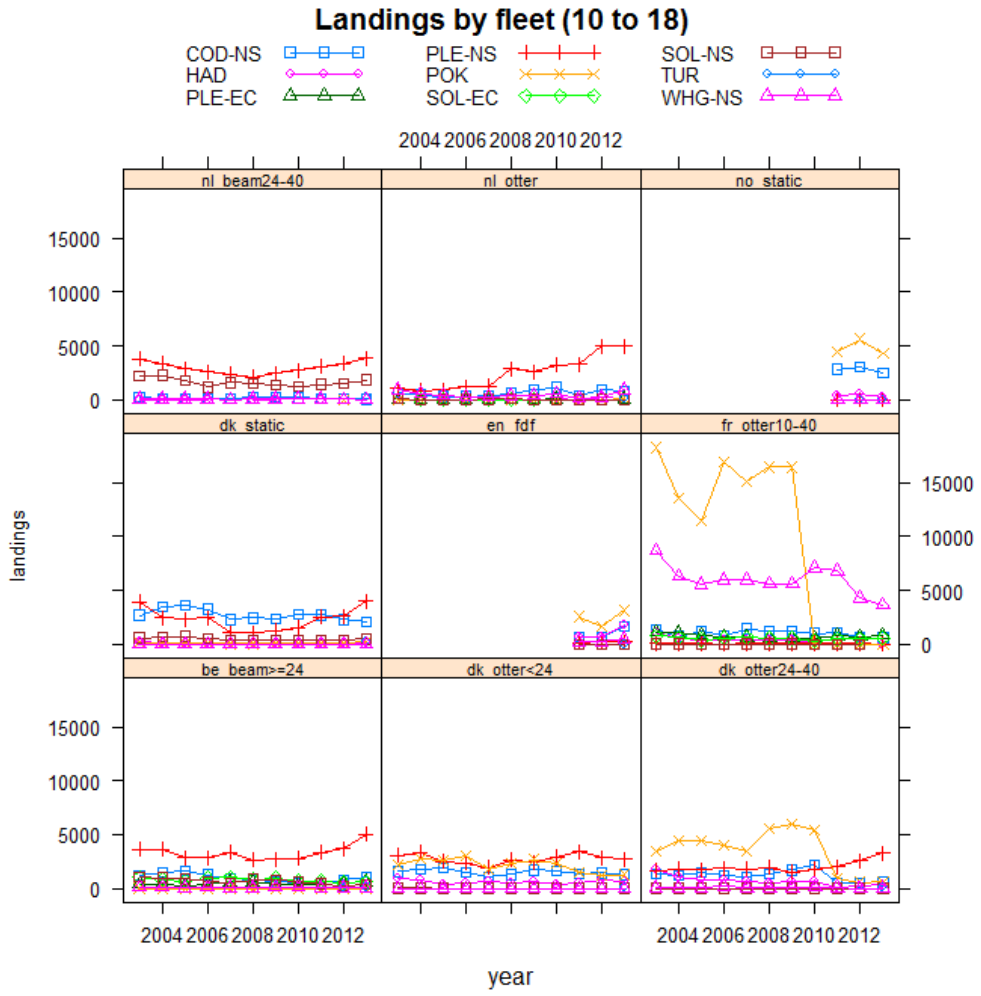



**Figure 4.2.3.4 (cont). Landings by fleet, stock and year. Fleets are shown in decreasing groups of total landings and with different scales.**

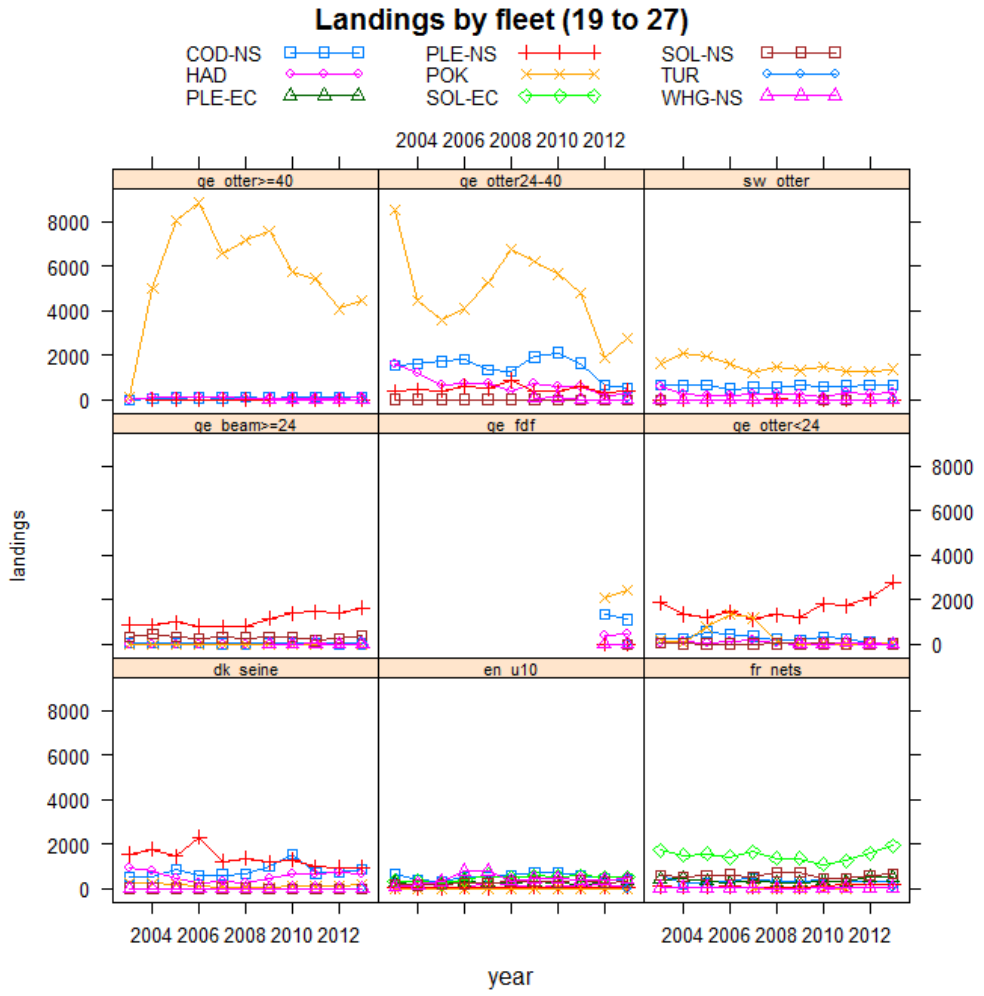



**Figure 4.2.3.4 (cont). Landings by fleet, stock and year. Fleets are shown in decreasing groups of total landings and with different scales**

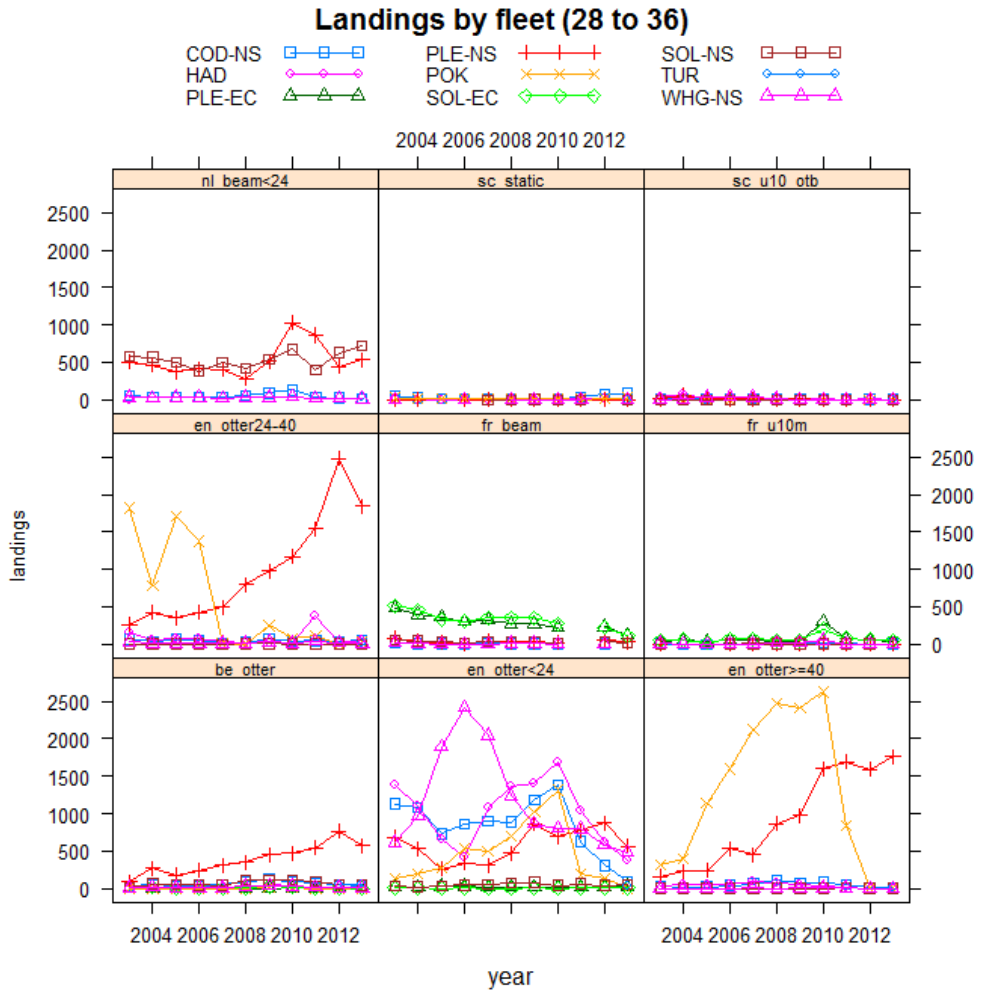



**Figure 4.2.3.4 (cont). Landings by fleet, stock and year. Fleets are shown in decreasing groups of total landings and with different scales**

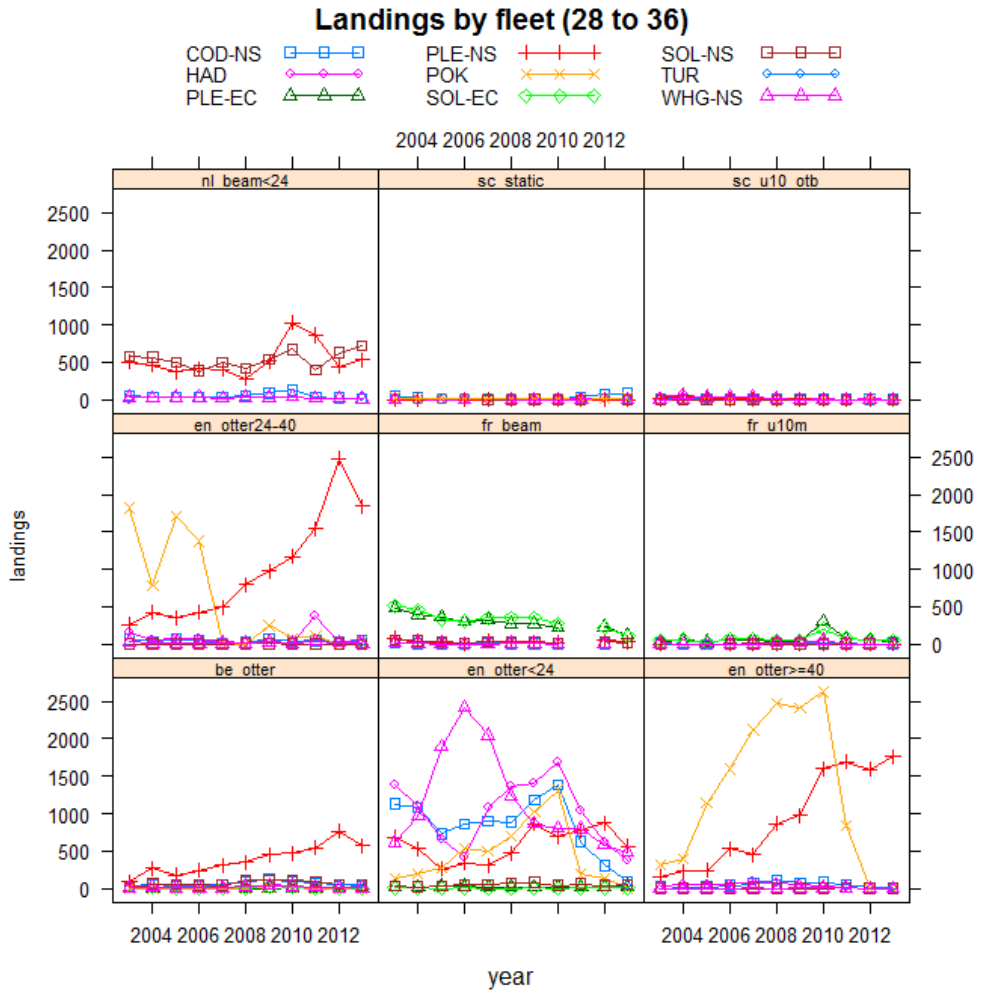



**Figure 4.2.3.4 (cont). Landings by fleet, stock and year. Fleets are shown in decreasing groups of total landings and with different scales.**

