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Executive summary

The ICES' Working Group on Mixed Fisheries Advice for the North Sea [WGMIX-FISH] (Chair: Steven Holmes (UK)) met at ICES HQ, 21-25 May 2012 to apply mixed fisheries forecasts to the draft North Sea single species advice formed by WGNSSK 2012.

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. The North Sea Mixed Fisheries Annex is unchanged from last year and is a separate document.

The mixed fisheries runs followed the approach used by ICES; management plan where it exists and MSY framework 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*. All of these are now subject to multi-annual management plans apart from *Nephrops*. Five scenarios were considered

- 1) **max**: The underlying assumption was that fishing stops when all quota species are fully utilised 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.

As a cross check, the landings by national fleets were summed over nation for each scenario, and the share by country was compared with the initial values input to the model. In general the results indicate that the approach used does not lead to violation of the underlying hypothesis of relative stability in the TAC sharing (quotas) across nations. Only minor deviations are observed across 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.

Data for this WG was requested as part of a joint WGNSSK-WGMIXFISH data call issued formally under the EU DCF regulations. This has allowed a greater consistency between catch totals supplied to WGMIXFISH and WGNSSK. Problems in data supply were still encountered, however, caused primarily by the level of fleet disaggregation best suited to the mixed fisheries projections being incompatible with national sampling schemes (and the need to keep the number of fleet-metier combinations used in the ICES database - InterCatch - to a manageable number).

1 Introduction

1.1 Background

The **Working Group on Mixed Fisheries Advice for the North Sea** [WGMIXFISH] (Chair: Steven Holmes (UK)) met at ICES HQ, 21-25 May 2012 to apply mixed fisheries forecasts to the North Sea single species advice. In previous years the WG met in August and the single species advice was as agreed by ACOM. In 2012 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 is the first mixed fisheries advice to be reviewed and released in conjunction with the single species advice for the North Sea. It 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)

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*. All of these are now subject to multi-annual management plans apart from *Nephrops*.

1.2 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 Regulation 671/2003 of 10 April 2003. The days at sea allowances have been revised by subsequent Council Regulations and the documents listing these days at sea limitations are given in Table 1.2.1

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 Regulations (EU) 43/2012 and (EU) 44/2012. 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 and table 1.2.2 summarises effort reductions imposed in the current year. In relation to this, some member states have implemented real-time closure schemes. The closures ap-

ply to areas with high cod catch rates with the intention that closing these will lead to an overall reduction in the catchability of cod (Holmes *et al*, 2011).

1.3 Stock-based management plans

The species considered here as part of the demersal mixed fisheries of the North Sea were cod, haddock, whiting, saithe, plaice, sole and *Nephrops norvegicus*. All of these were subject to multi-annual management plans apart from *Nephrops*. 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.

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.

1.4 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 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.

In 2012 WGMIXFISH 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'.

1.5 Terms of Reference

The terms of reference for WGMIXFISH were as follows

2011/2/ACOM24 The **Working Group on Mixed Fisheries Advice for the North Sea** (WGMIXFISH), chaired by Steven Holmes, UK, will meet at ICES Headquarters, 21–25 May and 27–31 August 2012 to:

21–25 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 and *Nephrops norvegicus* that is produced by WGNSSK in April 2012, and the management measures in place for 2013;

- b) Update the mixed fisheries annex for the North Sea;
- c) Produce a draft mixed-fisheries section for the ICES' advisory report 2012 that includes a dissemination of the fleet and fisheries data and forecasts ;

27–31 August

- d) Compile and review available fleet and fisheries data for fisheries West of Scotland;
- e) Where viable carry out mixed fisheries forecasts for fisheries West of Scotland taking into account the advice produced by WGCSE 2012 and the management measures currently in place for 2012;
- f) Produce a mixed fisheries annex for the west of Scotland region;
- g) Produce a draft mixed-fisheries section for the ICES' advisory report 2012 that includes a dissemination of the fleet and fisheries data and forecasts ;

For the North Sea and West of Scotland regions investigate the possibility of producing mixed fisheries forecasts based on the scenario of all stocks fished at FMSY in 2015.

In fulfilling its terms of reference above WGMIXFISH was also requested to respond to the following joint EU-Norway request to the fullest extent possible.

Joint EU–Norway Request to ICES on mixed fisheries advice

ICES is requested to provide in 2012, alongside its recurrent advice for single stocks, mixed-fisheries TAC advice for stocks in the North Sea and the Skagerrak. The mixed fisheries advice should reflect the target level of fishing mortalities as set in current management plans, and to the extent possible be consistent with the MSY framework, taking account of plausible ranges in the choice of MSY targets. The advice should also consider eventual adjustments to the MSY framework as a consequence of a mixed fisheries approach.

2 Software

All analyses were conducted using the FLR framework (Kell *et al.* (2007); www.flr-project.org) running with R2.14.1 (R Development Core Team, 2008). 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/WGMIXFISH2012/Report%202012/Forms/AllItems.aspx>

2.1 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 2012, single-species ICES advice was given according to a single preferred option; management plan if implemented, MSY framework 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 explored:

- 1) **max**: The underlying assumption was that fishing stops when all quota species are fully utilised 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. In 2012, that implies an 18.2% effort reduction in TR1 and TR2 gear categories compared to 2011, and another 22.2% reduction in 2013 compared to 2012. In addition, some effort reductions in the BT2 category are implemented in 2012 on the basis of the EU flatfish management plan, on a country-specific magnitude of up to 10% (7.17% for Belgium, 5.76% for Denmark, 2.24 % for France, 9.85% for Germany, 9.57% for the Netherlands and 8.85% for the UK, source Council Reg. 44/2012).

3 Input data and recent trends

3.1 Stocks

3.1.1 Data

The assessment data for the different stocks were taken from ICES WGNSSK (2012). For, plaice, saithe, and sole, no modifications were needed to incorporate the assessment and forecast inputs into the mixed fisheries routine. For whiting, the industrial bycatch component was included in the landings, whereas it is dealt with separately in the single-stock forecast. The same applied for haddock, for which the industrial bycatch is now extremely low. The single species haddock forecast also includes some non-standard procedures for projecting mean weight and mean selectivity, and this was accounted for as far as possible in the current mixed-fisheries forecast.

The cod assessment is performed using the state-space SAM model. This makes use of stochastic projections which are hard to replicate using the deterministic Fcube software. The assessment estimates unallocated removals which are considered as a category on their own, such that raising of the fleet data is not required.

Nephrops stocks were incorporated in the evaluation by functional unit. For the *Nephrops* stocks in FU 5, FU6, FU7, FU8, FU9, FU32, FU33 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 four other functional units (FU 5, 10, 32 and 33) and catches outside of the functional units in the North Sea were omitted in the projections.

The final data set extracted from InterCatch for use by WGNSSK includes cases where discards have been assigned to categories uploaded with only landings data. The data provided to WGMIXFISH, disaggregated by vessel length category and provided in csv files, contains no such assignments. InterCatch data is quarterly and in some cases a metier had raised discard data for some quarters but not others. This lead to different annual discard totals between InterCatch and csv file data. To make the data for Fcube compatible with the InterCatch output the following adjustment was made

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

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

3.1.2 Trends and advice

This advice is drafted by the WGNSSK-2012 before considerations by ACOM.

Recent trends are described on a stock-by-stock basis in ICES (2012), 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 collected directly below. It should be noted that although there is only one advice, additional management considerations are also listed. Table 3.1.1.1 lists the final advised TACs for 2013 and expected SSBs in 2014.

3.1.2.1 Cod in IIIa – IV – VIId

Trends

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, but remains just below Blim. Fishing mortality declined from 2000 and is now below Fpa, but is estimated to be well above FMSY. Recruitment since 2000 has been poor. Although discards are still high, there has been a decreasing trend since 2008.

Advice

ICES advises on the basis of the EU–Norway management plan that landings in 2012 should be no more than 25 441 t.

Additional management considerations

- 1) The EU–Norway agreement management plan as updated in December 2008 aims to be consistent with the precautionary approach and is intended to provide for sustainable fisheries and high yield leading to a target fishing mortality of 0.4. This agreement management plan will be re-considered during 2012.

The EU has adopted a long-term plan for this stock with the same aims (Council Regulation (EC) 1342/2008). In addition to the EU–Norway agreement the EU plan also includes effort restrictions, reducing kW-days available to community vessels in the main métiers catching cod in direct proportion to reductions in fishing mortality until the long-term phase of the plan is reached, for which the target F is 0.4 if SSB is above Bpa. This implies a reduction in effort ceilings of 18.2% in 2012.

In both plans fishing mortality should be reduced to levels corresponding to 75% of F2008 in 2009 and 65% of F2008 in 2010. Until the long-term phase of the management plans has been reached, further annual reductions of 10% must be applied which lead to an F in 2013 equal to 35% of F2008. This would lead to a TAC reduction outside the limits of the 20% TAC constraint, necessitating the application of the TAC constraint. According to these rules, landings should be 25 441 t in total for Subarea IV and Divisions IIIa West and VIId in 2013.

- 2) While ICES considers that a reduction in fishing mortality took place, the intermediate year F assumption from the management plan is considered to be over-optimistic (Simmonds and Kraak, 2011). An alternative assumption based on the continuation of the F trend from 2006–2010 for the F in 2012 is made.

Following the ICES MSY framework implies fishing mortality to be reduced to 0.10 (lower than FMSY because SSB 2013 < MSY Btrigger), resulting in landings of less than 10 000 t in 2012. This is expected to lead to an SSB of 123 000 t in 2014.

To follow the transition scheme towards the ICES MSY framework the fishing mortality must be reduced to $(0.4 \times 0.58) + (0.6 \times 0.10) = 0.29$, which is lower than Fpa. This results in landings of less than 27 600 t in 2013, which is expected to lead to an SSB of 100 600 t in 2014.

- 3) Following the precautionary approach, even a zero catch in 2012 is not expected to result in SSB reaching Bpa in 2013.

3.1.2.2 Haddock in IIIa – IV

Trends

Fishing mortality has been below F_{pa} and around F_{msy} and SSB has been above $MSY_{Btrigger}$ 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 about average, recent recruitment has been poor.

Advice

ICES advises on the basis of the EU-Norway management plan that landings in 2013 should be 47 811 t.

Additional management considerations

- 1) In 2008 the EU and Norway agreed a revised management plan for this stock, which states that every effort will be made to maintain a minimum level of SSB greater than 100 000 t (Blim). Furthermore, fishing was restricted on the basis of a TAC consistent with a fishing mortality rate of no more than 0.30 for appropriate age groups, along with a limitation on interannual TAC variability of $\pm 15\%$. Following a minor revision in 2008, interannual quota flexibility ("banking and borrowing") of up to $\pm 10\%$ is permitted (although this facility has not yet been used). The stipulations of the management plan have been adhered to by the EU and Norway since its implementation in January 2007.

Following the management plan implies a TAC of 47 811 t in 2013 which is a TAC increase of 15% and which is expected to lead to an F decrease of 8%.

- 2) Following the ICES MSY framework implies fishing mortality to be increased to 0.3, resulting in human consumption landings of less than 48 800 t in 2013. This would be expected to lead to an SSB of 202 000 t in 2014.
- 3) Following the precautionary approach, fishing mortality in 2013 should be no more than F_{pa} corresponding to human consumption landings of less than 96 000 t in 2013. This is expected to keep SSB just above B_{pa} in 2014.

3.1.2.3 Plaice in IV

Trends

The stock is well within precautionary boundaries, and has reached its highest levels in recorded history. Recruitment has been slightly above the long-term average from 2007 onwards.

Advice

ICES advises on the basis of the first stage of the EU management plan (Council Regulation No. 676/2007) that landings in 2013 should be no more than 97 070 t. ICES notes that the current advice is deemed to be on the basis of transitional arrangements until an evaluation of the plan (as stipulated in article 5 of the EC regulation) has been concluded.

Additional management considerations

- 1) Following the EU multiannual plan would imply a TAC of 97 070 t ($F=0.27$) in 2013, which is a 15% reduction in comparison to 2012, constrained by the 15% TAC change bounds of the plan. This is expected to lead to an SSB of 666 300 t in 2014. ICES has evaluated this management plan and considers it to be precautionary. Both the North Sea plaice and sole stocks have been within safe

biological limits in the last two years. According to the management plan (Article 3.2), this signals the end of stage one. Application of the plan is on the basis of transitional arrangements until an evaluation of the plan (as stipulated in article 5 of the EC regulation) has been concluded. See section 'Multiannual plan' under 'Additional considerations' for additional information on the EU management plan.

- 2) Following the ICES MSY framework implies fishing mortality to be increased to 0.25, resulting in landings of 90 200 t in 2013. This is expected to lead to an SSB of 677 000 t in 2014.

Given that the current (2011) estimate of fishing mortality is only slightly below F_{MSY} there is no need to follow a transition scheme towards this reference value.

- 3) Following the precautionary approach, the fishing mortality in 2013 should be no more than F_{pa} (0.6) corresponding to landings of less than 189 900 t in 2013. This is expected to keep SSB above B_{pa} in 2014.