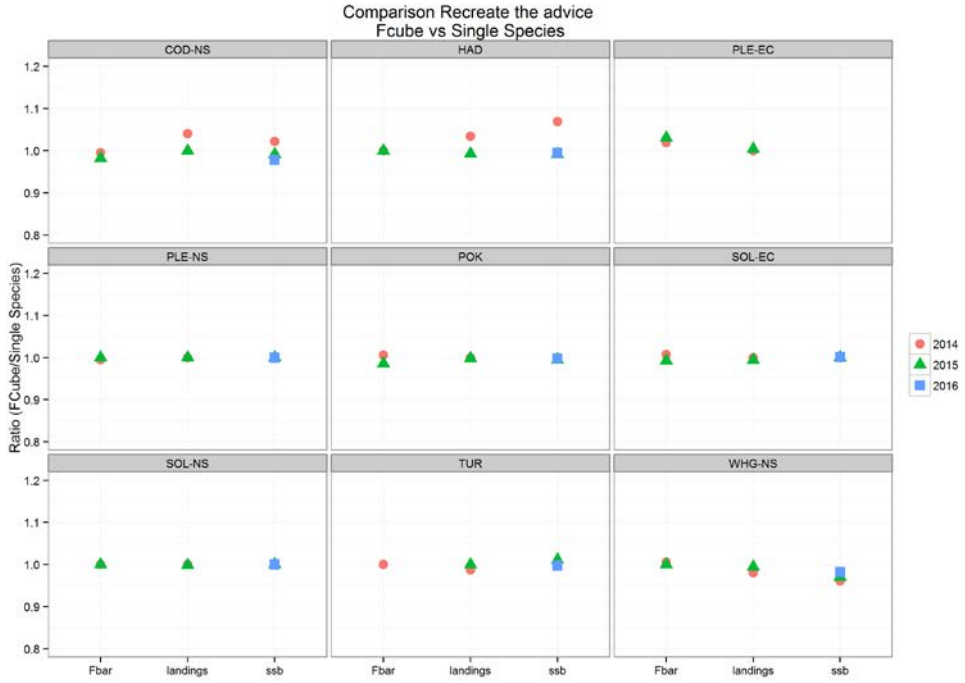



**Figure 5.2.1.1a Difference between Fcube baseline run and Single Species advice for finfish stocks, showing Fbar (2014—2015), landings (2014—2015) and SSB (2015—2016).**

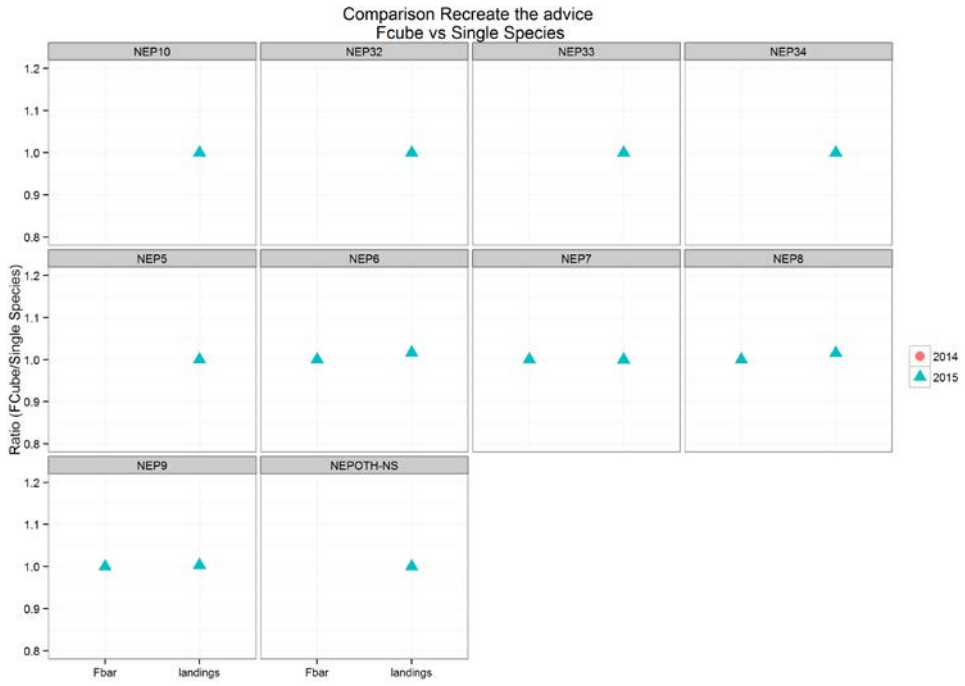



**Figure 5.2.1.1b Difference between FCube baseline run and single species advice for *Nephrops* stocks. FBar and landings in 2015 only shown as harvest in intermediate year is not directly comparable. Fbar not shown for some stocks as they're non-analytical assessments.**

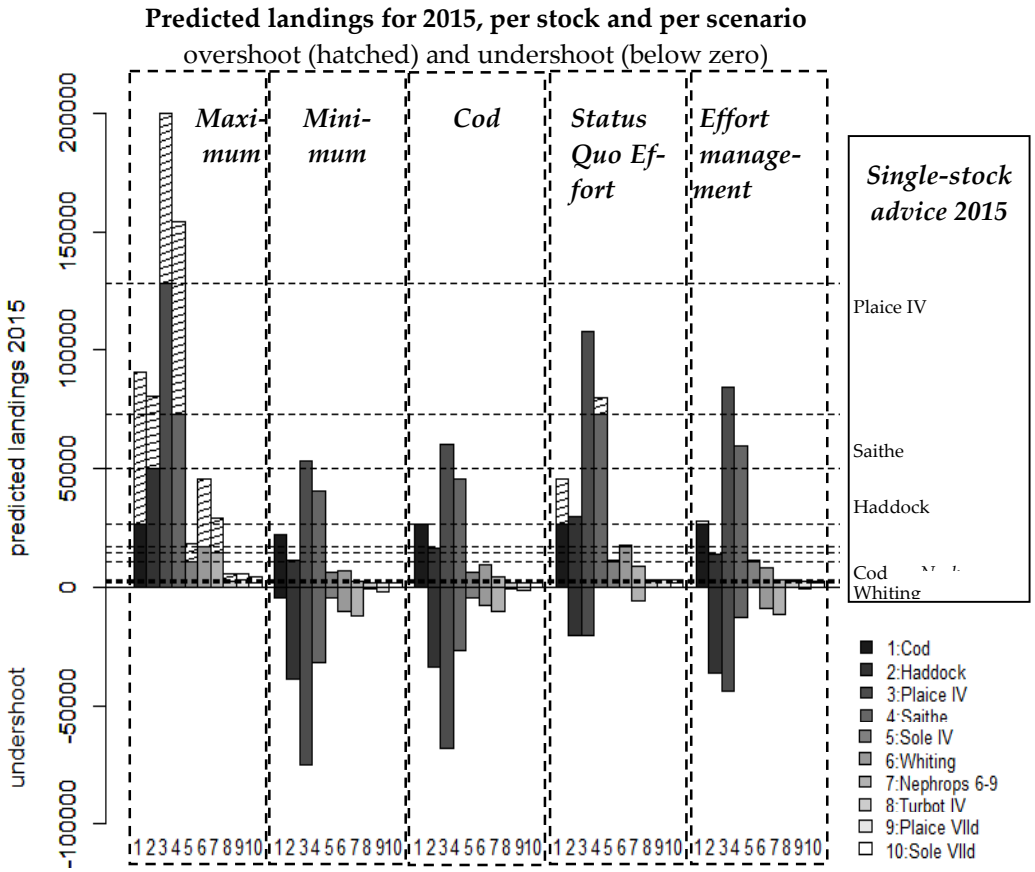



**Figure 5.2.2.1 TAC year results (2015). Fcube estimates of potential landings by stock after applying the status quo effort scenario to all stocks in the intermediate year followed by the Fcube scenarios. Horizontal lines correspond to the TAC set by the single-stock advice. Bars below the value of zero show the scale of undershoot (compared to the single species TAC) in cases where landings are predicted to be lower when applying the scenario.**

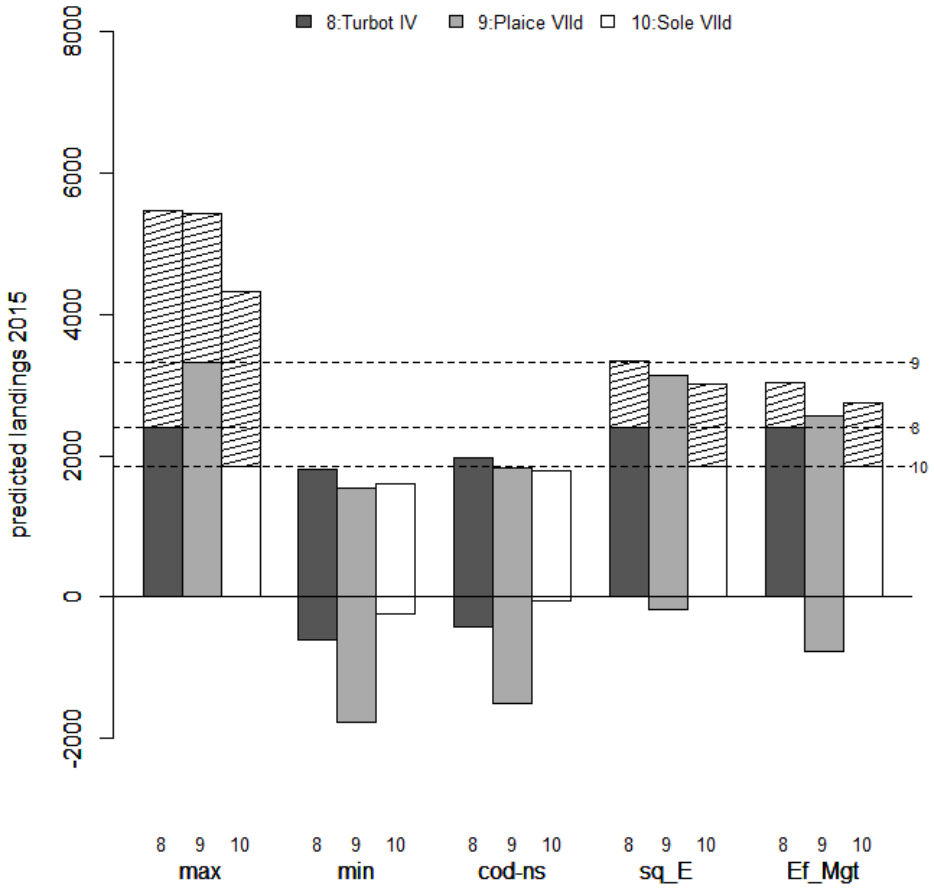



**Figure 5.2.2.2 TAC year results for the stocks subject to lower landings (detail from Figure 4.2.2.2.1). Estimates of potential landings (in tonnes) by stock and by scenario. Horizontal lines correspond to the single-stock advice for 2015. Bars below the value of zero show the scale of undershoot (compared to single-stock advice) in cases where landings are predicted to be lower when applying the scenario. Hatched columns represent landings in overshoot of the single-stock advice.**

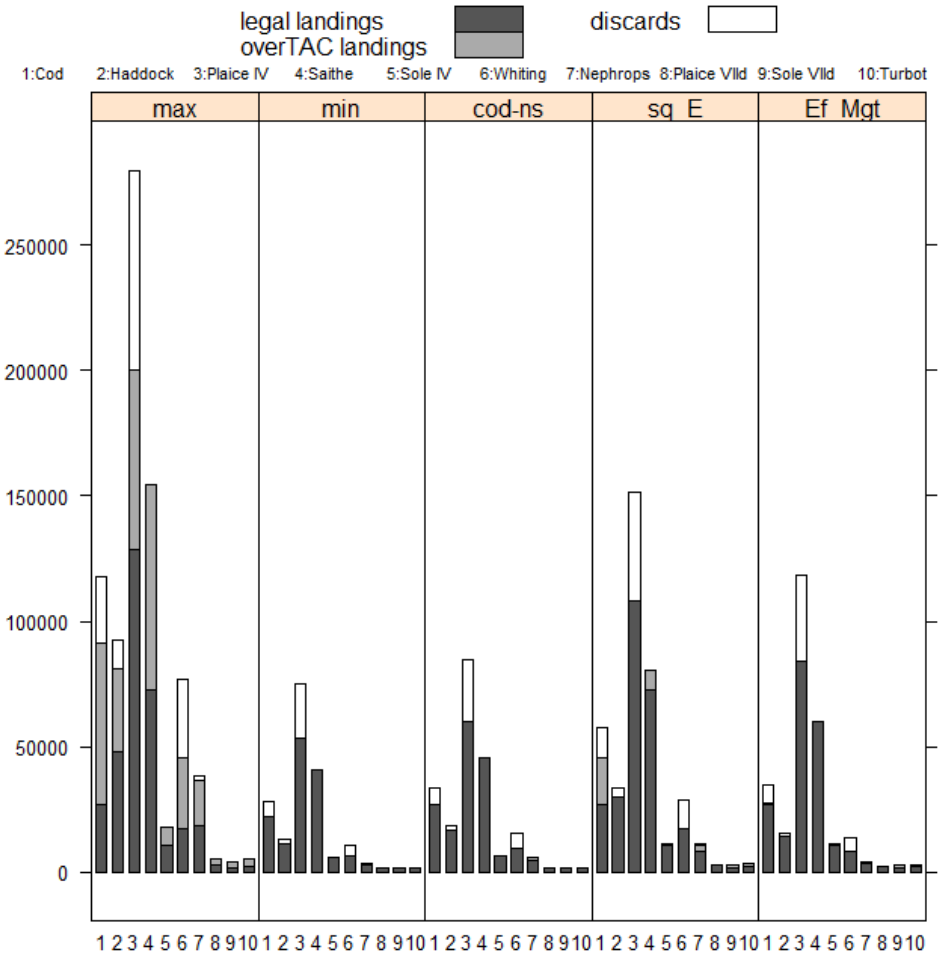



**Figure 5.2.2.3. TAC year results (2015). Total estimated catches by stock and Fcube scenario in 2015. Bars represent from bottom to top: potential landings (as estimated from previous ratios of landings vs. discards) up to the baseline single-stock 2015 TAC; potential landings (as estimated from previous ratios of landings vs. discards) above the baseline single-stock 2015 TAC; discards.**