3.1.2.4 Sole in IV

Trends

SSB has fluctuated around the precautionary reference points for the last decade and is estimated to be at B_{pa} in 2011. Fishing mortality has shown a declining trend since 1995 and is estimated to be below F_{pa} since 2008.

Advice

ICES advises on the basis of the EU management plan (Council Regulation No. 676/2007) that landings in 2013 should be no more than 13 800 t. ICES notes that the current advice is deemed to be on the basis of transitional arrangements until an evaluation of the plan (as stipulated in article 5 of the EC regulation) has been concluded.

Additional management considerations

- 1) Following the EU multiannual plan would imply a 10% reduction of F to 0.27, resulting in a TAC of 13 800 t in 2013 (an exact 15% reduction in comparison to 2012, while unconstrained by the 15% TAC change bounds of the plan) and implying a 10% reduction in fishing effort. This is expected to lead to an SSB of 48 700 t in 2014. ICES has evaluated this management plan and considers it to be precautionary. Both the North Sea plaice and sole stocks have been within safe biological limits in the last two years. According to the management plan (Article 3.2), this signals the end of stage one. Application of the plan is on the basis of transitional arrangements until an evaluation of the plan has been conducted (as stipulated in article 5 of the EC regulation)
- 2) Following the ICES MSY framework implies fishing mortality to be reduced to 0.22 (F_{MSY} , as $SSB_{2012} > MSY B_{trigger}$), resulting in landings of less than 11 700 t in 2013. This is expected to lead to an SSB of 50 900 t in 2014.

Following the transition scheme towards the ICES MSY framework implies fishing mortality to be reduced to 0.27 ($((0.36 * 0.4) + (0.22 * 0.6))$), which will result in landings of less than 14 200 t in 2013. This is expected to lead to an SSB of 48 300 t in 2014.

- 3) The precautionary F_{pa} for North Sea sole is 0.4. This would lead to landings of 19 400 t in 2013 (a 20% increase in TAC) and an SSB of 42 900 t in 2014.

3.1.2.5 Saithe in IIIa - IV - VI

Trends

The status of the stock has deteriorated in the last few years. Recruitment in 2006, 2008, and 2009 was among the lowest on record. SSB was above B_{pa} during 1997–2011 but has declined since 2005 towards B_{pa} . Fishing mortality has fluctuated around F_{msy} since 1997.

Advice

ICES advises on the basis of the EU–Norway management plan that landings in 2012 should be no more than 100 684 t for the whole assessment area.

Additional management considerations

- 1) The EU–Norway agreement management plan does not clearly state whether the SSB in the intermediate year or the SSB in the beginning or end of the TAC year should be used to determine the status of the stock. ICES interprets this as being the SSB in the beginning of the intermediate year (2012). Since SSB in the beginning of 2012 (216 941 t) is above B_{pa} (200 000 t, and an $F=0.3$ will give a larger change than 15 %, §5 of the harvest control rule applies, resulting in a TAC of 100 684 t and an SSB in 2014 of 252 000 t.
- 2) Following the ICES MSY framework implies a fishing mortality of $F_{MSY} = 0.3$. This would result in landings less than 113 000 t in 2013 and an SSB in 2014 of 241 100 t.
- 3) Fishing at $F_{pa} = 0.4$ results in landings of less than 143 100 t in 2013 and a SSB of 214 400 t in 2014.

3.1.2.6 Whiting in IV - VIId

Trends

SSB in 2011 is slightly lower than in 2010, but remains around the long-term average. Fishing mortality has been stable with minor fluctuations since 2003. Recruitment was low between 2003 and 2007, with above-average recruitments estimated in 2008 and 2009. Whiting is no longer considered to be in a period of impaired recruitment.

Advice

ICES advises on the basis of precautionary considerations that landings should be no more than 26 000 t (human consumption for the combined area) in 2013.

Additional management considerations

- 1) The response to the Joint EU–Norway request on the management of whiting in Subarea IV (North Sea) and Division VIId (Eastern Channel) from ICES in September 2010 stated that “maintaining fishing mortality at its current level of 0.3 would be consistent with long-term stability if recruitment is not poor” (ICES, 2010). Consequently the EU and Norway have agreed to interim management of whiting at this level of total fishing mortality for 2011, conditional on a $\pm 15\%$ TAC constraint.

Following the existing management plan in 2013 implies a TAC of 21 300, which corresponds to a 15% increase in TAC and a fishing-mortality decrease of 17%.

The considerable revisions in this year's assessment, caused by new estimates of natural mortality mean the target F is no longer considered applicable and the management target needs reevaluation. As an interim measure, it would be appropriate to scale the target F in the plan (0.3) according to the proportional change in F between the old and new assessment. The level of F of the whole time series was revised downwards by around 25% between the 2011 and 2012 assessments, which would generate a target F of 0.225 ($0.75 \cdot 0.3$). Following this approach in 2013 with a target fishing mortality of 0.225 would lead to human consumption landings of no more than 19 000t in the North Sea and 7 000 in Division VIIId.

- 2) There are no reference points to enable MSY advice.
- 3) There are no reference points to enable precautionary advice.

3.1.2.6.1 *Nephrops* in Botney Gut (FU 5)

Trends

The state of the stock is unknown but l_{pue} is fluctuating without trend indicating a stable stock status. A new scheme has been developed for *Nephrops* stocks without accepted analytical assessments. This uses the known area of *Nephrops* habitat and the range of densities observed on this (or neighboring) grounds to indicate if historical landings are likely to represent sustainable harvest rates or not. Preliminary TV surveys for this ground indicate a stock density of 0.7 *Nephrops* per m² although this is subject to considerable uncertainty. Historical average (10 year) landings appear to be sustainable and robust to uncertainty in the estimated stock density.

Advice

The 2010 advice for this *Nephrops* stock is biennial and valid for 2013 and 2014 (see [ICES 2010](#)). In the absence of a full analytical assessment, ICES bases advice for *Nephrops* on habitat extent and population characteristics. ICES advises that landings of 1000t should be sustainable for this stock.

To protect the stock in this functional unit, management should be implemented at the functional unit level.

Additional management considerations

- 1) There is currently no management plan for this Functional Unit.
- 2) In the absence of a full analytical assessment, ICES bases advice for *Nephrops* on habitat extent and population characteristics. ICES advises that landings of 1000t should be sustainable for this stock.
- 3) There is currently no advice given following the precautionary approach for this Functional Unit.

3.1.2.7 *Nephrops* in Farn Deep (FU 6)

Trends

The UWTV survey indicates that the stock status has declined since 2005 and has been rebuilding to just below $MSY B_{trigger}$ since 2009. Changes in survey methodology

in 2007 make exact comparisons with the preceding series difficult but the general trend is considered reliable.

Advice

ICES advises on the basis of the MSY transition that landings in 2013 should be no more than 1400 t.

To protect the stock in this functional unit (FU), management should be implemented at the functional unit level.

Additional management considerations

- 1) There is currently no management plan for this Functional Unit.
- 2) Following the ICES MSY framework implies a harvest rate of 8%, resulting in landings of 1300 t in 2013.

Following the transition scheme towards the ICES MSY framework implies fishing mortality to be reduced to $(0.4 \cdot F_{2010} + 0.6 \cdot F_{MSY}) = 8.8\%$ (biomass is just below MSY $B_{trigger}$, so no additional reductions are relevant), corresponding to landings of no more than 1400 t in 2013.

- 3) There is currently no advice given following the precautionary approach for this Functional Unit.

3.1.2.8 *Nephrops* Fladen Ground (FU 7)

Trends

The stock has declined in the last 3 years but remains above MSY $B_{trigger}$. The harvest rate has fluctuated around 8% in recent years, this is below F_{MSY}

Advice

ICES advises on the basis of the MSY approach that landings in 2013 should be no more than 10 100 t.

To protect the stock in this functional unit (FU), management should be implemented at the functional unit level.

Additional management considerations

- 1) There is currently no management plan for this Functional Unit.
- 2) Following the ICES MSY framework implies a harvest rate lower than 10.3%, corresponding to landings of less than 10 100 t in 2013.
- 3) There is currently no advice given following the precautionary approach for this Functional Unit.

3.1.2.9 *Nephrops* in Firth of Forth (FU 8)

Trends

The stock remains at a high level, above MSY $B_{trigger}$. The harvest rate remains above F_{MSY} .

Advice

ICES advises on the basis of the transition to the MSY approach that landings in 2013 should be no more than 1400 t.

To protect the stock in this functional unit (FU), management should be implemented at the functional unit level.

Additional management considerations

- 1) There is currently no management plan for this Functional Unit.
- 2) To follow the ICES MSY framework the harvest rate should be reduced to 16.3%, corresponding to maximum landings of 1350 t in 2013.

To follow the transition scheme towards the ICES MSY framework the harvest rate should be reduced to 17.1% ($0.4 \cdot F_{2010} + 0.4 \cdot F_{MSY}$), corresponding to landings of no more than 1400 t in 2013 (where F_{2010} is the observed harvest rate in 2010 (18.4%)).

- 3) There is currently no advice given following the precautionary approach for this Functional Unit.

3.1.2.10 *Nephrops* in Moray Firth (FU 9)

Trends

The stock remains above $MSY_{Btrigger}$. The harvest rate was just below F_{MSY} in 2010 but increased in 2011.

Advice

ICES advises on the basis of the MSY approach that landings in 2013 should be no more than 950 t.

To protect the stock in this functional unit (FU), management should be implemented at the functional unit level.

Additional management considerations

- 1) There is currently no management plan for this Functional Unit
- 2) Following the ICES MSY framework implies the harvest rate should be less than 11.8%, resulting in landings of less than 950 t in 2013.
- 3) There is currently no advice given following the precautionary approach for this Functional Unit.

3.1.2.11 *Nephrops* in Noup (FU 10)

Trends

The state of the stock is not fully known. Based on guideline evaluation the stock appears to be exploited close to 10% harvest rate on the basis of preliminary TV density estimates of 0.2m².

Advice

The 2012 advice for this *Nephrops* stock is biennial and valid for 2013 and 2014 (see [ICES, 2010](#))

In the absence of a full analytical assessment, ICES bases advice for *Nephrops* on habitat extent and population characteristics. ICES advises that catches of 150t should be sustainable for this stock.

To protect the stock in this functional unit (FU), management should be implemented at the functional unit level.

Additional management considerations

- 1) There is currently no management plan for this Functional Unit.
- 2) In the absence of a full analytical assessment, ICES bases advice for *Nephrops* on habitat extent and population characteristics. ICES advises that landings of 150t should be sustainable for this stock.
- 3) There is currently no advice given following the precautionary approach for this Functional Unit.

3.1.2.12 *Nephrops* in Norwegian Deep (FU 32)

Trends

The state of the stock is unknown but l_{pue} is fluctuating without trend indicating a stable stock status and suggest that current and past levels of exploitation are sustainable. A slight increase in mean size in the catches in 2007 and 2010 could indicate a reduced exploitation pressure. A new scheme has been developed for *Nephrops* stocks without accepted analytical assessments. This uses the known area of *Nephrops* habitat and the range of densities observed on this (or neighbouring) grounds to indicate if historical landings are likely to represent sustainable harvest rates or not. The density in FU 32 is most likely found in the range 0.05-0.1 animals m^{-1} , where 0.1 animals m^{-1} is the minimum density observed in the neighbouring Fladen Ground. Historical average (10 year) landings appear to be sustainable and robust to uncertainty in the estimated stock density.

Advice

The 2012 advice for this *Nephrops* stock is biennial and valid for 2013 and 2014 (see ICES, 2012). In the absence of a full analytical assessment, ICES bases advice for *Nephrops* on habitat extent and population characteristics. ICES advise landings of 1000 t should be sustainable for this stock.

For the stock in this functional unit (FU), management is implemented at the functional unit level.

Additional management considerations

- 1) There is currently no management plan for this Functional Unit.
- 2) In the absence of a full analytical assessment, ICES bases advice for *Nephrops* on habitat extent and population characteristics. ICES advises that landings of 1000t should be sustainable for this stock.
- 3) There is currently no advice given following the precautionary approach for this Functional Unit.

3.1.2.13 *Nephrops* off Horn's Reef (FU 33)

Trends

The state of this stock is unknown. l_{pue} has been increasing up to 2008, probably reflecting increase in gear efficiency (technological creep) in the last years. The mean sizes in 2005 catches and the increased l_{pue} 's in the subsequent years could indicate a high recruitment in 2005. The development in 2009 then suggests that the contribution of the 2005 recruitment to the stock now has faded.

Following WKLFIE guidelines a new scheme has been developed for *Nephrops* stocks without accepted analytical assessments. This uses the known area of *Nephrops* habi-

tat and the range of densities observed on this (or other) grounds to indicate if historical landings are likely represent sustainable harvest rates or not. *Nephrops* density on this ground is unknown, but the neighbouring Fladen ground has typical densities 0.1-0.3 per m² so these values are useful proxies. Historical maximum landings appear to be sustainable and robust to uncertainty in the estimated stock

Advice

The 2012 advice for this *Nephrops* stock is biennial and valid for 2013 and 2014 (see [ICES, 2010](#)). In the absence of a full analytical assessment, ICES bases advice for *Nephrops* on habitat extent and population characteristics. ICES advises landings of 1500t should be sustainable for this stock.