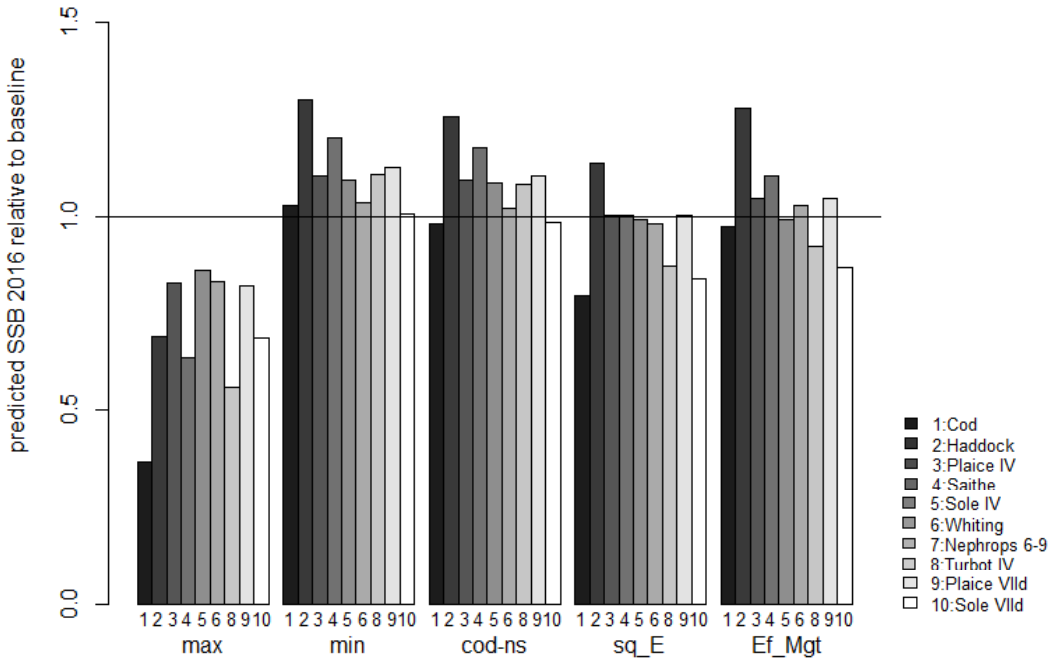



**Figure 5.2.2.4. Estimates of potential SSB at the start of 2016 by stock after applying the mixed fisheries scenarios, expressed as a ratio to the single species advice forecast. Horizontal line corresponds to the SSB resulting from the single-stock advice (at the start of 2016). Nephrops are not included as abundance is not forecast from the mixed fisheries model.**

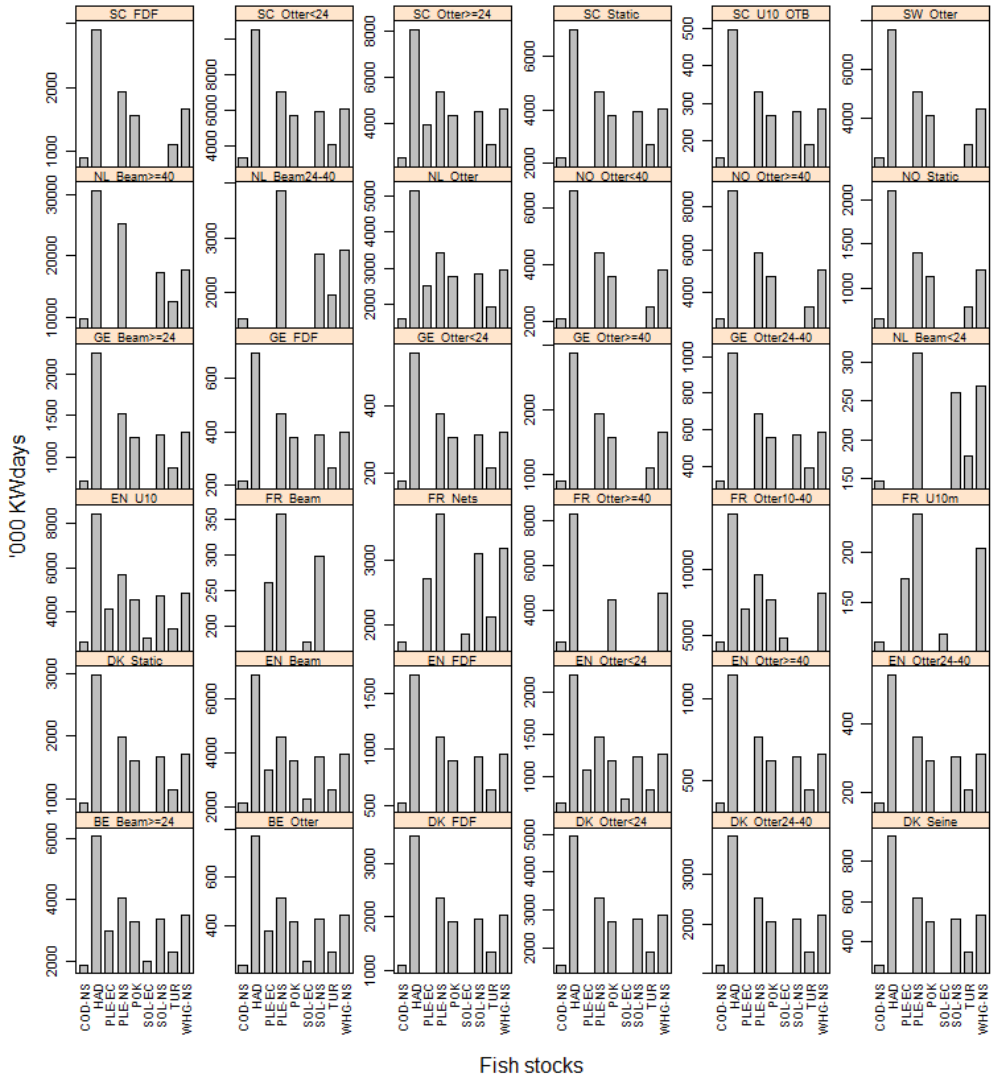



**Figure 5.2.2.5. TAC year results (2015). Fcube estimates of effort by fleet corresponding to the individual "quota share" (or partial target F) by stock in 2015 (baseline run). Finfish species.**

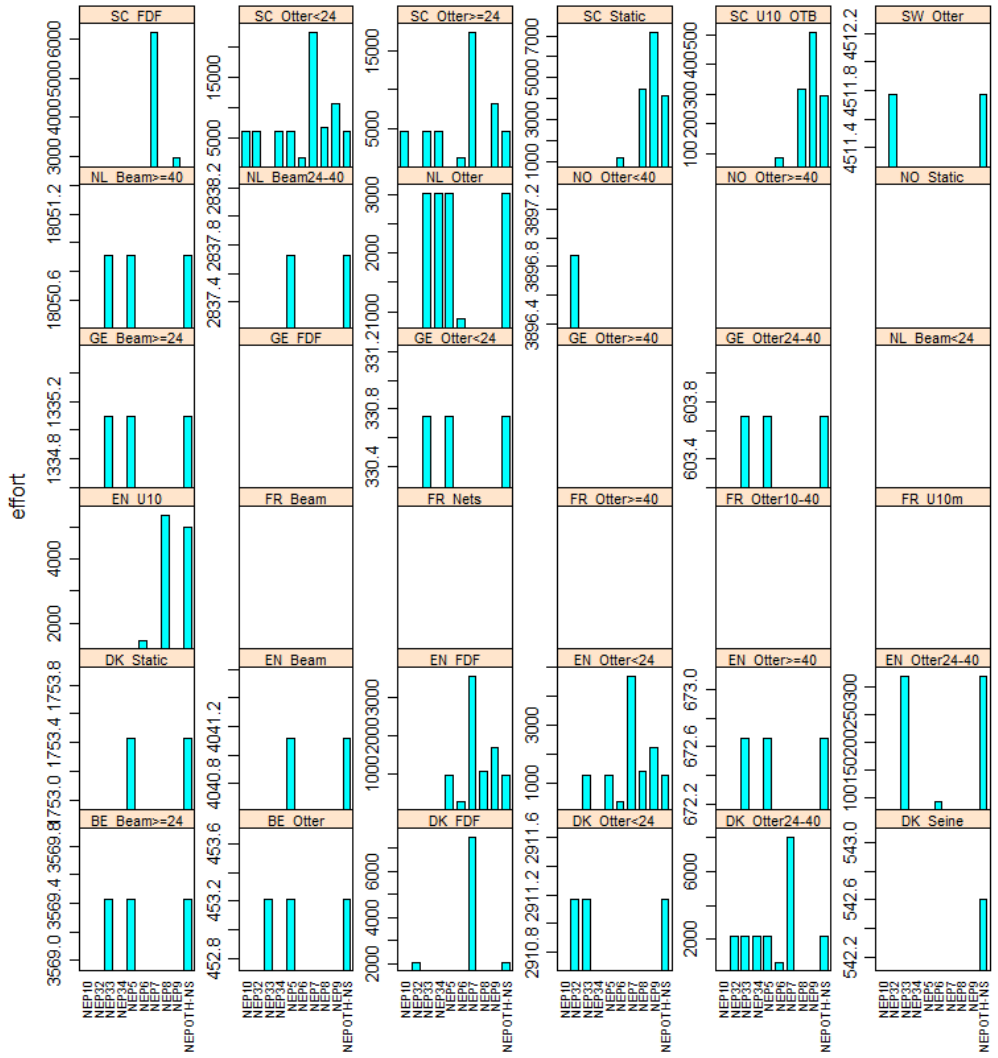



**Figure 5.2.2.6. TAC year results (2015). Fcube estimates of effort by fleet corresponding to the individual "quota share" (or partial target F) by stock in 2015 (baseline run). *Nephrops* FUs.**

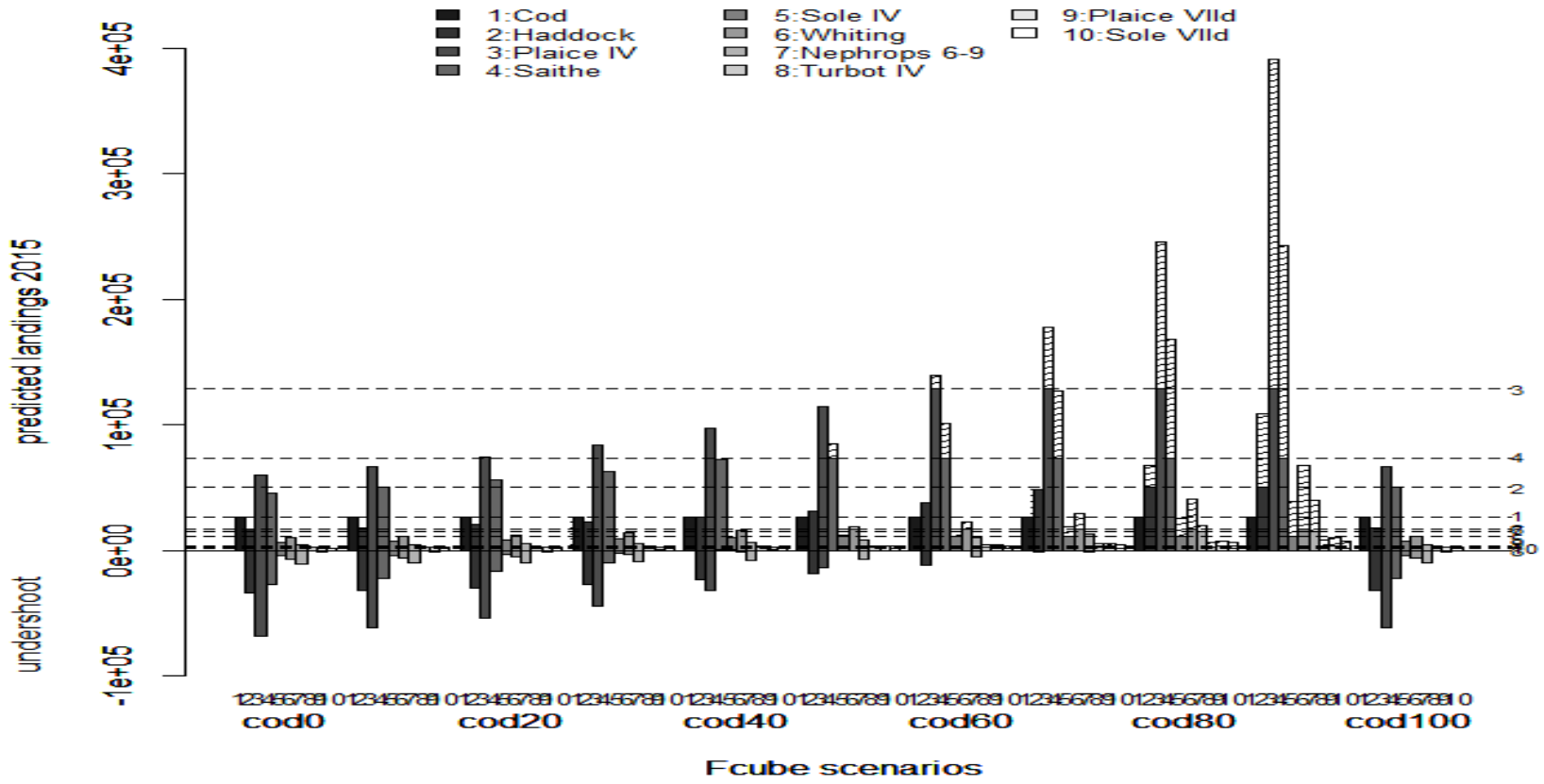



**Figure 5.2.2.7 Cod catchability reduction scenario. Each group of barcharts shows the predicted landings based on 'cod' as the limiting stock, with successive reductions of 10% in cod catchability (i.e. Cod0 is no reduction in catchability, similar to the standard 'cod' scenario, cod20 is a 20% reduction in cod catchability etc..). Cod100 is erroneously labelled, and is the same scenario as Cod0 (i.e. 0% reduction).**