To protect the stock in this functional unit (FU), management should be implemented at the functional unit level.

Additional management considerations

- 1) There is currently no management plan for this Functional Unit.
- 2) In the absence of a full analytical assessment, ICES bases advice for *Nephrops* on habitat extent and population characteristics. ICES advises that landings of 1500t should be sustainable for this stock.
- 3) There is currently no advice given following the precautionary approach for this Functional Unit.

3.1.2.14 *Nephrops* in Devil's Hole (FU 34)

Trends

The state of the stock is not fully known. Based on guideline evaluation the stock appears to be to be exploited close to 10% harvest rate.

A new scheme has been developed for *Nephrops* stocks without accepted analytical assessments. An estimate of the total *Nephrops* grounds was used to give a likely envelope for the total abundance of *Nephrops* in the functional unit 34 – Devil's Hole (see text table below). The discard rate and mean weight was taken from FU7. The 2012 survey shows that density is low to moderate on this ground at 0.3 burrows per metre squared. 10 year average landings of 600 at this density equates to a harvest rate of around 6.3%, which is well below any proxy for Fmsy used on other grounds. There is uncertainty in the TV estimate, but even if the density were over-estimated by 50%, the harvest rate would still be below 10% at the level of average landings. Maximum landings of 1200t carry an appreciably higher risk of exceeding any MSY proxies.

Advice

This is the first year ICES gives advice for this Functional Unit separately. The 2012 advice for this *Nephrops* stock is biennial and valid for 2013 and 2014 (see [ICES, 2010](#)). In the absence of a full analytical assessment, ICES bases advice for *Nephrops* on habitat extent and population characteristics. ICES advises landings of 600t should be sustainable for this stock.

To protect the stock in this functional unit (FU), management should be implemented at the functional unit level.

Additional management considerations

- 1) There is currently no management plan for this Functional Unit.

- 2) The In the absence of a full analytical assessment, ICES bases advice for *Nephrops* on habitat extent and population characteristics. ICES advises that landings of 600t should be sustainable for this stock.
- 3) There is currently no advice given following the precautionary approach for this Functional Unit.

3.1.2.15 *Nephrops* in Other rectangles (NEPOTH)

Trends

The stock status is unknown.

Advice

On the basis of precautionary considerations, ICES advises that catches should not increase in these rectangles

Additional management considerations

- 1) There is currently no management plan for this area.
- 2) There is currently no advice given following the ICES MSY framework for this area.
- 3) On the basis of precautionary considerations, ICES advises that catches should not increase in these rectangles.

3.1.3 Software

The collation of WGNSSK data highlighted the great diversity of software and settings used in the single species assessments and forecasts, as illustrated in the text table below

Species	Assessment	Forecast
HADDOCK IV, IIIa and VIIb	FLR 2.x, FLXSA	MFDP
COD IV, IIIa and VIIb	SAM	SAM
PLAICE IV	FLR 3.0, FLXSA	FLR3.0, FLSTF
WHITING IV and VIIId	FLR 2.x, FLXSA	MFDP
SAITHE IV, IIIa and VI	FLR 2.x, FLXSA	FLR 2.x, FLSTF
SOLE IV	FLR 2.x, FLXSA	FLR 2.x, FLSTF

In the mixed-fisheries runs, all forecasts run were done with the same FLR forecast method (see chapter 2), but using the Flash package rather than the FLSTF package which is not maintained anymore.

3.2 Fleets and métiers

3.2.1 Catch and effort Data

The collection of catch and effort data changed significantly in 2012 compared to previous years (cf Annex 2). Previously, data were submitted 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). In 2012 the data were requested consistent with the definition of DCF métiers, as specified by the joint WGNSSK/WGMIXFISH data call. Beyond the métier-based landings and discards data used by WGNSSK and stored in InterCatch, a break-down of effort and catches across vessel length categories specified to match

fleet segments from the STECF AER (Annual Economic Report) was provided directly as comma separate files. Some countries provided this breakdown according to the DCF métiers and others according to last year's format, and these inputs were standardized afterwards by WGMIXFISH. Age distribution by métier and area, which is now available in InterCatch, was not integrated in the MIXFISH data this year, but it is ultimately the purpose that these will be included in the near future.

In spite of 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 year's data, though with two noticeable changes: first, because no mesh size information was available from Norway in 2011, the whole Norwegian time series was recomputed without any mesh size, thus losing the precision available in previous years. Second, the Swedish *Nephrops* fishery with an escapement grid, OTB_CRU_70-89_2_35 was previously reported as TR2 (70-89) whereas in 2012 this métier was 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 in 2012 is the increase of discard coverage in the MIXFISH data. Until last year, 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 (where discard rates had been assigned to unsampled fleets within nations and/or between national 'fleets'). In 2012, the assignments were done by WGNSSK at the métier level. The final data set extracted from InterCatch for use by WGNSSK therefore included cases where discards had been assigned to categories uploaded with only landings data but for categories that were consistent with the categories in the MIXFISH csv file data. It was 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 is aggregated over all vessel lengths the same adjustment was applied to all vessel length categories of otherwise comparable MIXFISH métiers.

3.2.2 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 3.2.2.1). 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 unbalance in the relative size of fleets in the model. In 2012, more in-depth consideration was 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 led to some changes in the fleet definition compared to previous years, 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 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 vessels in a separate fleet,
- France: Distinction of the <10m vessels; separation of the trawlers at <40m and ≥40m, specific gill- and trammel net 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
- 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; No mesh size used for métiers definition.
- 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 for 2011 only.

As a second step, and in order to reduce the number of categories, an aggregation threshold, established through trial and error was used to determine ‘small’ métiers. A métier failing to catch 1.0% in 2011 of at least one of the stocks considered was 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), were afterwards aggregated into one single “OTH” fleet.

All these changes performed during the 2012 WG led to a significant increase in the number of fishing units identified for the North Sea demersal fisheries compared to previous years. In 2012, the final data used contained 39 national fleets (plus the OTH fleet) from nine countries (against 27 fleets in 2011), from 2003 to 2011. These fleets engage in one to four different métiers each, resulting in 88 combinations (against 68 in 2011) of country*fleet*métier*area catching cod, haddock, whiting, saithe, plaice, sole and *Nephrops* (Table 3.2.2.2).

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 3.2.2.1). Some landings may not be allocated to fleets, due to for example missing countries or areas (e.g. area VIa for saithe) or national landings with missing logbook information that cannot be allocated to a fleet. The landings coverage for most stocks is high (from 75 to 100% of landings could be allocated to one of the fleets). Since cod 'unallocated removals' are now removed from the landings in the SAM assessment, the match of cod landings was also satisfactory this year (above 85%, against 50% in previous years). In 2012, the match of discards estimates has clearly improved, due to the availability of raised discards ratio by métier in InterCatch. To solve the remaining small inconsistencies between fleets data and stock data, the differences between them were pooled into the "OTH" fleet (both landings and discards).

3.2.3 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 3.2.3.1) and relative trends (Figure 3.2.3.2), effort share by métier and fleet (Figure 3.2.3.3) and landings by fleet and stock (Figure 3.2.3.4) are included in this report.

4 Mixed fisheries forecasts

4.1 Description of scenarios

4.1.1 Baseline Runs

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

- 4) reproduce as closely as possible the single species 2012 advice produced by ACOM, and
- 5) 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 minimise discrepancies to the largest extent possible.

There may also be small differences in the catch input to WGNSSK assessments and the more disaggregated data provided for WGMIXFISH. The results from WGNSSK use discard estimating procedures which utilise estimated discard rates from across countries to fill missing gear specific estimates whereas WGMIXFISH input data provided country specific estimates only, which results in some missing discard values for some gear/species combinations compared to the WGNSSK data. This is compensated for by raising discards in the WGMIXFISH data to match those records on InterCatch used by WGNSSK to ensure, to the greatest extent possible, identical catches.

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.

4.1.2 Mixed fisheries runs

4.1.2.1 Fcube analyses of the intermediate year (2012)

The single species stock forecast settings and target F for 2012 from the baseline run were used to perform Fcube scenario analyses for 2012 (Run “One Year Fcube” – Single-Stock TargetF 2012). The aim of these analyses was to provide alternative sets of plausible levels of F by stock in 2012 accounting for mixed-fisheries interactions. This is similar to the base case run described and analysed in ICES (2008).

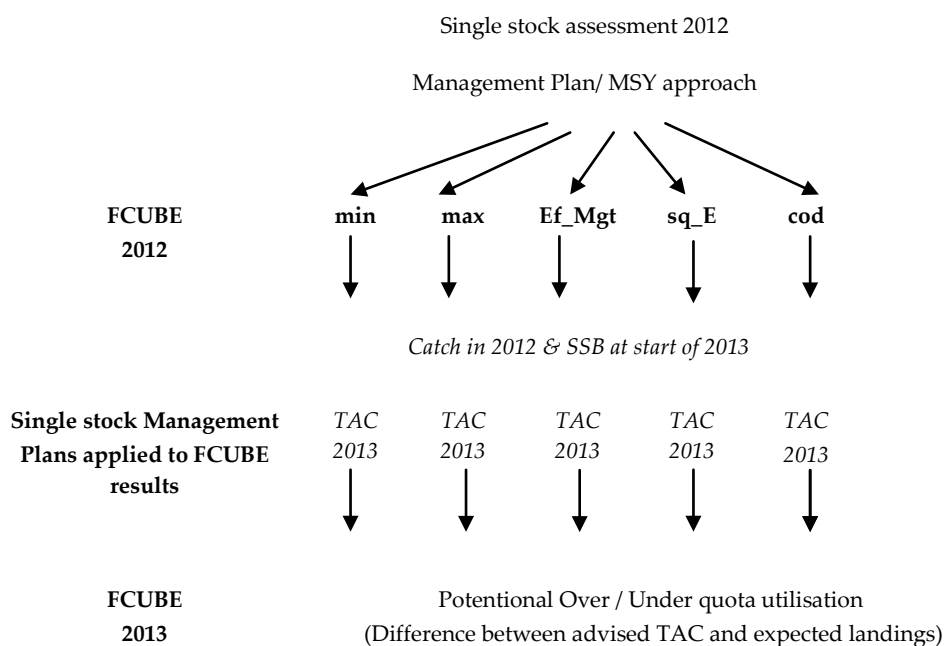
The Fcube scenarios **max**, **min**, **cod**, **sq_E** and **Ef_Mgt** were performed.

4.1.2.2 Fcube analyses for the TAC year (2013)

The new F2012 values by stock derived from the Fcube scenarios were used as input for the Intermediate Year in single-species forecasts, instead of the values from WGNSSK. The stocks were projected again to 2014, using the same settings (objectives and constraints) for 2013 as in the Baseline Run. The aim was to derive single species stock TAC advice for 2013 following the single species advice approach but as if catch resulting from the assumed mixed-fisheries interactions in 2012 had come about and the data were available for the intermediate year. Finally, for each Fcube scenario, the same scenario was applied in 2013 to the stock results (numbers-at-age) resulting from applying that scenario for 2012. In this way the following could be calculated:

- Differences in recommended TACs for 2013 resulting from the single species advice approach being applied to the stock status at the end of the intermediate year of different scenarios and
- An estimate of the cumulative difference between baseline run (single species advice) intermediate year catch plus TAC and realised catches over two years from each scenario,

In summary, the Fcube runs followed the scheme below:



4.2 Results of Fcube runs

4.2.1 Baseline run

The rationale behind the single species baseline runs is given in Section 4.1.1. Table 4.2.1.1 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 4.2.1.2 and 4.2.1.3, and summarised at Figure 4.2.1.1.

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 5000 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 addition, the assessment and projection include a component of unallocated removals, while the FLR setup normally copes only with landings and discards. This latter issue was handled in two steps, first by combining unallocated removals and discards within the projections, to maintain the TAC constraint on the landings component, and second by splitting the resulting 'discards' into actual discards and unallocated removals based on 2011 ratios.

In 2012 ACOM changed the basis for the assumption of F in the intermediate year to reflect the fact that the realised decline in F has been slower than the Management Plan stipulated. The new assumption is based on the slope of the recent trends in reduction in F over 2006-2010, giving an F multiplier of 0.87 between 2011 and 2012. This same assumption was carried across into the Fcube simulations.

The final discrepancy between the ICES cod advice and the WGMIXFISH replicate was low (0.4% in estimated 2012 landings and 0% in 2013), and the FLR forecast could thus be used as a satisfactory basis for the mixed-fisheries projection. At the fleet level, unallocated removals were technically treated as a specific fleet to ease the automatic calculations in Fcube.

Haddock: The methods developed in WGNSSK to parameterise 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 with less than 1% discrepancy between SSB projections.

Whiting: There are some discrepancies in the forecast catches from the WG and the FLR forecasts. A small error was discovered in the single-species whiting advice, linked to an overestimation of the share of the VIIId catches in the forecast. Whilst this doesn't affect the advice of a 15% TAC increase in the North Sea for 2012, it may have some small consequences for the estimation of the whiting TAC for subarea VII. The WGMIXFISH projections are based on the corrected share between areas. A second source of differences between WGMIXFISH and WGNSSK can be attributed to differences in the way the industrial by-catch 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.

Saithe: Straightforward, no problems encountered.

Plaice: Straightforward, no problems encountered.

Sole: Straightforward, no problems encountered

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. However, there are two issues that arise due to different assumptions to the WGNSSK.

Firstly, 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 2012 TAC applied to the abundance estimates in 2012 for that particular FU (equal to proportion of the N 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. For example, in the case of FU9 the harvest ratio has increased significantly in the last year, which is weighted down by previous years in the averaging process of the single species forecast. The assumption taken in WGMIXFISH may be more appropriate, as it's 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 2012 is not used in the forecasts for 2013.

Secondly, 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.

4.2.2 Mixed fisheries analyses

4.2.2.1 Fcube analyses of the intermediate year (2012)

The Target F by stock for 2012 were set as the landings component of the F used in the Baseline (see table 4.2.1.1). For cod the same assumption was used as in the ICES WGNSSK (ICES 2012) that the target F in the management plan would not be met, but that F has reduced following the trend observed over 2006 – 2010 (i.e. 13% F reduction in 2012 on 2011 rather than 18% reduction). It is to be noted that for cod, whiting and sole, the single-species forecast assumptions used by ICES' WGNSSK (ICES 2012) (and reproduced here in the *baseline*) imply to some extent expected landings for 2012 higher than the actual TAC.

The Fcube scenarios **min**, **max**, **sq_E**, **cod** and **Ef_Mgt** were applied to these target Fs (Table 4.2.2.1.1 and Figures 4.2.2.1.1 to 4.2.2.1.5). The results were interesting when compared to the TAC year forecasts in WGMIXFISH last year (i.e. the intermediate year this year; ICES, 2011). In the 2011 MIXFISH projections the forecasted limiting species was cod, but in the 2012 simulations haddock is the limiting species in the intermediate year for almost all fleets. This changed perception may be a consequence of the fact that 1) lower than expected discard rates in 2011 (used for estimating discards in 2012) lead to more consistency between catchability of cod and other species, and 2) because estimates of natural mortality in the cod assessment were revised upwards following multi-species analysis (ICES, 2011d), maintaining the perception of SSB trends, but with F2010 revised down (by 14%) in the 2011 assessment indicating less of a "gap" between the current and required F.

In 2011 there was fairly good consistency between the single-stock forecasts and the status quo effort (**sq_E**) scenario, as most single-stock forecasts assumed status quo F in the intermediate year, and should therefore be in line with status quo effort. However, this was not the case in 2012, with the single stock being similar to **sq_E** for sole and whiting but **sq_E** indicating 9%, 18% and 15% higher landings for cod, saithe and plaice respectively. This lack of consistency has important consequences in terms of advice, as it suggests that the cod forecast may be considered slightly overoptimistic for 2012 if effort does not reduce in 2012. However, it does still indicate that even if effort remains constant from 2011 to 2012 then some reduction in F can still be expected and therefore the working group assumption of a (reduced) F reduction in the intermediate year may be well founded. .

The outcomes of the **cod** scenario are no longer comparable to the outcomes of the **min** scenario (cf ICES WGMIXFISH 2010), with the min scenario limited by haddock. This indicates that the cod stock is not necessarily the limiting stock for the majority of fleets; with Figure 4.2.2.1.1 indicating the majority of fleets are now limited by haddock (and saithe to a lower extent) for which they may have low quota shares or higher catchabilities. For 2012 the cod TAC was basically rolled-over from 2011, and thus F estimates and catches are more likely to be consistent between the two years. On the contrary, both haddock and saithe forecasts assume a constraining TAC for 2012, which implies a reduction of F in 2012 compared to 2011, of 34% and 15% respectively. This maintains haddock F at 0.2, which is 50% below the management plan target for 2012. As the model assumes by default that catchability in 2012 is the same as in 2011, then this reduction in F can only be achieved in the model through a reduction of effort, which has then implications for the other species in a mixed-fisheries context.

The **Ef_Mgt** scenario implies quite large effort reductions in 2011 in the main cod matters (TR1, TR2 and to a lower extent BT2). The scenario shows some consistency with the single species advice target landings except for cod and whiting where catches are indicated to be considerably lower than the single stock advice. There is also undershoot for *Nephrops* landings. The scenario leads to overshoots for haddock and saithe while there is little impact on the catches of plaice and sole.

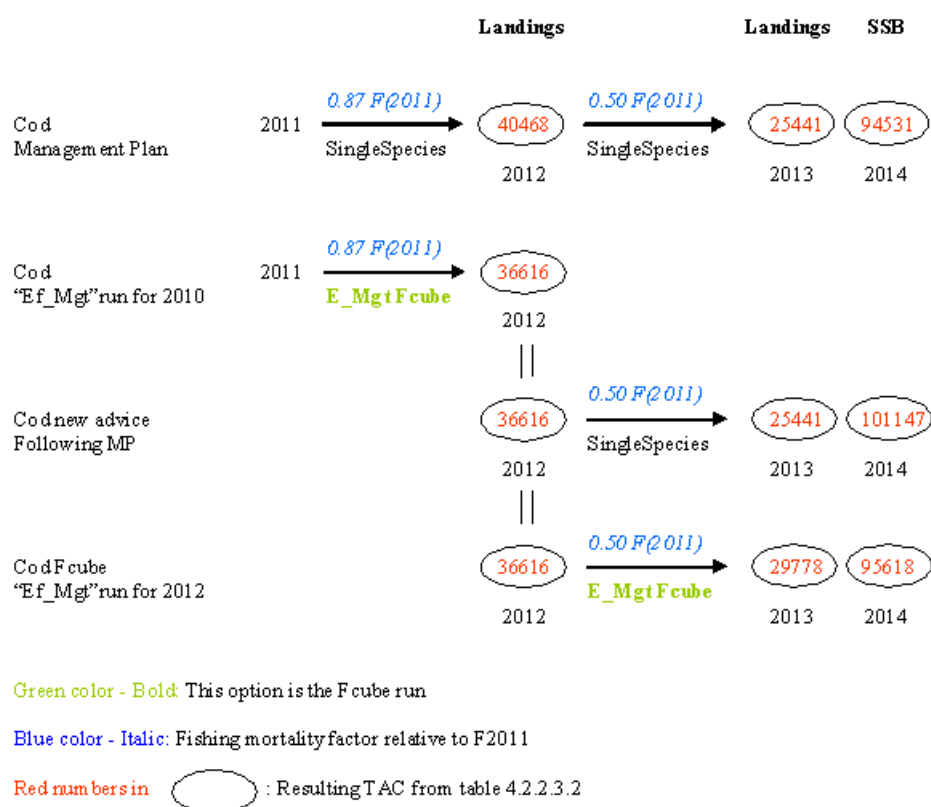
The **min** and **max** scenarios are still kept in the figures as illustrative boundaries, but WGMIXFISH consider that these scenarios are not realistic in a management perspective. Hindcasting exercises over historical data (up to 2008) have been conducted by Ulrich et al. (2011.), showing that actual realised fleet effort had been in almost all cases between but far from the **min** and **max** estimates, and closer to the **sq_E** and **val** (where fleet effort on a stock is weighted by the value of landings for that species by that fleet compared to the overall value of landings for that fleet) scenarios. This can be understood when looking at the effort estimates for the various fleets corresponding to their various quota share (Figures 4.2.2.1.1 and 4.2.2.1.2) estimated through the relationships between *F*, effort and catches, where it is clear that for most fleets the **max** estimate is driven up by non-important by-catch species, especially whiting.

Importantly, Figure 4.2.2.1.4 displays only information on *landings*, i.e. the share of predicted catches that corresponds to marketable 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-stock landings estimates for 2012 with the mixed-fisheries landings estimates. To get an overview of the amount of total catches for the various scenarios, Figure 4.2.2.1.5 displays the catch by category, i.e. potential 'legal' landings (i.e. below the official 2012 TAC, which in practice acts as a TAL), potential 'over TAC' landings, i.e. estimated landings above this official TAC, if any, and discards, as calculated according to the discards ratio observed in assessment data (as in the single-stock forecast). Therefore the discards in this figure reflect undersize discarding rather than overquota discarding. In the case of cod there is also the issue of 'unallocated removals'. These are simply considered constant over all scenarios.

4.2.2.2 Fcube analyses for the TAC year (2013)

The full overview of the two year projections to 2013 is presented in Table 4.2.2.3 and Figures 4.2.2.2.1 to 4.2.2.2.4.

The Fcube outputs for 2013 are quite comprehensive and their interpretation is not easy. An example of interpretation is given in the scheme below to aid understanding of the advice tables. The example follows the landings results for the cod stock in the Fcube **Ef_Mgt** scenario under the Management Plan advice approach:



In this example, the baseline run, which follows the single-stock ICES advice, assumes landings of 40468 tonnes in 2012 (corresponding to a 13% reduction in F from F_{2011} to F_{2012} following analysis of recent mean F trend), and 25441 tonnes in 2013. The resulting SSB in 2014 is estimated to be 94531 tonnes. However, assuming that the effort restrictions imposed for 2012 on TR1, TR2 and BT2 (18.2% reduction for TR1 and TR2 and 2-10% reductions for BT2 depending on the country) are applied, the 2011 landings are estimated at 36616 tonnes, i.e. 9.5% less than assumed in the baseline. If this was the case, then the TAC advice for 2012 would still be set to 25441 tonnes in order to comply with the management plan rules on single species advice in 2012. But the resulting SSB in 2013 is estimated to be 101147 tonnes, 7% higher than the resulting SSB following the single species advice according to the cod Management Plan.

If again we assume that the fleets fish in line with the effort reductions in 2013 (22.2% reduction for TR1, TR2 and a 2-10% reduction for BT2), then the landings in 2013 would be estimated at 29778 tonnes, i.e. 17% above the initial single-stock baseline. While the Single-Stock advice estimates an SSB level around 94531 tonnes by 2013 under full compliance with the MP, the **Ef_Mgt Fcube** scenario (following the effort reduction from the Management Plan) estimates SSB in 2013 as high as 95618 tonnes. In other words, effort reductions in 2012 would be more beneficial to the stock than was assumed in the single-stock projection, but the further effort reductions proposed for 2013 would not be sufficient to achieve the Management Plan target in terms of F .

Considering results table 4.2.2.3 with respect to all species, the first set of results to investigate is the sensitivity of the single-stock advice to the Fcube hypotheses applied to the intermediate year, i.e. what happens if we maintain the same single-stock target for 2013 as in the current advice, but change the 2012 hypotheses (Block D in the output tables compared to the 2013 Baseline in Block C {uppermost line}). Due to TAC constraints included in the management plans for most stocks, the differences

are in most cases relatively small (usually less than $\pm 10\%$ changes compared to the single-stock forecast), although some more extreme values can sometimes appear in the **min** and **max** scenarios. From 2012 this situation is true for all stocks including whiting because an interim LTMP for whiting has been implemented for the past two years with a similar basis to other demersal stocks.

The second set of results to investigate is the difference between i) the potential 2013 landings (~TAC advice) when considering mixed-fisheries interactions during both 2012 and 2013 (block C), ii) the single-species advice (2013 baseline in block C and horizontal lines in Figure 4.2.2.2.1) and iii) the mixed-fisheries advice accounting for single species Management Plans (Block D). This provides estimates of potential over/under shooting of 2013 TACs due to mixed-fisheries interactions.

It is worth noting that the SSB for cod under **sq_E** is similar in 2013 but much lower in 2014 than under the baseline, resulting over the two years in the continuing current trends of slowly increasing SSB. The picture for haddock is much less optimistic with a much larger decline predicted than in the baseline for both 2013 and 2014 (Figure 4.2.2.2.3). This results from the overshoot in the intermediate year if F remains the same, whilst cod again becomes the limiting stock for all fleets in 2013, with haddock landings again coming broadly into line with those projected by the baseline (Figure 4.2.2.2.4). This is interesting as it suggests that whilst management measures have largely been focussed on cod recovery in recent years (as it has generally been the limiting stock) this is not necessarily the case in 2012 as the TAC was rolled over from 2011, and therefore there is a need to take account of changing stock dynamics and consistency (or otherwise) of TACs.

In terms of effort management, the simulations indicate that while current levels of effort (**sq_E**) are likely to achieve the expected 12% reduction in cod fishing mortality in 2012, they are unlikely to achieve the target 35% reduction of F in 2013 compared to 2008 as stipulated by the management plan, and further effort reductions may be required. This is in contrast to projections in 2011 (ICES< 2011) which indicated that the target for 2012 would not be met; indicating that changes to discarding levels may have brought about a reduction in overall catchability that could not be predicted.

Alternatively, stepwise effort reductions in TR1 and TR2 in both 2012 and 2013 (**Ef_Mgt**) would imply some interesting consequences. Reductions in F for 2012 beyond that required by the management plan under the **Ef_Mgt** scenario indicate that the full catching opportunities would not be taken. However, much more abrupt reductions in effort would be required in 2013 to bring the fleets into line with the baseline catching opportunities for cod in 2013. In contrast, the **Ef_Mgt** scenario leads to underutilisation of both the plaice and sole baseline TACs, suggesting a significant impact from the effort reductions on beam trawls from the plaice and sole management plan.