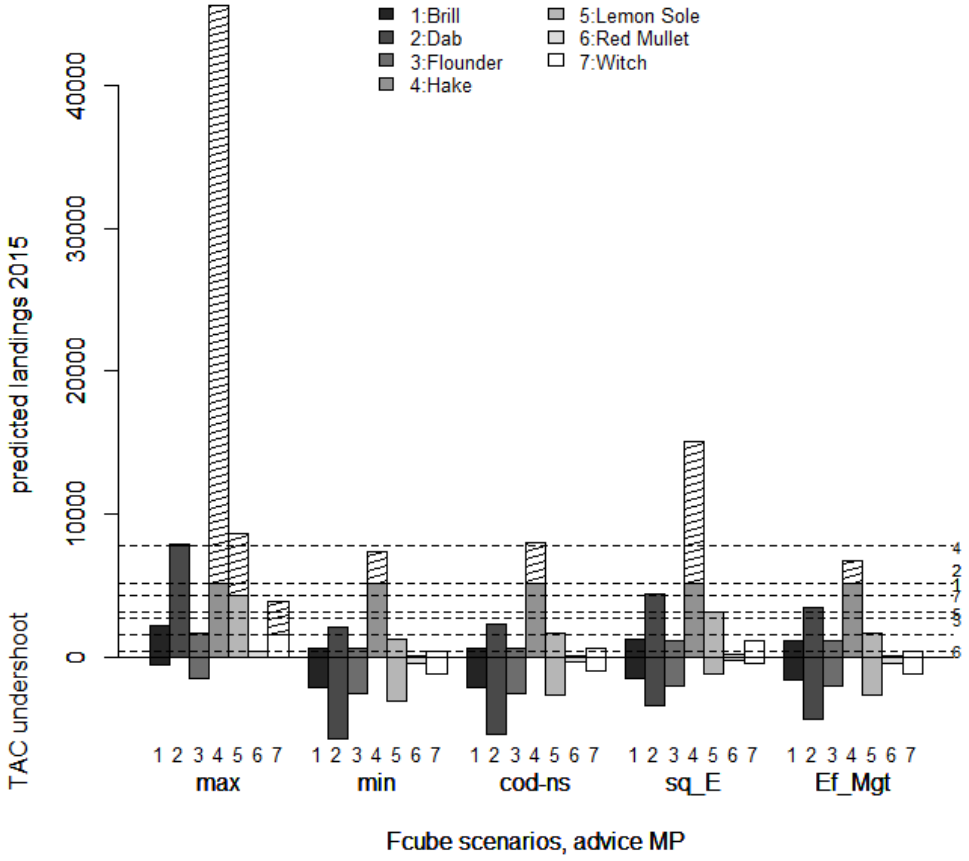
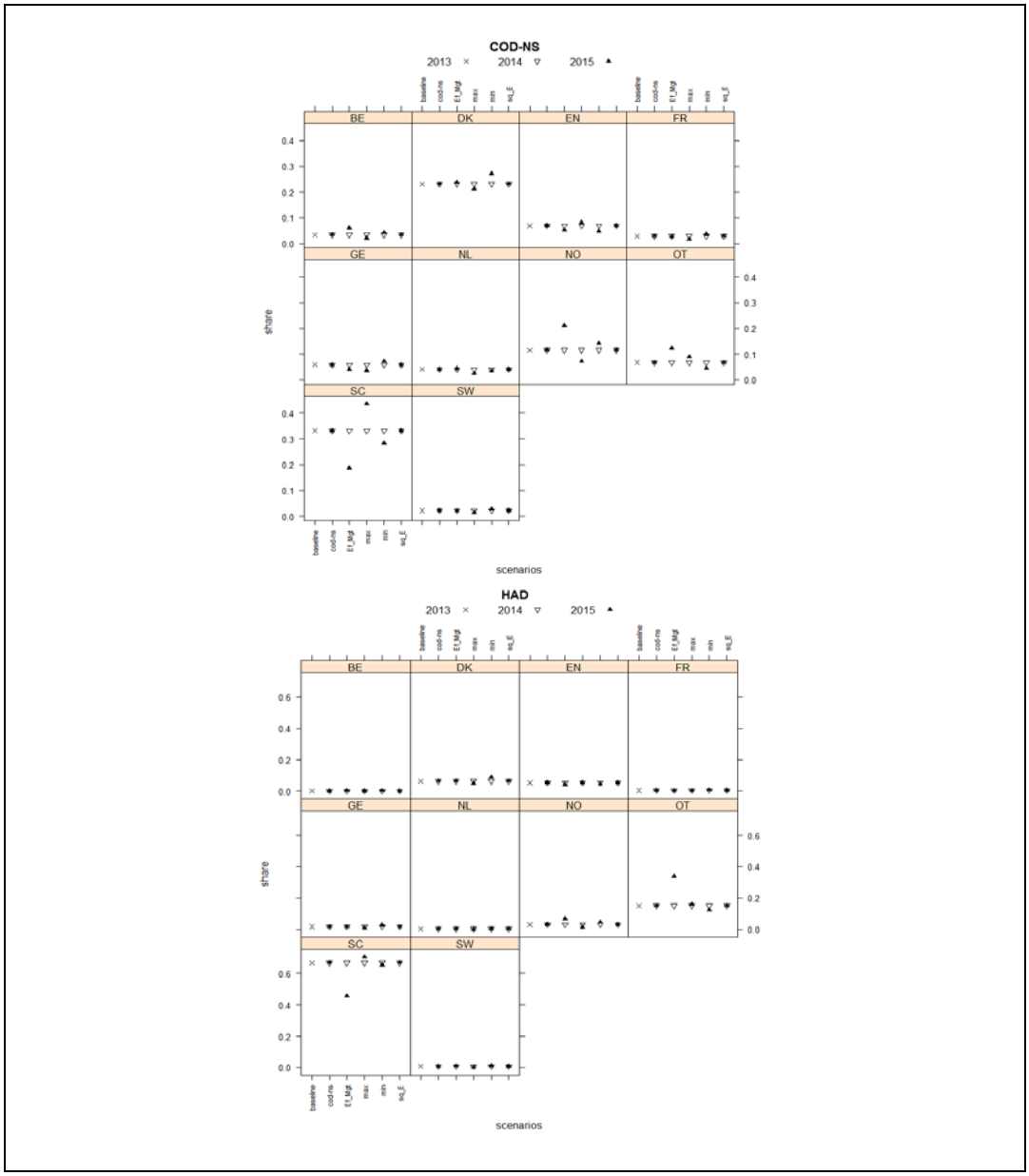



**Figure 5.2.2.1.1. TAC year results. Estimates of potential landings by stock after applying the status quo effort scenario in the intermediate year followed by the Fcube scenarios. Stocks shown do not influence the mixed fisheries projections but potential landings are calculated using fleet effort results from the scenarios and the lpue of métiers from the final data year. Horizontal lines correspond to the TAC set by the single-stock advice. Bars below the value of zero show the scale of undershoot (compared to the single species TAC) in cases where landings are predicted to be lower when applying the scenario.**


COD-NS
2013
2014
2015
baseline
cod-ns
EI_Mgt
max
min
eq_E
BE
DK
EN
FR
GE
NL
NO
OT
SC
SW
share
scenarios
HAD
2013
2014
2015
baseline
cod-ns
EI_Mgt
max
min
eq_E
BE
DK
EN
FR
GE
NL
NO
OT
SC
SW
share
scenarios

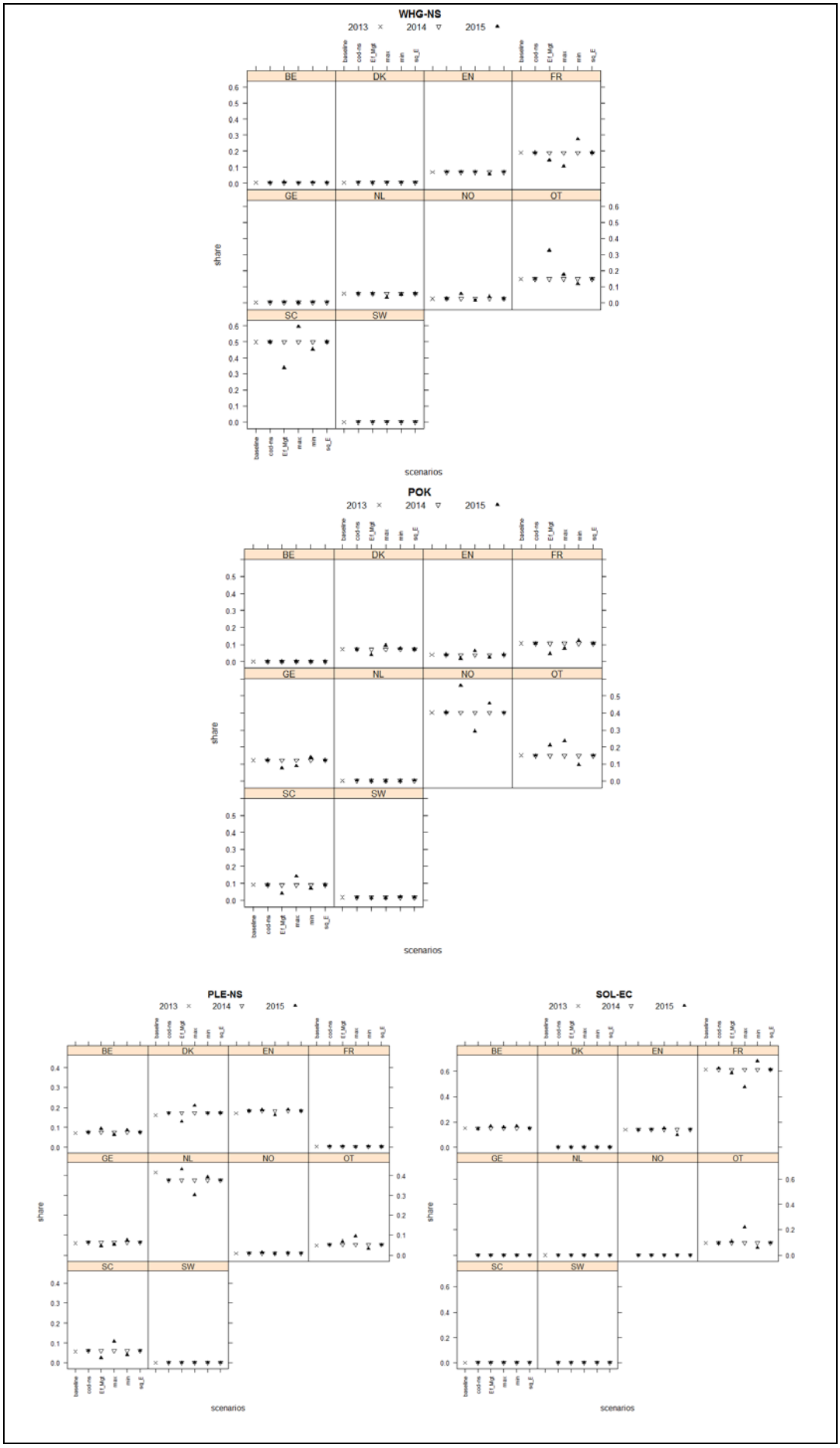

WHG-NS
2013 2014 2015
BE DK EN FR
GE NL NO OT
SC SW
share
baseline cod-ns EI_Mgt max min sq_E
scenarios
POK
2013 2014 2015
BE DK EN FR
GE NL NO OT
SC SW
share
baseline cod-ns EI_Mgt max min sq_E
scenarios
PLE-NS
2013 2014 2015
BE DK EN FR
GE NL NO OT
SC SW
share
baseline cod-ns EI_Mgt max min sq_E
scenarios
SOL-EC
2013 2014 2015
BE DK EN FR
GE NL NO OT
SC SW
share
baseline cod-ns EI_Mgt max min sq_E
scenarios

**Figure 5.2.2.2.1: Test for relative stability. Changes of relative share of species' landings by country in 2014 and 2015 compared to the 2013 share, for the 'baseline' and 5 Fcube scenarios.**

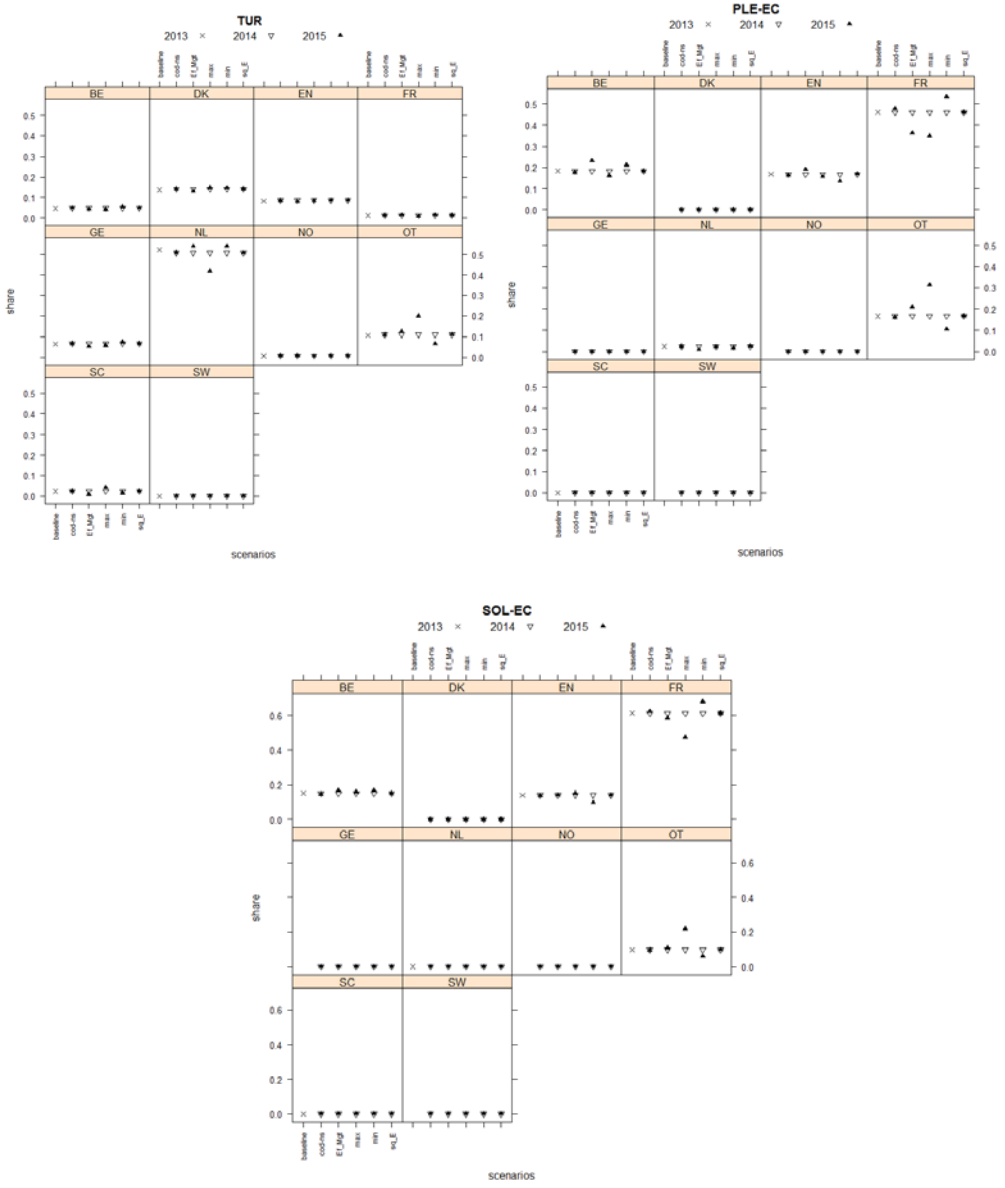



**Figure 5.2.2.2.1 (cont): Test for relative stability. Changes of relative share of species' landings by country in 2014 and 2015 compared to the 2013 share, for the 'baseline' and 5 Fcube scenarios.**

## Annex 1: List of participants

| Name | Address | Phone/Fax | E-mail |
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| Paul Dolder (Chair) | Centre for Environment, Fisheries and Aquaculture Science (Cefas)<br>Pakefield Road<br>NR33 0HT Lowestoft Suffolk<br>UK | Phone: +44 (0)1502 52 4259 | paul.dolder@cefas.co.uk |
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| | | | |
|---|---|---|---|
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## Annex 2: Specification of the ICES data call

Following intercessional debate and a workshop held at WGMIXFISH 2011 data from WGMIXFISH 2012 was requested as part of a joint WGNSSK-WGMIXFISH data call issued formally under the EU data collection framework (DCF) regulations. This annex contains a summary of the considerations that influenced the design of the data call followed by a copy of the data call document issued by ICES for supply of 2012 data.