The advice for a 20% reduction in cod TAC in light of an increasing biomass means that catchability would increase whilst quota decreases, meaning significantly lower activity or changes to catchability required in order to achieve the cod target in 2013. If this is achieved through effort reductions it would also have strong negative impacts on the ability of the fleets to catch all other 2013 TACs, particularly haddock, whiting and *Nephrops* but also to some extent plaice and saithe. The likely TAC increase for all but *Nephrops* stocks in 2013 (according to ICES advice and as repeated in the baseline run) will create strong incentives for maintaining effort at its current level – or even to increase it slightly – since even in the **sq_E** scenario the estimated

2013 landings are below the baseline for haddock, plaice, whiting and to a lesser extent *Nephrops* (Figure 4.2.2.2.1).

To get an overview of the amount of total catches for the various scenarios, Figure 4.2.2.2 displays the catch by scenario for each of the species.

These results are now used to form the basis of mixed fisheries advice for the North Sea.

WGMIXFISH stresses again that these scenarios are based on central assumptions that fishing patterns and catchability in 2012 and 2013 are similar to those in 2011, as in a single-stock forecast where growth and selectivity are assumed constant. However, as for growth and selectivity, it is known that in reality, fleet dynamics will adapt to changes in fishing environment and opportunities. But the direction and magnitude of these changes, occurring at the level of the individual fishers, cannot be easily predicted and integrated in a model. WGMIXFISH underlines therefore that these scenarios are useful for pointing out where are the highest risk of unbalance among fishing opportunities, rather than predicting what will happen next year. Discrepancies between the outcomes of the various scenarios indicate considerable imbalance between the single-species targets, suggesting that indeed fleets will have to adapt – e.g. by changing fishing patterns, catchability or discarding practices.

4.2.2.3 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 over 2009-2011. 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 4.2.2.3). 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.

5 Future Developments

5.1 Future developments for WGMIXFISH

5.1.1 MIXFISH methodology meeting

The terms of reference for WGMIXFISH (see section 1.5) include those for a meeting to be held in August. Mixed fisheries projections and advice for North Sea stocks was always envisaged as a first step in developing such advice throughout the ICES regions (ICES 2012b). The successful benchmarking of analytical assessments for two stocks west of Scotland (ICES division VIa) offers the possibility of using the Fcube software in a way similar to in the North Sea. The EU commission also requested of ICES mixed fisheries projections using a scenario of all species fished at Fmsy in 2015. Such a scenario – considering the mean F on each stock two years beyond the TAC year – has not been attempted before and was considered beyond the scope of a purely operational meeting such as the May meeting of WGMIXFISH.

Agreed in 2012 the 'August meeting' has been made a second meeting of WGMIXFISH for reasons of ease of administration. There is a clear need for ongoing methodological development and for testing the ability to perform mixed fisheries

forecasts in further areas. It is hoped a regular ICES WG meeting can be established in its own right to consider future developments. For example, a working paper was presented at WGHMM to consider whether mixed fisheries projections could be applied to stocks covered by that WG (Castro and Santurtun, 2012) and it is believed a suggested contribution to terms of reference for a MIXFISH methodology meeting in 2013 are in preparation. WGMIXFISH also has candidate future scenarios (see next section) but continuing difficulties in data supply to WGMIXFISH and very high workload for assessment scientists in the second quarter restrict this WG to production of advice according to established methodology.

5.1.2 Candidate future scenarios

Projected trend in fleet effort levels

The outcomes from previous WGMIXFISH results (ICES, 2009, 2010b), as well as the general evaluation of the successes and failures of the cod LTMP (STECF/ ICES WKROUNDMP 2011c) have pointed out the importance of the specification of the intermediate (current) year for minimising implementation error. In 2009 in particular, the TAC advice for cod was based on a literal interpretation of the LTMP stating that F would be reduced by 25% in the first year of implementation, while effort data have shown that only limited effort reduction took place that year (STECF 2010) – and indeed F was estimated as not having decreased in 2009.

ICES WGMIXFISH and WKROUNDMP have also investigated the link between fishing effort and fishing mortality for North Sea cod (and Irish Sea cod). The results showed that, although imperfect and not necessarily fully linear, a link was nevertheless observed. In particular, it was shown that the correlation between fishing effort and fishing mortality was visible for the fisheries catching cod as bycatch (e.g. TR2 and BT2), but less significant for the targeted fishery TR1.

In summary a key weakness of the current cod management plan has been an over-optimistic single-stock short-term forecast with regards to the intermediate year. Although useful in demonstrating the possible outcome if the nominal effort cuts of the effort management regime were translated in full into actual effort cuts (and mean F reductions) the effort management scenario is considered to be unrepresentative of actual outcomes.

In 2012 WGNSSK presented a second options table for cod that, instead of the assumptions of the management plan, used as its basis for the intermediate year a projection of the trend in mean F estimated over recent years. In a similar spirit it would be possible to make use of the MIXFISH data from 2003 to estimate trends in effort in the fleets used by WGMIXFISH and project those effort trends forwards into the intermediate and TAC years.

In-year effort comparison

An alternative to projected effort trends would be to evaluate the uptake levels for TACs and effort ceilings in the intermediate (current) year and compare these with their equivalent over the same period the previous year, as a first rough proxy for the actual fishing pressure in the intermediate year. WGMIXFISH 2011 investigated this possibility but found that only some countries could provide information on within-year quota uptake at short notice.

Value scenario

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 relative catchability of different species by fleets and métiers remained constant going forwards. A consequence of this approach is that effort reductions in fleets (to achieve new partial F s) apply equally to fleets where cod is a major component of the catch and those where it represents a small bycatch component. In 2012 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 but very large reductions in saithe catches.

A scenario examined in the past (Ulrich et al., 2011) weighted the amount of effort a fleet needed to catch each species in its portfolio of catches by the value of landings for that species by that fleet compared to the overall value of landings for that fleet. Because catchability is calculated in F_{cube} as landings/effort the model has effectively adopted new catchabilities. Previously the scenario then assumed the effort necessary to land all quotas was deployed. Having adjusted catchabilities the technique can be matched with other ideas such as conforming to cod scenario targets.

Hindcasting

With data going back to 2003 it is possible to run mixed fisheries projections as they have been performed this year for a total of ten years. It is possible to compare the results from the first eight of those projections to current single species assessment estimates of SSB and F in the corresponding years. Existing and proposed scenarios can be compared for their ability to predict actual outcomes.

5.1.3 Towards mixed-fishery management plans

At present, WGMIXFISH provides annual advice on the implications of single stock management advice in the context of the mixed fisheries of the North Sea. In practice the TAC advice for many of the North Sea demersal stocks is derived from long-term management plans for those stocks. A logical development for the work of the WG would be the explicit incorporation of mixed-fishery effects within long-term management plans. Recent proposals on the reform of the European Union's Common Fisheries Policy (CFP) provide a context for this. Long-term management plans have been an important component of EU fisheries management since the 2002 CFP reform. Public consultation in relation to the recent reform proposals has found very strong support for the implementation of long-term management plans (CEC, 2011a). The current proposals (CEC, 2011b) widen the basis for the use of management plans as follows:

“Multi-annual plans should where possible cover multiple stocks where those stocks are jointly exploited. The multiannual plans should establish the basis for fixing fishing opportunities and quantifiable targets for the sustainable exploitation of stocks and marine ecosystems concerned, defining clear timeframes and safeguard mechanisms for unforeseen developments.”

The proposals also give more detail on the anticipated content of management plans in this context (see Article 11 in CEC, 2011b).

In the North Sea, mixed-fishery effects have been implicated as a contributing factor to the lack of recovery of the cod stock (Bannister, 2004; Hamon *et al.*, 2007; STECF/ICES WKROUNDMP 2011); hence the demersal stocks of the North Sea

would be an obvious candidate for a mixed-fishery management plan of the type anticipated in the CFP reform proposals.

The scientific input to long-term management plans generally involves the evaluation of harvest control rules, the parameters of which are typically derived from simulation studies. Such studies also provide a means of translating the objectives of the plan (e.g. "Achieve MSY") into numeric values, i.e. a target F that is likely to lead to maximum long-term yield. In any move to a mixed-fishery management plan, there would be a need to revisit both the objectives of the plan and the associated harvest control rules. There would also be a need to address the linkages between the different stocks within the plan, i.e. the mixed-fishery interactions.

With regard to the possible objectives of a mixed fishery plan, questions arise as to whether MSY objectives should be set, e.g. as a set of single stock MSY targets, or in more ecological and/or socio-economic terms. Similar questions arise with regard to candidate HCRs, i.e. could TACs be specified on some combined basis with constraints on catches of individual stocks. Experience with similar approaches off Alaska and New Zealand might be instructive here. The issue of how to deal with linkages between stocks might be best addressed by comprehensive simulation/management strategy evaluation studies with full, explicit representation of technical interactions in the way that is possible with the Fcube approach (Ulrich *et al*, 2011).

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 in 2012. One remaining idea is for advice to become an iterative process whereby Fcube is used to test the likelihood of assumptions made in single species short term forecasts, until the basis for the forecasts become consistent over stocks. This in turn implies the mixed fisheries forecasts being imbedded into the WGNSSK meeting. Continued problems over data consistency make this unrealistic in the near term.

6 Conclusions and Recommendations

WGMIXFISH has produced a draft North Sea Mixed Fisheries advice for use by ACOM. This is the first meeting of WGMIXFISH 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. However, problems were encountered because of the close proximity of this WG to that of WGNSSK; advice for some stocks (*Nephrops*) was revised as late as the second last day of WGMIXFISH.

To reduce the burden of data supply to different end users, increase the consistency of data between single species and mixed species analyses and improve the quality and transparency of data supply and aggregation for the single species assessments a single data call sufficient for both WGNSSK and WGMIXFISH was devised for 2012. This has allowed a greater consistency between catch totals supplied to WGMIXFISH and WGNSSK (see section 3.2.2). The ambition that WGMIXFISH data could be obtained through an extraction from InterCatch of the data compiled for WGNSSK was not realised, however, primarily because the level of fleet disaggregation best suited to the mixed fisheries projections were incompatible with national sampling schemes and the need to keep the number of fleet-metier combinations used in the ICES database (InterCatch) to a manageable number. Separate files containing vessel length specific data had to be requested and (as in 2010 and 2011), late, incomplete or data

with errors meant the dataset for the Fcube software was only completed part way through the meeting.

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

To increase trust in the results from alternative scenarios it is considered important for the Fcube code to reproduce as exactly as possible the single species projections in the first instance. At WGMIXFISH_2010 producing the 'baseline' run exposed detailed differences in short term forecast methodology between species that are unrelated to restrictions imposed by different software packages. The WG notes there remains no agreed standard approach to e.g. scaling a mean selection pattern to terminal year mean F. Reproducing this year's single-stock advice led to the discovery of a mistake in the computation of the draft whiting advice, which will be amended. As also shown in previous years, running mixed fisheries projections can provide a valuable quality assurance for the single species forecasts.

The use of multiple Fcube scenarios leads to a very data rich set of results. The move to give single species advice according to a single criteria (management plan if it exists, FMSY framework otherwise) helps reduce the level of complexity and is welcomed by WGMIXFISH. 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.

The effect of fleet behaviours on

- The TAC set for 2013 (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 2014,

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

Results across scenarios are similar for the intermediate year. This overall result can be attributed to a number of factors

- Assumptions for the intermediate year in the single species cod forecast more in line with an assumption of status quo effort.
- Data provided to WGMIXFISH showing reduced catchabilities on cod by significant cod catching fleets.
- Increases in assessed cod SSB in recent years.
- The introduction of a long term management plan for whiting.

Unlike the forecasts performed in 2010 and 2011 the **Ef_Mgt** scenario intermediate year landings as not restrictive as those from the **min** scenario. Data supplied to WGMIXFISH as well as other expert groups also suggest that effort in fleets subject to the EU effort regime have not to date reduced effort by the amounts expected from a straightforward interpretation of the effort regulations. The working group would therefore like to investigate at its August meeting the possibility of using within year effort uptake as an alternative to the **Ef_Mgt** scenario or extrapolation of recorded trends in fleets efforts (see section 5.1.2)

The advised single stock TACs for 2013 cannot be said to be consistent given the current landings compositions of North Sea fleets as can be seen from Figure 4.2.2.2.4. If the TAC for cod is assumed to limit the activity of fleets (**cod** scenario) the forecasts predict considerable underutilisation of other TACs, particularly those for haddock, plaice and saithe. The **Ef_Mgt** scenario is predicted to lead to a small overshoot of cod landings but considerably reduces the underutilisation of saithe quota compared to the **cod** scenario. While the “cod” scenario affects almost all metiers, thus sharing the burden of F reduction across most fleets and countries, the **Ef_Mgt** scenario affects uniquely the trawl metiers, which catch the bulk of cod, haddock and whiting landings. The **Ef_Mgt** scenario leads to greater underutilisation of whiting quota compared to the **cod** scenario.

Results showing the effort required for different fleets to fully utilise the different quotas available to them (Figure 4.2.2.1.2) suggest that for a number of significant fleets cod is not the limiting stock in 2012. Following the TAC constraint assumed in the single species forecast leads to haddock becoming the limiting stock for the majority of fleets. This does not remain the case in the TAC year (2013), however, as the requirements of the cod management plan again make cod the limiting stock in most fleets (Figure 4.2.2.2.3).