It was briefly considered to try to harmonize the ICES data call with the STECF 'effort regime' data calls but it quickly became clear that this could not be done because

- The STECF data are at the discretion of the EU commission
- As such STECF data calls could be subject to change
- The practicalities of data collection means that the sampling frames used by different member states do not necessarily match up directly with the DCF format.

Attention then switched to the DCF framework. The DCF currently requires the collection of biological data at level 6 of the métier structure given in Appendix IV of Commission Decision 2008/949/EC. The Level 6 métiers are defined by gear type, target assemblage, mesh size and physical characteristics of any selectivity devices fitted. The métier represents a principal domain of interest for which sampling data are required. Table 4 of the RCM (2010) report gave a list of 18 broader levels based on those comprising 90% of either landings, effort or value (of which only 8 have any real significance to the demersal stocks of the North Sea) and was proposed as a starting point for a more practical data call. Three problems with this list were identified

1 ) The mesh size categories at level 6 are based on the Council Reg. 850/1998 and are not necessarily consistent with the current effort regime therefore making the link between biological data and fisheries management difficult, e.g. the current gear regulation in the Skagerrak uses a different mesh size range for the Nephrops fishery than in the North Sea, and the DCF level 6 have been defined accordingly, however they are managed under the same category (TR2) in the current cod long-term management plan.

2 ) Fleet/métiers important to one or more member state are not listed in the 18 broader RCM levels mentioned above, e.g. the large mesh size beam trawl métier (corresponding to BT1).

3 ) Species specific fleets/métiers (i.e. fleets/métiers exclusively targeting Saithe) could not be distinguished.

Following these considerations two different starting positions became clear, one being that data should be provided at the DCF métier level, the other that data should only be disaggregated to the level of the sampling scheme employed in order to retain the statistical integrity of the data. It became clear that sampling schemes may not necessarily be the same as the DCF métier matrix. Ignoring the sampling design when raising catch data can lead to significant bias and error in the final estimates of numbers-at-age/length. In turn this implies that data calls should simply request raised catch data, and only landings for those métiers not sampled (effort data would simply match these categories).

It was concluded that data submission would follow the statistically robust route and that age disaggregated data would be provided at the level of the sampling frame. The data were to be submitted to InterCatch for safe storage and to allow allocations of

discards and age distributions to unsampled métiers. To reduce the number of métiers forming the stock data the following was requested from contributing nations:

- A description of sampling designs.
- A mapping of métiers to samples.
- Likely categorization (raised or unsampled).

After consideration of those métiers important to the North Sea demersal stocks a reduced set of 'métier-tags', using the DCF level 6 naming convention but often merging over métiers was defined in the data call.

During the data call design process it was realized national sampling schemes rarely distinguished between vessel length categories. Age specific raised data entered to InterCatch was therefore not disaggregated by vessel length category. WGMIXFISH, however, considers more realistic scenario results can be generated by taking account of vessel lengths, e.g. larger vessels using trawl gear may operate in a relatively clean saithe fishery further offshore while smaller vessels operate in a more mixed demersal fishery closer to home ports. As the mixed fishery projections currently base catchabilities on total weight of catch compared to fleet effort, vessel length specific data were requested specifically for WGMIXFISH (because of the way discards are raised in most countries this does mean that discards are allocated pro-rata across vessel length categories, i.e. discard proportions can only be assumed the same across vessel length categories).

DCF. 2010. Report of the Regional Coordination Meeting for the North Sea and Eastern Arctic (RCM NS&EA). Charlottenlund, Denmark, 17—21 May 2010.

# Data call: Data submission for ICES working Groups WGNSSK, WGMIXFISH and WGNEW

**Text in red bold (like this text) shows changes compared to last year's call.**

## Rationale

The mixed fisheries advice to the EU and Norway regarding the species in the North Sea is elaborated on the basis of the best available survey and commercial data.

There have been some significant changes compared to last year, these are:

- The data call now covers more species compared to last year. Catch information for these species are important to enable WGNSSK to provide catch advice and WGMIXFISH to provide mixed fishery advice covering a wider range of stocks, including additional stocks which will be subject to the EU's landings obligation from 2016.
- The data call now includes VIa and IIIaS for species where the stock definition includes these areas. For IIIaS, however, only overall catch and no catch by fleet has to be submitted. All catches from IIIaS can be recorded under **MIS_MIS_0_0_0_HC.**
- The format and structure of requested WGMIXFISH .csv files has been revised. Métier tags within .csv files should now be provided exactly as the métier tags used for data submitted to InterCatch. Length classifications should be provided in a separate column. See chapter on Aggregations vs.WGMIXFISH requirements for more details.
- Information on discards no longer have to be provided to WGMIXFISH in the .csv files *provided discard rates are the same for all vessel length categories within a métier*. See chapter on Aggregations *vs.* WGMIXFISH requirements for more details.

## Scope of call

ICES Countries are requested to supply landings, discards, biological sample and effort data from 2013. This information should be provided by métier, as listed in Annex 1. The list of species for which data should be prepared is given in Table 1. The species should be reported for the areas in Table 2. Data for stocks dealt by WGNEW in 2014 have to be submitted by March 7 as the group meets end of March. WGNSSK-WGMIXFISH data have to be submitted by March 28.

**Table1: List of species, and respective ICES Expert Group.**

| | Common species name | Code | Scientific species name | ICES EG |
|---|---|---|---|---|
| 1 | Cod | COD | Gadus morhua | WGNSSK |
| 2 | Common sole | SOL | Solea solea | WGNSSK |
| 3 | Haddock | HAD | Melanogrammus aeglefinus | WGNSSK |
| 4 | Plaice | PLE | Pleuronectes platessa | WGNSSK |
| 5 | Saithe | POK | Pollachius virens | WGNSSK |
| 6 | Whiting | WHG | Merlangius merlangus | WGNSSK |

| | | | | |
|---|---|---|---|---|
| **7** | **Turbot in IV** | **TUR** | **Psetta maxima** | **WGNSSK** |
| 8 | Hake1 | HKE | Merluccius merluccius | WGMIXFISH |
| 9 | Norway lobster | NEP | Nephrops norvegicus | WGNSSK |
| **10** | **Brill** | **BLL** | **Scophthalmus rhombus** | **WGNSSK** |
| **11** | **Dab** | **DAB** | **Limanda limanda** | **WGNSSK** |
| **12** | **Flounder** | **FLE** | **Platichthys flesus** | **WGNSSK** |
| **13** | **Lemon sole** | **LEM** | **Microstomus kitt** | **WGNSSK** |
| **14** | **Stripped red mullet** | **MUR** | **Mullus surmuletus** | **WGNSSK** |
| **15** | **Witch** | **WIT** | **Glyptocephalus cynoglossus** | **WGNSSK** |
| **16** | **Pollack** | **POL** | **Pollachius pollachius** | **WGNEW** |
| **17** | **Turbot in IIIa** | **TUR** | **Psetta maxima** | **WGNEW** |
| **18** | **Grey gurnard** | **GUG** | **Eutrigla gurnardus** | **WGNEW** |

**[1] Only csv files for WGMIXFISH are required for hake. No upload to Intercatch is needed for this data call.**

**Table 2. List of areas**

| Area | Area code |
|---|---|
| North Sea (IV) | IV |
| Skagerrak (IIIaN) | IIIaN |
| Eastern Channel (VIId) | VIId |
| **West of Scotland (VIa)1** | **VIa** |
| **Kattegat (IIIaS)2** | **IIIaS** |

**[1] area needed for saithe only**

**[2] area needed for all species except cod, sole and plaice**

### Deadline

The deadline to deliver the data is 7 March 2014 for WGNEW species and 28 March 2014 for WGNSSK and WGMIXFISH species.

### Data to be reported

Landings, discards, sample and effort data from 2013 according to one or more of the métiers listed in Annex 1. If corrections for earlier years need to be made, a full new set of data for the respective species may need to be uploaded as well. Please inform the relevant WG chairs if this is needed (see contacts below).

Additionally information by vessel length categories are also requested for WGMIXFISH, please see Section 'Aggregation *vs.* WGMIXFISH Requirements'.

### Format to report

The InterCatch format should be used.

Additionally information by vessel length categories should be in comma separated (CSV) file, please see Section 'Aggregation *vs.* WGMIXFISH Requirements'.

### How to report

The InterCatch formatted national data should be imported into InterCatch. Please use the following link: http://intercatch.ices.dk .

Additionally information to WGMIXFISH by vessel length categories should be electronically sent in .csv files to:

Alexander Kempf [alexander.kempf@ti.bund.de]-- Chair of WGNSSK

Paul Dolder [paul.dolder@cefas.co.uk] -- Chair of WGMIXFISH-NS

Clara Ulrich [clu@aqua.dtu.dk] -- Data coordinator

Jan Jaap Poos [janjaap.poos@wur.nl] -- Chair of WGNEW

There should be two .csv files:

- A single .csv file reporting métier and length disaggregated effort; and,
- A single .csv file reporting métier and length disaggregated catch

See specifications and examples in 'Aggregations *vs.* WGMIXFISH requirements' below.

**The métier_tag entries in Annex 1 follow closely the naming convention used for the EU Data Collection Framework (DCF). An explanation of the elements of these métier tags follows:**

1 ) *GEAR TYPE (gear types available under the DCF are shown in Appendix 1. Data can be aggregated over more than one category but in this case the most significant gear type is entered. The aggregations assumed in forming Annex 1 are also shown in Appendix 1)*

2 ) *MÉTIER CODE (code conforming to target assemblage code of DCF, see Appendix 2. Data can be aggregated over more than one category but in this case the most significant métier code is entered)*

3 ) *MESH SIZE RANGE (mesh size ranges available under the DCF, see Appendix 3. Data can be aggregated over more than one category but in this case the most significant mesh size range is entered.* ***If for that gear type data has been aggregated over all ranges used by a nation an additional (to the DCF) entry "all" can be used****.)*

4 ) *SELECTIVITY DEVICE (types of selectivity device available under the DCF are shown in Appendix 4.)*

5 ) *SELECTIVITY DEVICE MESH SIZE (the actual mesh size of any selectivity device is entered.)*

6 ) *VESSEL LENGTH CLASS (Member states have indicated national sampling scheme designs do not take account of vessel lengths. Therefore only the non-standard entry of "all" is currently provided for in InterCatch.)*

7 ) *FULLY DOCUMENTED FISHERIES (If the métier tag defines a fully documented fishery add "_FDF" after length class – but see note below).*

An underscore separates these elements.

**Note: DemHC and DemIBC (used in the earlier years) must be coded as MIS_MIS_0_0_0_HC and MIS_MIS_0_0_0_IBC respectively.**

Note: Country and area are supplied to InterCatch separately. Country codes are as shown in Appendix 6. Area codes are as shown in Appendix 7. It is stressed that to reduce the number of entries required in InterCatch data are requested according to the areas shown in Appendix 7 and **not** according to finer spatial resolutions.

**IMPORTANT:**

- When uploading to InterCatch the year is the data year, which must be entered as **2013.**
- If discard data are unavailable there should be no entry for discards. A value of zero should only be entered when zero discards have been observed.

### Effort Data

Effort is required in kWdays **for all species and areas (including Division VIa).** Effort is recorded in position 11 of the InterCatch header information.

### Fully Documented Fisheries

To prevent a requirement for large numbers of métier tags to be held within InterCatch métier tags for fully documented fisheries are added on a case by case basis. **FDF fisheries added to InterCatch in 2013 are shown in Annex 1.** If national data submitters have a fully documented fishery for which there are landings and discard data, which is not shown in Annex 1 and which they wish to submit as a unique métier they should contact Henrik Kjems-Nielsen [henrikkn@ices.dk], the contact point for InterCatch.

### Aggregations

If national data are aggregated over several DCF level 6 categories, the métier tag corresponding to the most significant category is chosen e.g. a mobile gear with mesh sizes covering 70—119 mm (combining 70—99 and 100—119) but 70—99mm is most significant – code 70—99.

Exceptions to this general rule are cases where data has been aggregated over all

- mesh size ranges

within the national fleet. In these instances the tag "all" can be entered.

In addition Member states have indicated national sampling scheme designs do not take account of vessel lengths and therefore only the non-standard entry of "all" is currently provided for in InterCatch against vessel length. The option has been left open for length category specific métier tags to be added in future years if nations begin to sample and raise data independently for different length categories.

### Aggregations vs. WGMIXFISH Requirements

Age specific data are best raised and entered to InterCatch using métiers / groups of vessels that match national sampling schemes. This means that the vessel length categories are omitted in the data submitted to InterCatch (e.g. métier tag TBB_DEF_>=120_0_0_all). This is sufficient to address the data needs for WGNSSK and WGNEW.

However, WGMIXFISH operates both at the level of the DCF métier, as explained above, AND the level of the fleet segment, consistently with the approach for the collection of economic data. Therefore, these métier aggregations are too broad for WGMIXFISH needs (leading to overly large fleet entries in the mixed fisheries projections, primarily for trawl and beam trawl fleets). To fulfil the additional WGMIXFISH specific need for information by vessel length categories, we kindly request estimates of landings weight totals and effort in a format similar to previous WGMIXFISH data calls.

Information on discards is no longer needed as this information can be taken from InterCatch as long as estimated discard rates are the same for all vessel length categories within a métier. Only if discard rates per vessel length category are available, data submitters are invited to provide discard estimates in an extra column:

Additionally, experience from previous years has taught that the previous request to append the vessel length category to the métier tag was more confusing than helpful, leading to unstandardized datasets. For this year, we have therefore kept information apart in two separate fields. **Please, use exactly the same Métier Tags as used to supply InterCatch!**

Finally, a field has been added to specifically flag FDF Vessels. It is as such, that some vessels are involved in FDF métiers in one area (e.g. North Sea), while being involved in non-FDF métiers in another (e.g. West of Scotland). Being the same vessels, it is important to flag these vessels at the fleet level also, and not only at the métier level. Please leave the field blank for the non FDF fleet, and write "FDF" for the FDF flagged vessels.

A single comma separated (CSV) 'effort' file containing the following entries:

ID, Country, Year, Quarter, **Intercatch Métier Tag, Vessel Length Category, FDF vessel flag**, Area, KW_Days, Days At Sea, No Vessels

Example

| ID | Country | Year | Quarter | Intercatch Metier Tag | Vessel Length Ca | FDF vesse | Area | KW_Days | Days At Sea | No Vessels |
|---|---|---|---|---|---|---|---|---|---|---|
| dnk1 | DK | 2013 | 1 | OTB_DEF_>=120_0_0_all | <10m | | IV | 1000 | 100 | 10 |
| dnk2 | DK | 2013 | 1 | OTB_DEF_>=120_0_0_all_FDF | 10<24m | FDF | IV | 1000 | 100 | 10 |
| dnk3 | DK | 2013 | 1 | OTB_DEF_>=120_0_0_all | 10<24m | FDF | VIa | 1000 | 100 | 10 |

A single CSV 'catch' file containing the following entries:

ID, Country, Year, Quarter, **Intercatch Métier Tag, Vesssel Length Category, FDF vessel flag**, Area, Species, Landings (tonnes), Value (average price*landings at first sale, expressed in Euros).

Example

| ID | Country | Year | Quarter | Intercatch Metier Tag | Vesssel Length C | FDF vesse | Area | Species | Landings | Value |
|---|---|---|---|---|---|---|---|---|---|---|
| dnk1 | DK | 2013 | 1 | OTB_DEF_>=120_0_0_all | <10m | | IV | COD | 100 | 1000 |
| dnk2 | DK | 2013 | 1 | OTB_DEF_>=120_0_0_all_FDF | 10<24m | FDF | IVb33 | NEP | 100 | 1000 |
| dnk3 | DK | 2013 | 1 | OTB_DEF_>=120_0_0_all | 10<24m | FDF | IVb33 | NEP | 100 | 1000 |

- Vessel length splits are only required for métier tags starting with OTB or TBB.
- **Vessel length categories are: <10m, 10<24m, 24<40m, >=40m (Please use exactly these vessel length codes!)**

**Sums of effort and landings across métier tags disaggregated by vessel length should equal the corresponding totals submitted to Intercatch**.

The CSV files should be submitted electronically to

Alexander Kempf [Alexander.kempf@ti.bund.de] -- Chair of WGNSSK

Paul Dolder [paul.dolder@cefas.co.uk] -- Chair of WGMIXFISH-NS

Jan Jaap Poos [janjaap.poos@wur.nl -- Chair of WGNEW

Clara Ulrich [clu@aqua.dtu.dk] -- Data coordinator

Supporting Documentation and work to be undertaken after the data upload

Once data has been submitted to InterCatch a process of fill-ins will be undertaken by the respective stock coordinators for entries containing only bulk weight of landings and/or discards. **To aid this process countries are requested to complete a documentation file (EXCEL spreadsheet) in a format like that shown in Annex 2.**

The documentation spreadsheet should be submitted electronically to

Alexander Kempf [alexander.kempf@ti.bund.de]-- Chair of WGNSSK

Paul Dolder [paul.dolder@cefas.co.uk] -- Chair of WGMIXFISH-NS

Jan Jaap [janjaap.poos@wur.nl] -- Chair of WGNEW

Clara Ulrich [clu@aqua.dtu.dk] -- Data coordinator

For InterCatch related questions contact: Henrik Kjems-Nielsen [henrikkn@ices.dk]

### Conversions to InterCatch Format

A description of the InterCatch Exchange format can be downloaded at the InterCatch information webpage under 'Manuals':

http://www.ices.dk/datacentre/InterCatch/InterCatch.asp

A two page overview of the fields in the InterCatch commercial catch format can be found at the same page, again under 'Manuals' (just below the InterCatch Exchange format manual). From this page the valid codes can be seen.

To ease the process of converting the national data into the InterCatch format Andrew Campbell from Ireland has made a conversion tool 'InterCatchFileMaker', which converts data manually entered in the 'Exchange format spreadsheet' into a file in the InterCatch format. The conversion tool 'InterCatchFileMaker' can be downloaded at the InterCatch information page (the one above) under 'Program to convert to InterCatch file format'. The download includes a spreadsheet in which the landings and sampling data can be placed; the converter then converts the data in the spreadsheet into the InterCatch format.

# Annex 1

## Appendix 1 Gear coding (as defined under the DCF).

Codes made available in the WGNSSK-WGNEW-WGMIXFISH data call are shown in the left hand column and are based on information from countries fishing in areas IIIaN, IV and VIId about significant fishing gears.

| Area | Gear type | Available métier tags<br>For fully documented fisheries add "_FDF" after length class. |
|---|---|---|
| IIIaN (Skagerrak) Area Type = SubDiv | | **TBB_CRU_16—31_0_0_all** |
| | | TBB_DEF_90—99_0_0_all |
| | | TBB_DEF_>=120_0_0_all |
| | Otter trawl | OTB_CRU_16—31_0_0_all |
| | | OTB_CRU_32—69_0_0_all |
| | | OTB_CRU_32—69_2_22_all |
| | | OTB_CRU_70—89_2_35_all |
| | | OTB_CRU_90—119_0_0_all<br>**OTB_CRU_90—119_0_0_all_FDF** |
| | | OTB_ DEF _>=120_0_0_all<br>**OTB_ DEF _>=120_0_0_all_FDF** |
| | Seines | SDN_DEF_>=120_0_0_all<br>**SDN_DEF_>=120_0_0_all_FDF** |
| | | SSC_DEF_>=120_0_0_all<br>**SSC_DEF_>=120_0_0_all_FDF** |
| | Gill, trammel, driftnets | GNS_DEF_100—119_0_0_all |
| | | GNS_DEF_120—219_0_0_all<br>**GNS_DEF_120—219_0_0_all_FDF** |
| | | GNS_DEF_>=220_0_0_all |
| | | GNS_DEF_all_0_0_all |
| | | GTR_DEF_all_0_0_all |
| | Lines | LLS_FIF_0_0_0_all<br>**LLS_FIF_0_0_0_all_FDF** |
| | Others (Human consumption) | **MIS_MIS_0_0_0_HC** |
| | Others (Industrial bycatch) | **MIS_MIS_0_0_0_IBC** |
| IIIaS (Kattegat) Area Type = SubDiv | Others (Human consumption) | **MIS_MIS_0_0_0_HC** |
| IV – (North Sea) Area type = SubArea<br>&<br>VIId (Eastern Channel) Area Type = Div<br>&<br>**VIa (for saithe only) Area Type = Div** | | **TBB_CRU_16—31_0_0_all** |
| | | TBB_DEF_70—99_0_0_all |
| | | TBB_DEF_>=120_0_0_all |
| | Otter trawl | OTB_CRU_16—31_0_0_all |
| | | OTB_CRU_32—69_0_0_all |
| | | OTB_SPF_32—69_0_0_all |
| | | OTB_CRU_70—99_0_0_all<br>**OTB_CRU_70—99_0_0_all_FDF** |
| | | OTB_ DEF _>=120_0_0_all<br>**OTB_ DEF _>=120_0_0_all_FDF** |

| | | |
|---|---|---|
| | Seines | SDN_DEF_>=120_0_0_all<br>**SDN_DEF_>=120_0_0_all_FDF** |
| | | SSC_DEF_>=120_0_0_all<br>**SSC_DEF_>=120_0_0_all_FDF** |
| | Gill, trammel, driftnets | GNS_DEF_100—119_0_0_all |
| | | GNS_DEF_120—219_0_0_all<br>**GNS_DEF_120—219_0_0_all_FDF** |
| | | GNS_DEF_>=220_0_0_all |
| | | GNS_DEF_all_0_0_all |
| | | GTR_DEF_all_0_0_all |
| | Lines | LLS_FIF_0_0_0_all<br>**LLS_FIF_0_0_0_all_FDF** |
| | Pots and Traps | FPO_CRU_0_0_0_all |
| | Others (Human consumption) | **MIS_MIS_0_0_0_HC** |
| | Others (Industrial bycatch) | **MIS_MIS_0_0_0_IBC** |

| Code available in WGNSSK–WGNEW–WGMIXFISH data call | DCF code | Type of gear |
|---|---|---|
| TBB | TBB | Beam trawl |
| OTB | OTB | Bottom otter trawl |
| | OTT | Multi-rig otter trawl |
| | PTB | Bottom pair trawl |
| | OTM | Midwater otter trawl |
| | PTM | Midwater pair trawl |
| SSC | SSC | Fly shooting (Scottish) seine |
| | SPR | Pair seine |
| | PS | Purse-seine |
| SDN | SDN | Anchored seine |
| | SB, SV | Beach and boat seine |
| GNS | GNS | Set gillnet |
| | GND | Driftnet |
| GTR | GTR | Trammelnet |
| LLS | LHP | Pole lines |
| | LHM | Handlines |
| | LLS | Set longlines |
| FPO | FPO | Pots and Traps |
| DemHC | FYK | Fykenets |
| | FPN | Stationary uncovered poundnets |
| | DRB | Boat dredge |
| | HMD | Mechanized/ Suction dredge |
| | OTH | Other |

## Appendix 2 Mesh size coding

Mesh size categories below are those permitted under the DCF. Data should be provided according to the categories below or aggregations of the categories below.

If data are aggregated over categories the most significant category is entered e.g. a mobile gear with mesh sizes covering 70—119 mm (combining 70—99, and 100—119) but 70—99mm is most significant receives code 70—99.

| Gear type | Area | Code |
|---|---|---|
| Mobile gears | IIIaN (Skagerrak) | <16 |
| | | 16—31 |
| | | 32—69 |
| | | 70—89 |
| | | 90—119 |
| | | >=120 |
| | IV & VIId (North Sea and Eastern Channel) | <16 |
| | | 16—31 |
| | | 32—69 |
| | | 70—99 |
| | | 100—119 |
| | | >=120 |
| Passive gears | Whole of IIIaN, IV and VIId | 10—30 |
| | | 50—70 |
| | | 90—99 |
| | | 100—119 |
| | | 120—219 |
| | | >=220 |

## Appendix 3 Selectivity device

Selectivity devices are defined under the DCF as follows

| Description | Code |
|---|---|
| None mounted | 0 |
| Exit window/selection panel | 1 |
| Grid | 2 |
| Unknown | 3 |

## Appendix 4 Country coding (as used currently by InterCatch)

BE Belgium

CA Canada

DE Germany

DK Denmark

EE Estonia

ES Spain

FI Finland

FO Faroe Islands

FR France

GG UK (Channel Island Guernsey)

GL Greenland

IE Ireland

IM UK (Isle of Man)

IS Iceland

IT Italy

JE UK (Channel Island Jersey)

LT Lithuania

LV Latvia

NL Netherlands

NO Norway

PL Poland

PT Portugal

RU Russia

SE Sweden

UK United Kingdom

UKE UK (England)

UKN UK(Northern Ireland)

UKS UK(Scotland)

US United States

## Appendix 5 Area coding

Codes accepted by InterCatch. Overall the codes are unique to this exercise because of the desire to receive data on Nephrops by Functional Unit (FU).

| **Finfish(or Nephrops if not possible to raise by Nephrops Functional Units)** | **Nephrops only** | | |
|---|---|---|---|
| | Functional Unit | InterCatch Code | Area Type Code |
| IIIaN (Skagerrak) | FU51 | IV5 | Div |
| IV (ICES Subarea IV) | FU6 | IVb6 | SubDiv |
| VIId (ICES division VIId) | FU7 | IVa7 | SubDiv |
| VIa (ICES division VIa) | FU8 | IVb8 | SubDiv |
| IIIaS (Kattegat) | FU9 | IVa9 | SubDiv |
| | FU10 | IVa10 | SubDiv |
| | FU321 | IV32 | Div |
| | FU33 | IVb33 | SubDiv |
| | FU34 | IVb34 | SubDiv |
| | Nephrops caught outside FUs | IVnotFU | Div |

[1] **FU5 is found in both ICES divisions IVb and IVc and FU32 is found in both ICES divisions IVa and IVb.**

*Nephrops Functional Units and descriptions by statistical rectangle follow*

| **Functional Unit** | **Stock** | **ICES Rectangles** | **Subarea** |
|---|---|---|---|
| 5 | Botney Gut | 36—37 F1-F4; 35F2-F3 | IV |
| 6 | Farn Deep | 38—40 E8-E9; 37E9 | IV |
| 7 | Fladen | 44—49 E9-F1; 45—46E8 | IV |
| 8 | Firth of Forth | 40—41E7; 41E6 | IV |
| 9 | Moray Firth | 44—45 E6—E7; 44E8 | IV |
| 10 | Noup | 47E6 | IV |
| 32 | Norwegian Deep | 44—52 F2—F6; 43F5—F7 | IV |
| 33 | Off Horn Reef | 39—41F4; 39—41F5 | IV |
| 34 | Devil's Hole | 41—43 F0—F1 | IV |

## Appendix 6.

Species for inclusion in WGNSSK-WGNEW-WGMIXFISH joint data call.