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Table 1.2.1, Council regulations introducing and modifying fishing effort (days at sea) allowances in EU fisheries.

Year of application	Regulation
2003	(EC) No 2341/2002–Annex XVII
2004	(EC) No 2287/2003–Annex V
2005	(EC) No 27/2005–Annex IVa
2006	(EC) No 51/2006–Annex IIa
2007	(EC) No 41/2007–Annex IIa
2008	(EC) No 40/2008–Annex IIa
2009	(EC) No 43/2009–Annex IIa
2010	(EU) No 23/2010–Annex IIa
2011	(EU) No 57/2011–Annex IIa
2012	(EU) No 43/2012–Annex IIa (EU) No 44/2012–Annex IIa

Table 1.2.2, Effort reductions in 2012 compared to 2011 and 2013 compared to 2012 by EU regulated fleet segment.

Gear Description	Code	% effort reduction in 2012 compared to 2011	% effort reduction in 2013 compared to 2012
Bottom trawls and seines $\geq 100\text{mm}$	TR1	18.2%	22.2%
Bottom trawls and seines $\geq 70\text{mm}$ & $< 100\text{mm}$	TR2	18.2%	22.2%
Bottom trawls and seines $\geq 16\text{mm}$ & $< 32\text{mm}$	TR3		0%
Beam trawls $\geq 120\text{mm}$	BT1		0%
Beam trawls $\geq 80\text{mm}$ & $< 120\text{mm}$	BT2	Between 0% and 9,85% for some countries	0%
Gill nets and entangling nets, excluding trammel nets	GN1		0%
Trammel nets	TN1		0%
Longlines	LL1		0%
Not regulated gear	None		0%

Table 3.1.1.1: Summary of the 2013 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	Management Plan / MSY approach for 2013		SSB 2014	Rational
	TAC	F / Harvest ratio		
Cod IIIa-IV-VIIId	< 25 441 t	0.27	103 300 t	MP
Haddock IIIa-IV	< 47 811 t HC	0.29	203 000 t	MP
Plaice IV	< 97 070 t	0.27	666 300 t	MP
Sole IV	< 13 800 t	0.27	48 700 t	MP
Saithe IIIa-IV-VI	< 100 684 t	0.26	252 200 t	MP
Whiting IV-VIIId	< 26 000 t	0.225	346 000 t	MP (modified) ¹
<i>Nephrops</i> in Botney Gut (FU 5)	< 1 000 t	n/a	n/a	MSY approach
<i>Nephrops</i> in Farn Deep (FU 6)	< 1 400 t	9.0	n/a	MSY approach
<i>Nephrops</i> Fladen Ground (FU 7)	< 10 100 t	10.3	n/a	MSY approach
<i>Nephrops</i> in Firth of Forth (FU 8)	< 1 400 t	17.1	n/a	MSY approach
<i>Nephrops</i> in Moray Firth (FU 9)	< 950 t	11.8	n/a	MSY approach
<i>Nephrops</i> in Noup (FU 10)	< 150 t	n/a	n/a	MSY approach
<i>Nephrops</i> in Norwegian Deep (FU 32)	< 1000 t	n/a	n/a	MSY approach
<i>Nephrops</i> of Horn's Reef (FU 33)	< 1 500 t	n/a	n/a	MSY approach
<i>Nephrops</i> in Devil's Hole (FU 34)	< 600 t	n/a	n/a	MSY approach
<i>Nephrops</i> in Other rectangles (NEPOTH)	< 819 t*	n/a	n/a	

* Value adopted from no change in landings NEPOTH for 2011 minus FU 34 landings

¹ Advice used management plan target F rescaled by the amount historical F results had been rescaled on average by a newly introduced assessment model.

Table 3.2.2.1: Métiers consistent with the cod long term management plan and AER database.

Gear	Mesh Size	fleet	Métier
Gillnet			GN1
Pots		Static	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		BT2
	90-99		
	80_89		
Dredge		Dredge	OTH

Table 3.2.2.2: Final fleet and métier categories used in the mixed fishery analysis. 4, 3AN and 7D refer to the area.

fleet	metier	fleet	metier	fleet	metier
BE_Beam<24	BT2.4	EN_Beam	BT2.4	NL_Beam<24	BT2.4
	OTH		OTH		OTH
BE_Beam>=24	BT1.4	EN_FDF	OTH	NL_Beam>=40	BT2.4
	BT2.4		TR1.4		OTH
	OTH	EN_Otter<24	OTH	NL_Beam24-40	BT2.4
BE_Otter	OTH		TR1.4		OTH
	TR2.4		TR2.4	NL_Otter	OTH
DK_Beam	BT1.4	EN_Otter>=40	OTH		TR1.4
	OTH		TR1.4		TR2.4
DK_FDF	OTH	EN_Otter24-40	OTH		TR2.7D
	TR1.3AN		TR1.4	NL_Static	GN1.4
	TR1.4		TR2.4		OTH
DK_OTH	demhc.3AN	EN_U10	demhc.4	NO_Otter<40	OTH
	OTH		GN1.4		otter.4
DK_Otter<24	OTH		OTH	NO_Otter>=40	otter.4
	TR1.4		TR2.4	NO_Pelagic	pelagic.4
	TR2.3AN	FR_Nets	GT1.4	NO_Static	GN1.4
	TR2.4		OTH		LL1.4
DK_Otter24-40	OTH	FR_Otter>=40	OTH	OTH_OTH	OTH
	TR1.4		TR1.4	SC_FDF	TR1.4
	TR2.4	FR_Otter10-40	TR2.4	SC_Otter<24	TR1.4
DK_Pelagic	OTH		TR2.7D		TR2.4
	pelagic.4	GE_Beam>=24	BT2.4	SC_Otter>=24	OTH
DK_Seine	TR1.3AN	GE_Otter<24	OTH		TR1.4
	TR1.4		TR2.4		TR2.4
DK_Static	GN1.3AN	GE_Otter>=40	OTH	SC_Static	OTH
	GN1.4		TR1.4		pots.4
	OTH	GE_Otter24-40	OTH	SC_U10_OTB	TR1.4
			TR1.4		TR2.4
			TR2.4		
		GE_Static	GN1.4		

Table 4.2.1.1: Baseline run outputs from the Fcube FLR package.

Management plan		COD	HAD	PLE	POK	SOL	WHG
2012	Fbar	0.5	0.2	0.23	0.24	0.3	0.17
	FmultVsF11	0.87	0.66	1	0.85	1	1
	landings	40468	41575	78501	87550	14969	19436
	ssb	62658	269855	589341	216941	46654	306738
2013	Fbar	0.28	0.29	0.29	0.26	0.27	0.25
	FmultVsF11	0.5	0.97	1.2	0.92	0.9	1.42
	landings	25441	47811	84400	100682	13850	27242
	ssb	72215	253352	628143	235149	47145	312484
2014	ssb	94531	202475	666278	252159	48665	344880

Management plan		NEP5	NEP6	NEP7	NEP8	NEP9	NEP10	NEP32	NEP33	NEPOTH
2012	Harvest rate		0.16	0.1	0.3	0.22				
	FmultVsF11		1.28	1.28	1.28	1.28				
	landings	1353	2659	9704	2425	1787	89	507	1531	1318
2013	Harvest rate		0.09	0.1	0.17	0.12				
	FmultVsF11		0.72	1.34	0.74	0.67				
	landings	1000	1493	10116	1388	938	150	1000	1500	819

Table 4.2.1.2: Comparison between baseline run and ICES advice for finfish. Figures for 2012 compare results from the baseline run - that use the same assumptions for F in the intermediate year as the forecasts leading to ICES advice – to the ICES intermediate year results.

Management plan		COD	HAD	PLE	POK	SOL	WHG
2012	landings						
	Baseline	40468	41575	78501	87550	14969	19436
	ICES	40300	42000	78 501	87600	15000	20200
	% difference	0.4 %	-1.0 %	0.0 %	-0.1 %	-0.2 %	-3.78 %
2013	landings						
	Baseline	25441	47811	97072	100682	13850	24945
	ICES	25441	47811	97070	100684	13800	26000
	% difference	0.0 %	0.0 %	0.0 %	0.0 %	0.4 %	-4%

Table 4.2.1.3: 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 policy paper category 3 (-25%). 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.

Management plan	NEP5	NEP6	NEP7	NEP8	NEP9	NEP10	NEP32	NEP33	NEP34	NEPOTH
2013 landings										
Baseline	1000	1493	10116	1388	938	80	900	910	600	819
ICES	1000	1400	10100	1400	950	150	1000	1500	600	819
% difference	0.0 %	6.2 %	0.2 %	-0.9 %	-1.3 %	-87.5 %	-11.1 %	-64.8 %	0.0 %	0.0 %

Table 4.2.2.1: Results of running Fcube scenarios on intermediate year (2012). Comparison of the actual TAC, baseline landings according to the single-stock projection, and potential landings in the various scenarios.

	COD	HAD	PLE	POK	SOL	WHG					
TAC2012	31 801	41 575	84 410	87 550	16 200	23 689					
baseline	40 468	41 575	78 501	87 550	14 969	19 436					
max	50 432	79 619	102 663	113 471	16 206	21 471					
min	29 266	41 575	59 840	65 094	10 222	11 235					
cod	40 468	59 162	84 247	91 805	13 648	16 399					
sq_E	43 986	64 849	92 735	100 645	14 969	18 140					
Ef_Mgt	36 616	50 750	76 610	91 361	13 111	13 453					
* Whiting TAC for area IV only											
	NEP10	NEP32	NEP33	NEP34	NEP5	NEP6	NEP7	NEP8	NEP9	NEPOTH	
TAC2012	89	507	1 531	556	1 353	2 659	9 704	2 425	1 787	1 318	
baseline	89	507	1 531	556	1 353	2 659	9 704	2 425	1 787	1 318	
max	90	516	1 557	566	1 376	2 723	9 843	2 505	1 787	1 340	
min	42	239	721	262	637	1 261	4 559	1 160	828	621	
cod	62	356	1 074	390	949	1 879	6 791	1 728	1 233	925	
sq_E	69	396	1 196	435	1 057	2 092	7 561	1 924	1 372	1 029	
Ef_Mgt	47	269	813	295	718	1 472	5 076	1 330	924	700	

Table 4.2.2.3. Results of Final Fcube runs.