Whitefish species coding according to Council Regulation (EC) No. 2298/2003 and as used in InterCatch.

| | *Common name* | *Code* | *Scientific name* |
|---|---|---|---|
| *1* | *Cod* | *COD* | *Gadus morhua* |
| *2* | *Common sole* | *SOL* | *Solea solea* |
| *3* | *Haddock* | *HAD* | *Melanogrammus aeglefinus* |
| *4* | *Plaice* | *PLE* | *Pleuronectes platessa* |
| *5* | *Saithe* | *POK* | *Pollachius virens* |
| *6* | *Whiting* | *WHG* | *Merlangius merlangus* |
| *7* | *Hake* | *HKE* | *Merluccius merluccius* |
| *8* | *Norway lobster* | *NEP* | *Nephrops norvegicus* |
| ***9*** | ***Brill*** | ***BLL*** | ***Scophthalmus rhombus*** |
| ***10*** | ***Dab*** | ***DAB*** | ***Limanda limanda*** |
| ***11*** | ***Flounder*** | ***FLE*** | ***Platichthys flesus*** |
| ***12*** | ***Lemon sole*** | ***LEM*** | ***Microstomus kitt*** |
| ***13*** | ***Pollack*** | ***POL*** | ***Pollachius pollachius*** |
| ***14*** | ***Stripped red mullet*** | ***MUR*** | ***Mullus surmuletus*** |
| ***15*** | ***Turbot*** | ***TUR*** | ***Psetta maxima*** |
| ***16*** | ***Witch*** | ***WIT*** | ***Glyptocephalus cynoglossus*** |
| ***17*** | ***Grey gurnard*** | ***GUG*** | ***Eutrigla gurnardus*** |

# Annex 2

The documentation spreadsheet

Example of how to describe specific DCF categories contributing to supra-métiers uploaded to InterCatch

| Metier code WGMIXFISH | Area | Vessel length classes | Gear types | Mesh size range | Description |
|---|---|---|---|---|---|
| OTB_CRU_70-99_0_0_all | 4 | <10<br>10<12<br>12<18<br>18<24<br>24<40<br>>=40 | OTB<br>OTT<br>PTB<br>SSC | 70-99 | Bottom trawls with mesh size >=70 & < 100 mm.<br>No distinction between gear with or<br>without selective devices.<br>Notes<br>NEP7 - majority of vessels 18<24 length with<br>use of OTT gear.<br>NEP8 & NEP9 - majority of vessels 12<18 length. |
| OTB_DEF_>=120_0_0_all | 4 | <10<br>10<12<br>12<18<br>18<24<br>24<40<br>>=40 | OTB<br>OTT<br>PTB<br>SSC | 100-119<br>>=120 | Bottom trawls with mesh size >=100mm.<br>No distinction between gear with or<br>without selective devices. |
| FPO_CRU_0_0_0_all | 4 | <10<br>10<12<br>12<18<br>18<24<br>24<40<br>>=40 | FPO | na | Creels<br>There are very small amounts of creel<br>landings - no sampling.<br>Mostly <10m vessels |

## Annex 3: Data issues for specific nations

**Belgium**

The Belgium landings and effort data were compiled according to the specification of the data request. Discard information was only available for the main métiers (Beam trawls) and since 2004.

**Denmark**

Landings and effort data for 2013 were compiled according to the specification of the data request, and appended to the dataset from last year. It was only possible to attach discard information to some métiers.

**France**

Landings and effort data for 2013 were compiled according to the specification of the data request, and appended to the dataset from last year. It was only possible to attach discard information to some métiers. All the time-series could not be resubmitted to fulfil the data request specification. However, the different fisheries (saithe fishery vs. fishery on cod and plaice) were taken into account using the vessel length class already available in previous data submission. Data for 2009 were not available for the meeting.

**Germany**

Landings and effort data for 2013 were compiled according to the specification of the data request, and appended to the dataset from last year. It was only possible to attach discard information to some métiers. With otter trawls >=100mm different kinds of fisheries are conducted (saithe fishery vs. fishery on cod and plaice) that cannot be fully differentiated by the current DCF métiers and German sampling scheme. Value information was available for 2010 — 2013 data only.

**The Netherlands**

Landings and effort data for 2013 were compiled according to the specification of the data request, and appended to the dataset from last year. It was only possible to attach discard information to some métiers.

**Norway**

From 2011 a new electronic logbook has been implemented in Norwegian fisheries for all vessels with total length over 15 m using a new database standard. Vessels between 12 and 15 m total length may submit daily electronic logbooks if they have the capability to do so; vessels under 12 m in length are not required to submit logbooks. Vessels are again required to submit information on mesh size in the logbooks; it was only 2012 that this requirement was relaxed.

**UK (England, Wales and Northern Ireland)**

Data were provided for England, Wales and Northern Ireland for 2013 according to the data call. Discard data were only available for some métiers. Not all length classes of vessels are routinely sampled for discards, but the discard data were applied to all vessel length categories irrespective of this. The dataset includes some vessels from UK (Northern Ireland) and from Guernsey that fish in the North Sea and/or Eastern Channel. These vessels are lumped in with the English fleet for analysis. Fully Documented Fishery (FDF) vessels were recorded as a separate fleet both for landings and effort.

**Scotland**

Landings and effort data were compiled according to the specification of the data request. It was only possible to attach discard information to some métiers; also the design of the Scottish discard observer scheme changed in 2009 and aggregation strata were revised again for 2010 data. For data between 2003 and 2008 the Scottish discard observer scheme was designed to achieve a reasonable coverage of vessels in each of the following categories

- MTR: Motor trawl (bottom trawls, boat length >= 27.432m, targeting demersal species)
- LTR: Light trawl (bottom trawls, boat length < 27.432m, targeting demersal species)
- PTR: Pair trawl (all pair trawls targeting demersal species)
- SEN: Seine nets (single and pair)
- NTR: *Nephrops* trawls (all trawls targeting *Nephrops*)

Where the gear categories for records in the landings dataset could be mapped to one of the above categories a discard value was assigned according to the discard ratio of that category. Therefore records mapped to these categories always receive the same ratio of discards to landings.

Vessels with OTTER and PEL_TRAWL gear and in the length categories o24t40m and o40m were mapped to the MTR category. However, as for STECF effort calculations all records with OTTER gear and with mesh between 70 and 100mm are mapped to NTR.

For 2009 data discard fractions were available for the two categories

- DEF: Demersal otter, demersal seine and beam trawls targeting demersal fish
- CRU: Demersal otter, demersal seine and beam trawls targeting crustaceans

Vessels with PEL_TRAWL gear and with OTTER gear with mesh > 100mm were mapped to the DEF category. Vessels with OTTER gear with mesh < 100mm were mapped to the CRU category. The Scottish fleet consists of few beam trawlers and the discard rates in the DEF and CRU categories reflect those from otter and demersal seine gears. Discards were therefore not attached to beam trawl landings.

For 2010 and 2011 data discard fractions were available for the two categories

- TR1: Demersal otter and demersal seine gears with mesh >= 100mm
- TR2: Demersal otter and demersal seine gears with mesh >=70 and < 100mm

Again discards were not attached to beam trawl landings.

For 2012 data fully documented fishery (FDF) fleet data were raised separately.

The sampling of vessels <10m is very limited and it is considered unreasonable to assume they have the same discarding patterns as larger boats. Scotland does not provide discard estimates for vessels < 10m to STECF. Discard estimates are therefore not estimated for vessels in the u12m category (2003—2010) or <10m (2011 onwards).

# Annex 4: Stock-based management plans

**Cod in IIIa – IV – VIId (Norway-EU management plan and EU management plan – EC 1342/2008)**

**EU Norway management plan**

In 2008 the EU and Norway renewed their initial agreement from 2004 and agreed to implement a long-term management plan for the cod stock, which is consistent with the precautionary approach and is intended to provide for sustainable fisheries and high yield.

**Transitional arrangement**

F will be reduced as follows: 75 % of F in 2008 for the TACs in 2009, 65 % of F in 2008 for the TACs in 2010, and applying successive decrements of 10 % for the following years.

The transitional phase ends as from the first year in which the long-term management arrangement (paragraphs 3—5) leads to a higher TAC than the transitional arrangement.

**Long-term management**

1. If the size of the stock on 1 January of the year prior to the year of application of the TACs is:
    a. Above the precautionary spawning biomass level, the TACs shall correspond to a fishing mortality rate of 0.4 on appropriate age groups;
    b. Between the minimum spawning biomass level and the precautionary spawning biomass level, the TACs shall not exceed a level corresponding to a fishing mortality rate on appropriate age groups equal to the following formula:

        0.4 - (0.2 * (Precautionary spawning biomass level - spawning biomass) / (Precautionary spawning biomass level - minimum spawning biomass level))

    c. At or below the limit spawning biomass level, the TAC shall not exceed a level corresponding to a fishing mortality rate of 0.2 on appropriate age groups.
2. Notwithstanding paragraphs 2 and 3, the TAC for 2010 and subsequent years shall not be set at a level that is more than 20 % below or above the TACs established in the previous year.
3. Where the stock has been exploited at a fishing mortality rate close to 0.4 during three successive years, the parameters of this plan shall be reviewed on the basis of advice from ICES in order to ensure exploitation at maximum sustainable yield.
4. The TAC shall be calculated by deducting the following quantities from the total removals of cod that are advised by ICES as corresponding to the fishing mortality rates consistent with the management plan:
    a. A quantity of fish equivalent to the expected discards of cod from the stock concerned;
    b. A quantity corresponding to other relevant sources of cod mortality.

5. The Parties agree to adopt values for the minimum spawning biomass level (70,000 tonnes), the precautionary biomass level (150,000 tonnes) and to review these quantities as appropriate in the light of ICES advice.

Procedure for setting TACs in data-poor circumstances

6. If, due to a lack of sufficiently precise and representative information, it is not possible to implement the provisions in paragraphs 3 to 6, the TAC will be set according to the following procedure.

    a. If the scientific advice recommends that the catches of cod should be reduced to the lowest possible level the TAC shall be reduced by 25% with respect to the TAC for the preceding year;

    b. In all other cases the TAC shall be reduced by 15% with respect to the TAC for the previous year, unless the scientific advice recommends otherwise.

This plan shall be subject to triennial review, the first of which will take place before 31 December 2011. It enters into force on 1 January 2009.

The main changes between this and the plan of 2004 are the phasing (transitional and long-term phase) and the inclusion of an F reduction fraction.

In December 2008 the European Council agreed on a new cod management plan implementing the new system of effort management and a target fishing mortality of 0.4 (EC 1342/2008). The HCR for setting TAC for the North Sea cod stock are as follows:

**EU management plan**

Article 7 1.(a) and 1.(b) are required for interpretation of Article 8.

*Article 7: Procedure for setting TACs for cod stocks in the Kattegat the west of Scotland and the Irish Sea*

1. *Each year, the Council shall decide on the TAC for the following year for each of the cod stocks in the Kattegat, the west of Scotland and the Irish Sea. The TAC shall be calculated by deducting the following quantities from the total removals of cod that are forecast by STECF as corresponding to the fishing mortality rates referred to in paragraphs 2 and 3:*

*(a) a quantity of fish equivalent to the expected discards of cod from the stock concerned;*

*(b) as appropriate a quantity corresponding to other sources of cod mortality caused by fishing to be fixed on the basis of a proposal from the Commission. […]*

*Article 8: Procedure for setting TACs for the cod stock in the North Sea*

*1. Each year, the Council shall decide on the TACs for the cod stock in the North Sea. The TACs shall be calculated by applying the reduction rules set out in Article 7 paragraph 1(a) and (b).*

*2. The TACs shall initially be calculated in accordance with paragraphs 3 and 5. From the year where the TACs resulting from the application of paragraphs 3 and 5 would be lower than the TACs resulting from the application of paragraphs 4 and 5, the TACs shall be calculated according to the paragraphs 4 and 5.*

*3. Initially, the TACs shall not exceed a level corresponding to a fishing mortality which is a fraction of the estimate of fishing mortality on appropriate age groups in 2008 as follows: 75 % for the TACs in 2009, 65 % for the TACs in 2010, and applying successive decrements of 10 % for the following years.*

*4. Subsequently, if the size of the stock on 1 January of the year prior to the year of application of the TACs is:*

*(a) above the precautionary spawning biomass level, the TACs shall correspond to a fishing mortality rate of 0,4 on appropriate age groups;*

*(b) between the minimum spawning biomass level and the precautionary spawning biomass level, the TACs shall not exceed a level corresponding to a fishing mortality rate on appropriate age groups equal to the following formula: 0,4 – (0,2 * (Precautionary spawning biomass level – spawning biomass) / (Precautionary spawning biomass level – minimum spawning biomass level))*

*(c) at or below the limit spawning biomass level, the TACs shall not exceed a level corresponding to a fishing mortality rate of 0,2 on appropriate age groups.*

*5. Notwithstanding paragraphs 3 and 4, the Council shall not set the TACs for 2010 and subsequent years at a level that is more than 20 % below or above the TACs established in the previous year.*

*6. Where the cod stock referred to in paragraph 1 has been exploited at a fishing mortality rate close to 0,4 during three successive years, the Commission shall evaluate the application of this Article and, where appropriate, propose relevant measures to amend it in order to ensure exploitation at maximum sustainable yield.*

*Article 9: Procedure for setting TACs in poor data conditions*

*Where, due to lack of sufficiently accurate and representative information, STECF is not able to give advice allowing the Council to set the TACs in accordance with Articles 7 or 8, the Council shall decide as follows:*

*(a) where STECF advises that the catches of cod should be reduced to the lowest possible level, the TACs shall be set according to a 25 % reduction compared to the TAC in the previous year;*

*(b) in all other cases the TACs shall be set according to a 15 % reduction compared to the TAC in the previous year, unless STECF advises that this is not appropriate.*

*Article 10: Adaptation of measures*

*1. When the target fishing mortality rate in Article 5(2) has been reached or in the event that STECF advises that this target, or the minimum and precautionary spawning biomass levels in Article 6 or the levels of fishing mortality rates given in Article 7(2) are no longer appropriate in order to maintain a low risk of stock depletion and a maximum sustainable yield, the Council shall decide on new values for these levels.*

*2. In the event that STECF advises that any of the cod stocks is failing to recover properly, the Council shall take a decision which:*

*(a) sets the TAC for the relevant stock at a level lower than that provided for in Articles 7, 8 and 9;*

*(b) sets the maximum allowable fishing effort at a level lower than that provided for in Article 12;*

*(c) establishes associated conditions as appropriate.*

**Haddock in IIIa – IV (EU and Norway management plan)**

*"The plan consists of the following elements:*

1. *Every effort shall be made to maintain a minimum level of Spawning-stock biomass greater than 100,000 tonnes (Blim).*
2. *For 2009 and subsequent years the Parties agreed to restrict their fishing on the basis of a TAC consistent with a fishing mortality rate of no more than 0.3 for appropriate age-groups, when the SSB in the end of the year in which the TAC is applied is estimated above 140,000 tonnes (Bpa).*
3. *Where the rule in paragraph 2 would lead to a TAC, which deviates by more than 15 % from the TAC of the preceding year, the Parties shall establish a TAC that is no more than 15 % greater or 15 % less than the TAC of the preceding year.*
4. *Where the SSB referred to in paragraph 2 is estimated to be below Bpa but above Blim the TAC shall not exceed a level which will result in a fishing mortality rate equal to 0.3—0.2*(Bpa-SSB)/(Bpa-Blim). This consideration overrides paragraph 3.*
5. *Where the SSB referred to in paragraph 2 is estimated to be below Blim the TAC shall be set at a level corresponding to a total fishing mortality rate of no more than 0.1. This consideration overrides paragraph 3.*
6. *In the event that ICES advises that changes are required to the precautionary reference points Bpa (140,000t) or Blim, (100,000t) the Parties shall meet to review paragraphs 1—5.*
7. *In order to reduce discarding and to increase the spawning-stock biomass and the yield of haddock, the Parties agreed that the exploitation pattern shall, while recalling that other demersal species are harvested in these fisheries, be improved in the light of new scientific advice from inter alia ICES.*
8. *No later than 31 December 2010, the parties shall review the arrangements in paragraphs 1 to 7 in order to ensure that they are consistent with the objective of the plan. This review shall be conducted after obtaining inter alia advice from ICES concerning the performance of the plan in relation to its objective.*
9. *This arrangement enters into force on 1 January 2009."*

**Saithe in IIIa – IV – VI (EU and Norway management plan)**

In 2008 EU and Norway renewed the existing agreement on *"a long-term plan for the saithe stock in the Skagerrak, the North Sea and west of Scotland, which is consistent with a precautionary approach and designed to provide for sustainable fisheries and high yields. The plan shall consist of the following elements.*

1. *Every effort shall be made to maintain a minimum level of Spawning-stock biomass (SSB) greater than 106,000 tonnes (Blim).*
2. *Where the SSB is estimated to be above 200,000 tonnes the Parties agreed to restrict their fishing on the basis of a TAC consistent with a fishing mortality rate of no more than 0.30 for appropriate age groups.*
3. *Where the SSB is estimated to be below 200,000 tonnes but above 106,000 tonnes, the TAC shall not exceed a level which, on the basis of a scientific evaluation by ICES, will result in a fishing mortality rate equal to 0.30—0.20*(200,000-SSB)/94,000.*

4. *Where the SSB is estimated by the ICES to be below the minimum level of SSB of 106,000 tonnes the TAC shall be set at a level corresponding to a fishing mortality rate of no more than 0.1.*
5. *Where the rules in paragraphs 2 and 3 would lead to a TAC which deviates by more than 15 % from the TAC of the preceding year the Parties shall fix a TAC that is no more than 15 % greater or 15 % less than the TAC of the preceding year.*
6. *Notwithstanding paragraph 5 the Parties may where considered appropriate reduce the TAC by more than 15 % compared to the TAC of the preceding year.*
7. *A review of this arrangement shall take place no later than 31 December 2012.*
8. *This arrangement enters into force on 1 January 2009."*

**Plaice in IV (Multiannual plan for sole and plaice in the North Sea EC 676/2007)**

Extract from Council Regulation (EC) No 676/2007 of 11 June 2007 establishing a multiannual plan for fisheries exploiting stocks of plaice and sole in the North Sea:

Article 2 Safe biological limits

*1. For the purposes of this Regulation, the stocks of plaice and sole shall be deemed to be within safe biological limits in those years in which, according to the opinion of the Scientific, Technical, and Economic Committee for Fisheries (STECF), all of the following conditions are fulfilled:*

*(a) the spawning biomass of the stock of plaice exceeds 230 000 tonnes;*

*(b) the average fishing mortality rate on ages two to six years experienced by the stock of plaice is less than 0,6 per year;*

*(c) the spawning biomass of the stock of sole exceeds 35 000 tonnes;*

*(d) the average fishing mortality rate on ages two to six years experienced by the stock of sole is less than 0,4 per year.*

*2. If the STECF advises that other levels of biomass and fishing mortality should be used to define safe biological limits, the Commission shall propose to amend paragraph 1*

Article 3 Objectives of the multiannual plan in the first stage

*1. The multiannual plan shall, in its first stage, ensure the return of the stocks of plaice and of sole to within safe biological limits.*

*2. The objective specified in paragraph 1 shall be attained by reducing the fishing mortality rate on plaice and sole by 10 % each year, with a maximum TAC variation of 15 % per year until safe biological limits are reached for both stocks.*

Article 4 Objectives of the multiannual plan in the second stage

*1. The multiannual plan shall, in its second stage, ensure the exploitation of the stocks of plaice and sole on the basis of maximum sustainable yield.*

*2. The objective specified in paragraph 1 shall be attained while maintaining the fishing mortality on plaice at a rate equal to or no lower than 0,3 on ages two to six years.*

*3. The objective specified in paragraph 1 shall be attained while maintaining the fishing mortality on sole at a rate equal to or no lower than 0,2 on ages two to six years.*

Article 5 Transitional arrangements

*1. When the stocks of plaice and sole have been found for two years in succession to have returned to within safe biological limits the Council shall decide on the basis of a proposal from the Commission on the amendment of Articles 4(2) and 4(3) and the amendment of Articles 7, 8 and 9 that will, in the light of the latest scientific advice from the STECF, permit the exploitation of the stocks at a fishing mortality rate compatible with maximum sustainable yield.*

Article 7 Procedure for setting the TAC for plaice:

1. *The Council shall adopt the TAC for plaice at that level of catches which, according to a scientific evaluation carried out by STECF is the higher of:*
    - *(a) that TAC the application of which will result in a 10 % reduction in the fishing mortality rate in its year of application compared to the fishing mortality rate estimated for the preceding year;*
    - *(b) that TAC the application of which will result in the level of fishing mortality rate of 0.3 on ages two to six years in its year of application.*
2. *Where application of paragraph 1 would result in a TAC which exceeds the TAC of the preceding year by more than 15 %, the Council shall adopt a TAC which is 15 % greater than the TAC of that year.*
3. *Where application of paragraph 1 would result in a TAC which is more than 15 % less than the TAC of the preceding year, the Council shall adopt a TAC which is 15 % less than the TAC of that year.*

**Sole in IV (Multiannual plan for sole and plaice in the North Sea EC 676/2007)**

Extract from Council Regulation (EC) No 676/2007 of 11 June 2007 establishing a multiannual plan for fisheries exploiting stocks of plaice and sole in the North Sea

Article 2 Safe biological limits

*1. For the purposes of this Regulation, the stocks of plaice and sole shall be deemed to be within safe biological limits in those years in which, according to the opinion of the Scientific, Technical, and Economic Committee for Fisheries (STECF), all of the following conditions are fulfilled:*

*(a) the spawning biomass of the stock of plaice exceeds 230 000 tonnes;*

*(b) the average fishing mortality rate on ages two to six years experienced by the stock of plaice is less than 0,6 per year;*

*(c) the spawning biomass of the stock of sole exceeds 35 000 tonnes;*

*(d) the average fishing mortality rate on ages two to six years experienced by the stock of sole is less than 0,4 per year.*

*2. If the STECF advises that other levels of biomass and fishing mortality should be used to define safe biological limits, the Commission shall propose to amend paragraph 1*

Article 3 Objectives of the multiannual plan in the first stage

*1. The multiannual plan shall, in its first stage, ensure the return of the stocks of plaice and of sole to within safe biological limits.*

*2. The objective specified in paragraph 1 shall be attained by reducing the fishing mortality rate on plaice and sole by 10 % each year, with a maximum TAC variation of 15 % per year until safe biological limits are reached for both stocks.*

Article 4 Objectives of the multiannual plan in the second stage

*1. The multiannual plan shall, in its second stage, ensure the exploitation of the stocks of plaice and sole on the basis of maximum sustainable yield.*

*2. The objective specified in paragraph 1 shall be attained while maintaining the fishing mortality on plaice at a rate equal to or no lower than 0,3 on ages two to six years.*

*3. The objective specified in paragraph 1 shall be attained while maintaining the fishing mortality on sole at a rate equal to or no lower than 0,2 on ages two to six years.*

Article 5 Transitional arrangements

*1. When the stocks of plaice and sole have been found for two years in succession to have returned to within safe biological limits the Council shall decide on the basis of a proposal from the Commission on the amendment of Articles 4(2) and 4(3) and the amendment of Articles 7, 8 and 9 that will, in the light of the latest scientific advice from the STECF, permit the exploitation of the stocks at a fishing mortality rate compatible with maximum sustainable yield.*

*Article 8 Procedure for setting the TAC for sole:*

*1) The Council shall adopt a TAC for sole at that level of catches which, according to a scientific evaluation carried out by STECF is the higher of:*

   *(a) that TAC the application of which will result in the level of fishing mortality rate of 0,2 on ages two to six years in its year of application;*

   *(b) that TAC the application of which will result in a 10 % reduction in the fishing mortality rate in its year of application compared to the fishing mortality rate estimated for the preceding year.*

*2) Where the application of paragraph 1 would result in a TAC which exceeds the TAC of the preceding year by more than 15 %, the Council shall adopt a TAC which is 15 % greater than the TAC of that year.*

*3) Where the application of paragraph 1 would result in a TAC which is more than 15 % less than the TAC of the preceding year, the Council shall adopt a TAC which is 15 % less than the TAC of that year.*

**Whiting in IV – VIId (EU and Norway interim management plan)**

The TAC for whiting for 2011 will be fixed by applying an interim management plan consisting of the following elements:

*1. For 2011 and subsequent years the Parties agreed to restrict their fishing on the basis of a TAC consistent with a fishing mortality rate of no more than 0.3 for appropriate age-groups.*

*2. Where the rule in paragraph 1 would lead to a TAC, which deviates by more than 15 % from the TAC of the preceding year, the Parties shall establish a TAC that is no more than 15 % greater or 15 % less than the TAC of the preceding year.*

*3. During 2011, after obtaining advice from ICES, the Parties will refine the management plan, in particular to allow for a reduction in the target fishing mortality when recruitment to the stock has been low for a period of years.*

# Annex 5: Recommendations

| Recommendation | For follow up by: |
|---|---|
| 1. ICES should send out a data call for WGNSSK, WGNEW, WGCSE and WGMIXFISH-NS by end of February 2015 to be fullfilled four weeks before the start of the relevant working groups. | ICES secretariat |
| 2. ICES and STECF liase in arranging expert group meetings for 2015 such that WGMIXFISH-NS can be held before ICES ADGNS and mixed fisheries forecast results incorporated into ICES June advice. Every effort be made to allow short gaps (in days) between the WGNSSK and WGMIXFISH. | ICES secretariat and Commission through STECF |
| 3. WGMIXFISH-METH should consider whether revisions to the data call are necessary for 2015, including whether a revised time series should be requested based on the current metier definitions. Every effort should be made to avoid additional burden on national labortories unless necessary for improving the mixed fishery advice. | ICES WGMIXFISH-METH |
| 4. WGMIXFISH-NS should reinstate the 'val' scenario and hindcasting as a routine analysis to identify the 'most plausible' mixed fishery scenario for advice to customers. | ICES WGMIXFISH-METH; ICES WGMIXFISH-NS |

## Annex 6: Proposed ToR for 2015 WGMIXFISH Meeting

**WGMIXFISH-NS – Working Group on Mixed Fisheries Advice for the North Sea**

2013/#/ACOM## The **Working Group on Mixed Fisheries Advice for the North Sea** (WGMIXFISH-NS), chaired by Paul Dolder, UK, will meet at ICES Headquarters, ##–## May

a ) Carry out mixed demersal fisheries projections for the North Sea taking into account the single species advice for cod, haddock, whiting, saithe, plaice, sole, turbot, *Nephrops norvegicus*, sole VIId and plaice VIId that is produced by WGNSSK in XXXX 2015, and the management measures in place for 2016;

b ) Produce a draft mixed-fisheries section for the ICES advisory report 2015 that includes a dissemination of the fleet and fisheries data and forecasts ;

WGMIXFISH will report by ## ### 2015 for the attention of ACOM.

Supporting Information

| | |
|---|---|
| Priority: | The work is essential to ICES to progress in the development of its capacity to provide advice on multispecies fisheries. Such advice is necessary to fulfil the requirements stipulated in the MoUs between ICES and its client commissions. |
| Scientific justification and relation to action plan: | The issue of providing advice for mixed fisheries remains an important one for ICES. The Aframe project, which started on 1 April 2007 and finished on 31 march 2009 developed further methodologies for mixed fisheries forecasts. The work under this project included the development and testing of the Fcube approach to modelling and forecasts.<br><br>In 2008, SGMIXMAN produced an outline of a possible advisory format that included mixed fisheries forecasts. Subsequently, WKMIXFISH was tasked with investigating the application of this to North Sea advice for 2010. AGMIXNS further developed the approach when it met in November 2009 and produced a draft template for mixed fisheries advice. WGMIXFISH has continued this work since 2010. |
| Resource requirements: | No specific resource requirements, beyond the need for members to prepare for and participate in the meeting. |
| Participants: | Experts with qualifications regarding mixed fisheries aspects, fisheries management and modelling based on limited and uncertain data. |
| Secretariat facilities: | Meeting facilities, production of report. |
| Financial: | None |

| | |
|---|---|
| Linkages to advisory committee: | ACOM |
| Linkages to other committees or groups: | SCICOM through the WGMG. Strong link to STECF. |
| Linkages to other organizations: | This work serves as a mechanizm in fulfilment of the MoU with EC and fisheries commissions. It is also linked with STECF work on mixed fisheries. |