	year	scenario	COD	HAD	PLE	POK	SOL	WHG	NEP10	NEP32	NEP33	NEP34	NEP5	NEP6	NEP7	NEP8	NEP9	NEPOTH	NEP tot			
landings	2012	baseline	40468	41575	78501	87550	14969	19436	89	507	1531	556	1353	2659	9704	2425	1787	1318	21929			
Fbar	2011	baseline	0.57	0.30	0.23	0.28	0.30	0.17						0.12	0.08	0.23	0.17					
	2012	baseline	0.5	0.2	0.23	0.24	0.3	0.17	-	-	-	-	-	0.16	0.1	0.3	0.22	-	-	A		
	2013	baseline	0.28	0.29	0.27	0.26	0.27	0.22	-	-	-	-	-	0.09	0.1	0.17	0.12	-	-			
FmultVsF11	2012	baseline	0.87	0.66	1	0.85	1	1	-	-	-	-	-	1.28	1.28	1.28	1.28	-	-			
		cod	0.87	0.98	1.08	0.9	0.9	0.83	-	-	-	-	-	0.91	0.9	0.92	0.89	-	-			
		Ef_Mgt	0.77	0.82	0.97	0.89	0.86	0.68	-	-	-	-	-	0.71	0.67	0.7	0.66	-	-			
		max	1.17	1.4	1.35	1.15	1.1	1.11	-	-	-	-	-	1.32	1.3	1.33	1.28	-	-			
		min	0.59	0.66	0.74	0.61	0.65	0.56	-	-	-	-	-	0.61	0.6	0.61	0.59	-	-			
		sq_E	0.97	1.09	1.2	1	1	0.93	-	-	-	-	-	1.01	1	1.02	0.99	-	-			
	2013	baseline	0.5	0.97	1.18	0.92	0.9	1.29	-	-	-	-	-	0.72	1.34	0.74	0.67	-	-	B		
		cod	0.5	0.56	0.62	0.51	0.51	0.48	-	-	-	-	-	0.52	0.51	0.52	0.5	-	-			
		Ef_Mgt	0.57	0.55	0.8	0.78	0.79	0.42	-	-	-	-	-	0.4	0.34	0.38	0.34	-	-			
		max	1.35	1.52	1.67	1.38	1.39	1.29	-	-	-	-	-	1.4	1.39	1.42	1.37	-	-			
		min	0.43	0.48	0.53	0.44	0.44	0.41	-	-	-	-	-	0.44	0.44	0.45	0.43	-	-			
		sq_E	0.97	1.09	1.2	1	1	0.93	-	-	-	-	-	1.01	1	1.02	0.99	-	-			
landings	2012	baseline	40468	41575	78501	87550	14969	19436	89	507	1531	556	1353	2659	9704	2425	1787	1318	21929			
		cod	40468	59162	84247	91805	13648	16399	62	356	1074	390	949	1879	6791	1728	1233	925	15387			
		Ef_Mgt	36616	50750	76610	91361	13111	13453	47	269	813	295	718	1472	5076	1330	924	700	11644			
		max	50432	79619	102663	113471	16206	21471	90	516	1557	566	1376	2723	9843	2505	1787	1340	22303			
		min	29266	41575	59840	65094	10222	11235	42	239	721	262	637	1261	4559	1160	828	621	10330			
		sq_E	43986	64849	92735	100645	14969	18140	69	396	1196	435	1057	2092	7561	1924	1372	1029	17131			
	2013	baseline	25441	47811	97072	100682	13850	24945	150	1000	1500	600	1000	1493	10116	1388	938	819	19004	C		
		cod	25441	26404	52270	58861	8565	9915	33	188	567	206	501	1071	3869	984	702	488	8609			
		Ef_Mgt	29778	27134	68415	86417	12863	8966	23	129	390	142	345	835	2537	723	466	336	5926			
		max	49193	55686	121438	130507	19432	24626	89	510	1539	559	1360	2907	10506	2673	1907	1324	23374			
		min	25441	25261	48690	55095	7920	8823	28	161	486	177	429	918	3319	844	602	418	7382			
		sq_E	42207	46419	94313	104000	15163	18558	64	367	1108	402	978	2092	7561	1924	1372	953	16821			
Ld_MgtPlan	2013	cod	25441	44733	97071	100682	13770	25421	150	1000	1500	600	1000	1493	10116	1388	938	819	19004			
		Ef_Mgt	25441	46922	97072	100682	13770	25884	150	1000	1500	600	1000	1493	10116	1388	938	819	19004			
		max	25441	39466	97072	100682	14650	24626	150	1000	1500	600	1000	1493	10116	1388	938	819	19004			
		min	25441	47811	97071	100682	13770	26234	150	1000	1500	600	1000	1493	10116	1388	938	819	19004			
		sq_E	25441	43260	97072	100682	13850	25148	150	1000	1500	600	1000	1493	10116	1388	938	819	19004	D		
ssb	2012	baseline	62658	269855	589341	216941	46654	306738														
		2013	baseline	72215	253352	628143	235149	47145	312484													
		2014	baseline	94531	202475	666278	252159	48665	347890													
	ssb	2013	cod	72215	231312	618855	231394	48513	316515													
			Ef_Mgt	76747	241833	631205	231786	49070	320426													
			max	60727	205904	589230	212379	45864	309783													
		2014	min	85519	253352	658453	255076	52068	323373													
			sq_E	68119	224223	605172	223613	47145	314204													
			cod	94531	206802	724294	285675	55522	370219													
	ssb_MgtPlan	2014	Ef_Mgt	95618	216586	715749	261176	51645	374022													
			max	49729	144953	574735	200147	41612	346479													
			min	113955	230664	785088	316284	59816	376138													
ssb_MgtPlan	2014	sq_E	67965	174744	638905	236154	47310	357404														
		cod	94531	183990	653443	247913	50141	349993														
		Ef_Mgt	101147	191917	670516	248356	50708	352032														
		max	77780	164837	612673	226390	46533	346479														
		min	113955	202475	708338	274659	53762	353566														
ssb_MgtPlan	2014	sq_E	88554	178647	634579	239112	48665	348787														

Share of Landings and Discards compare to single-species analyses

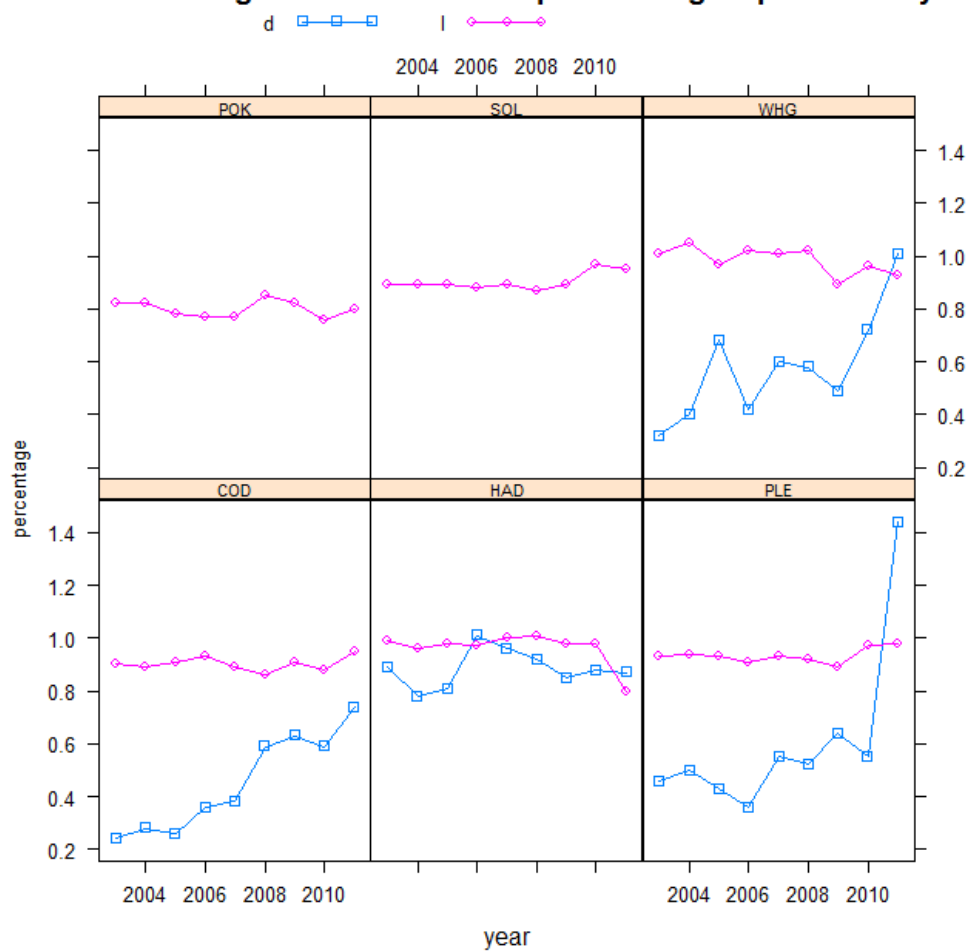


Figure 3.2.2.1. Ratio between the sum of landings and discards across fleets used in the MIXFISH analysis and the landings and discards estimated by the WGNSSK stock assessments.

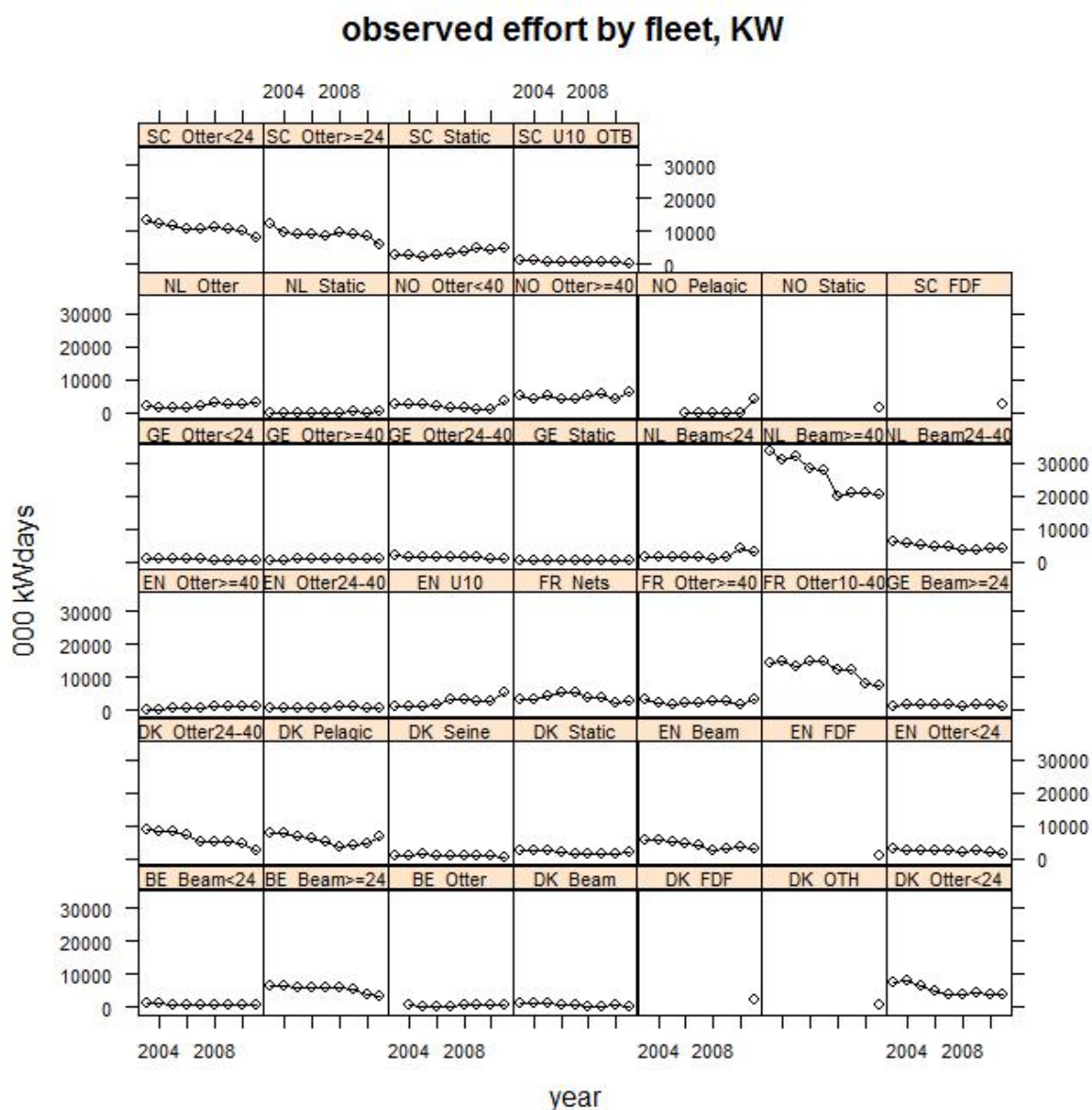


Figure 3.2.3.1 – Effort by fleet and year for the North Sea demersal fleets, in '000 KWdays. Data for French fleets from 2009 were not available and for Fcube projections French fleet values were assumed the same in 2009 as values from 2008.

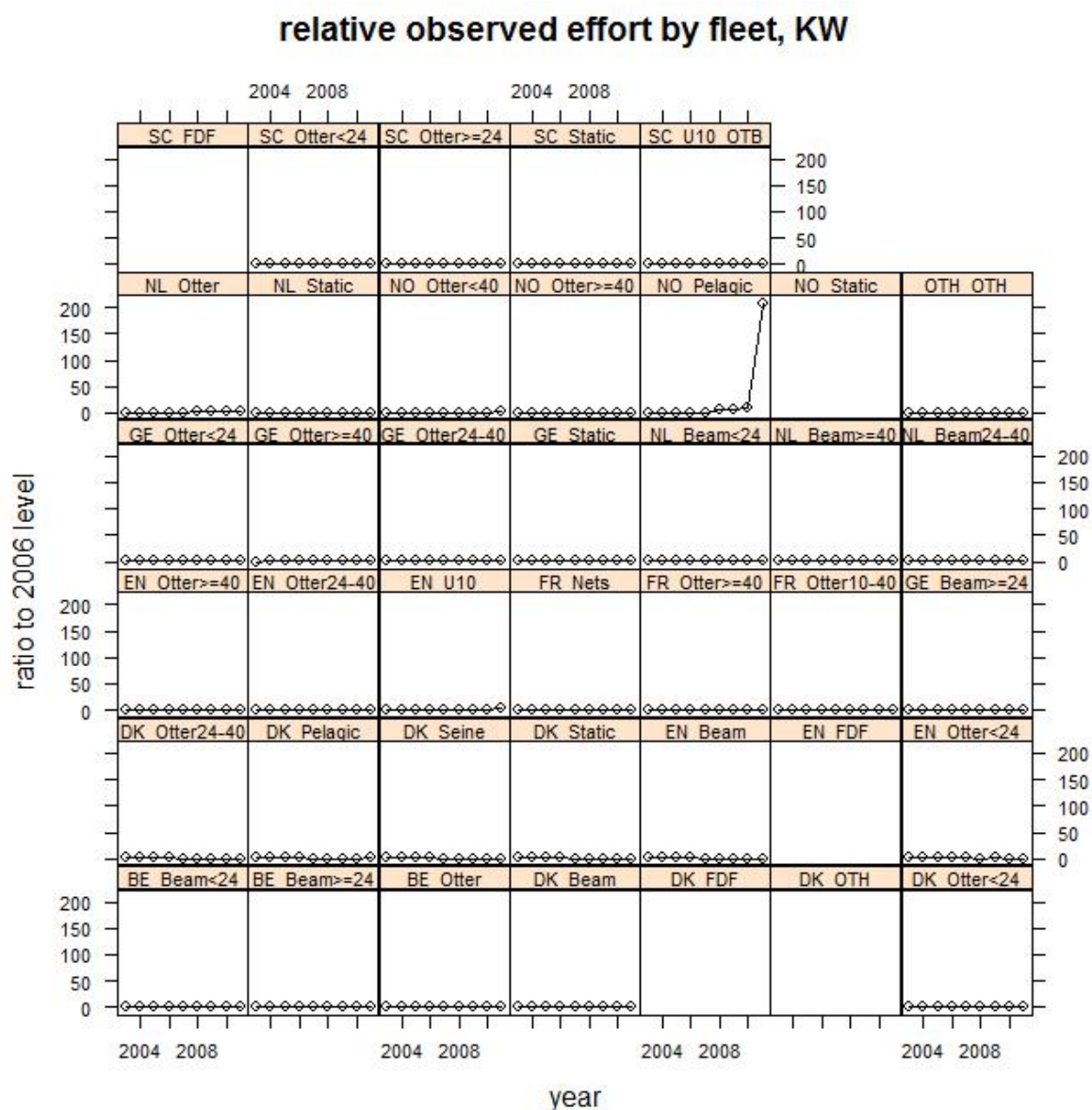


Figure 3.2.3.2 – Relative trends in effort (KW Days) by fleet and year for the North Sea demersal fleets. Data for French fleets from 2009 was not available and for Fcube projections French fleet values were assumed the same in 2009 as values from 2008.



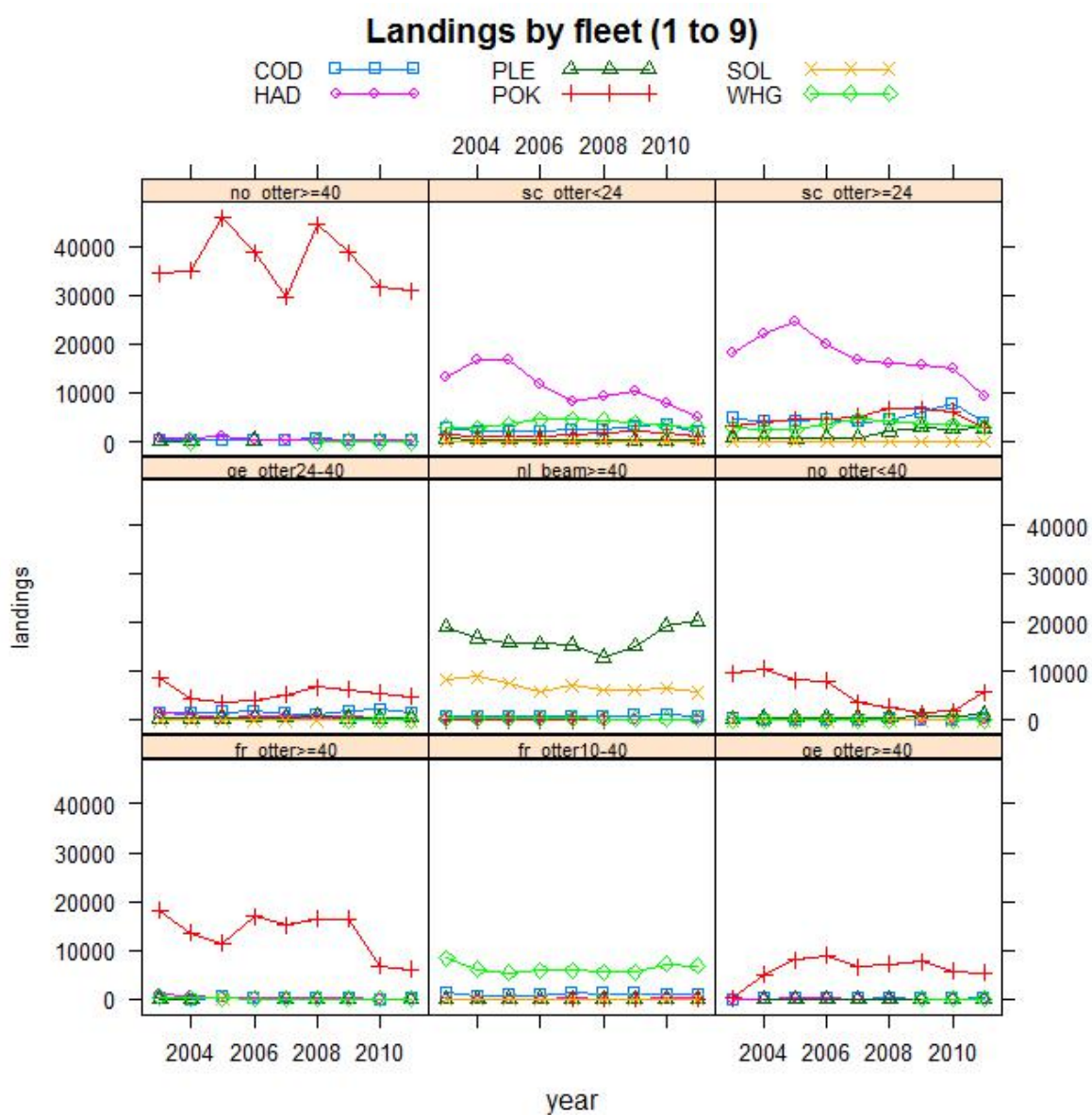


Figure 3.2.3.4. Landings by fleet, stock and year. Fleets are shown in decreasing groups of total landings and with different scales.

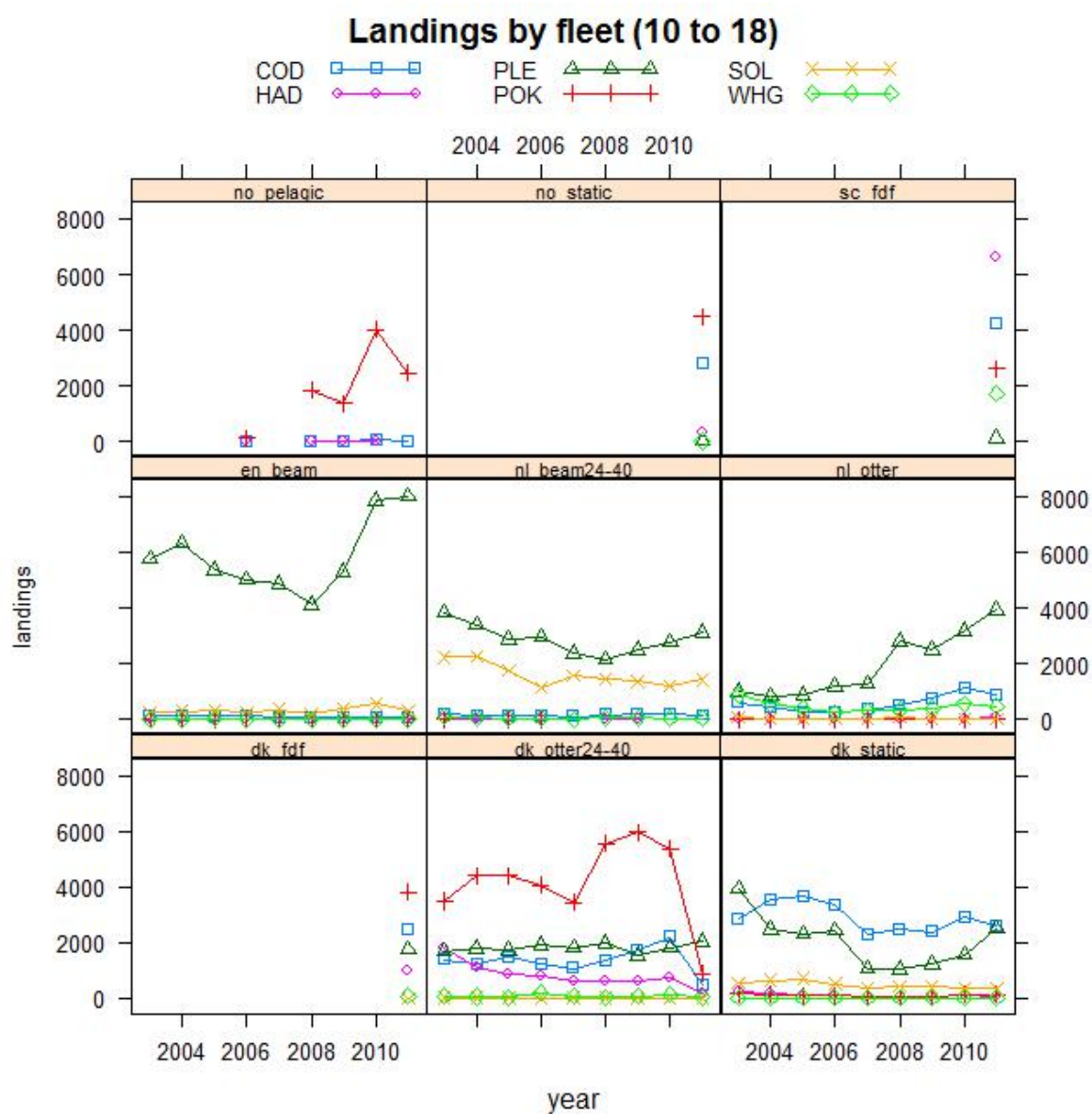


Figure 3.2.3.4 (cont). Landings by fleet, stock and year. Fleets are shown in decreasing groups of total landings and with different scales.

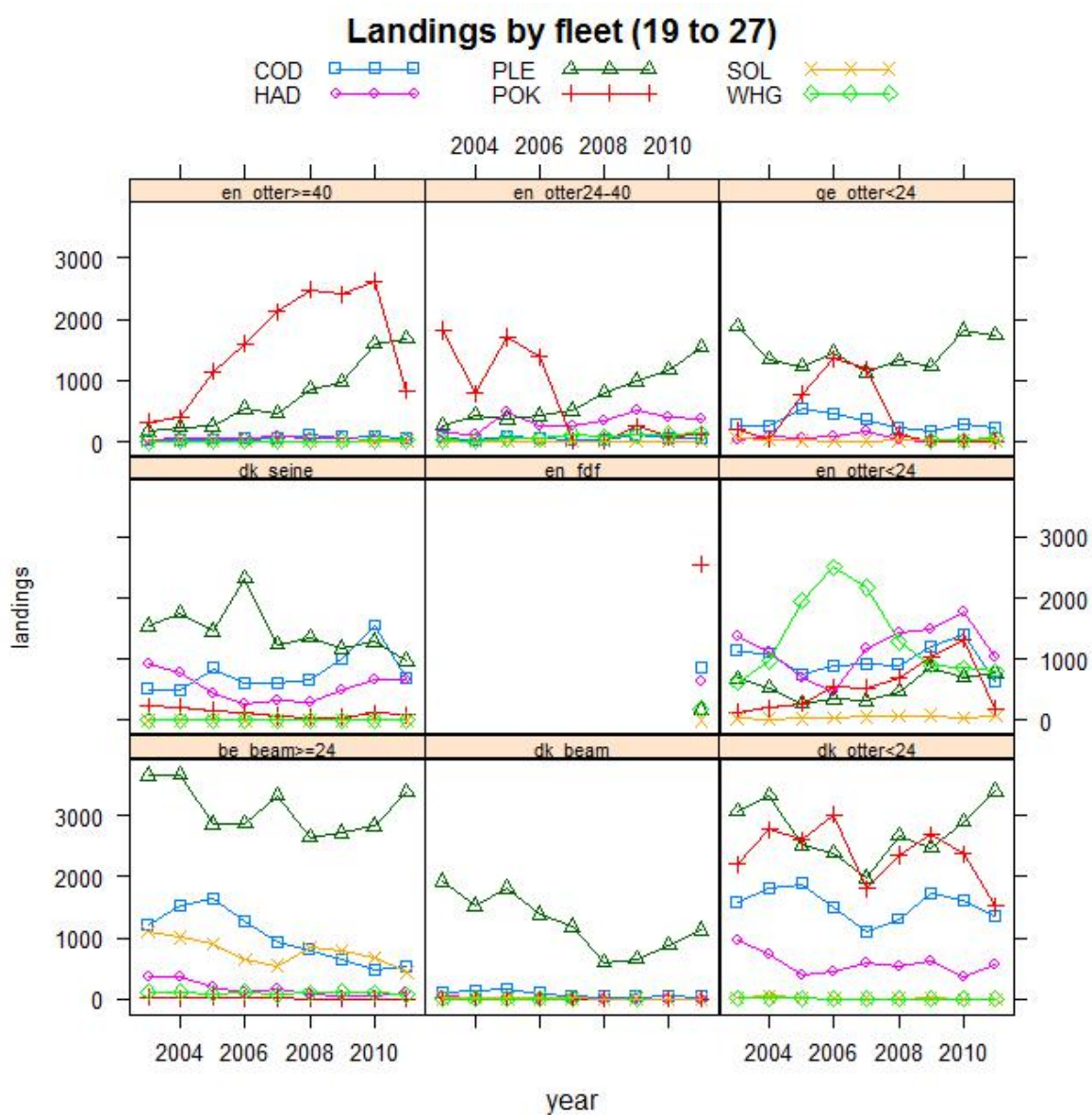


Figure 3.2.3.4 (cont). Landings by fleet, stock and year. Fleets are shown in decreasing groups of total landings and with different scales

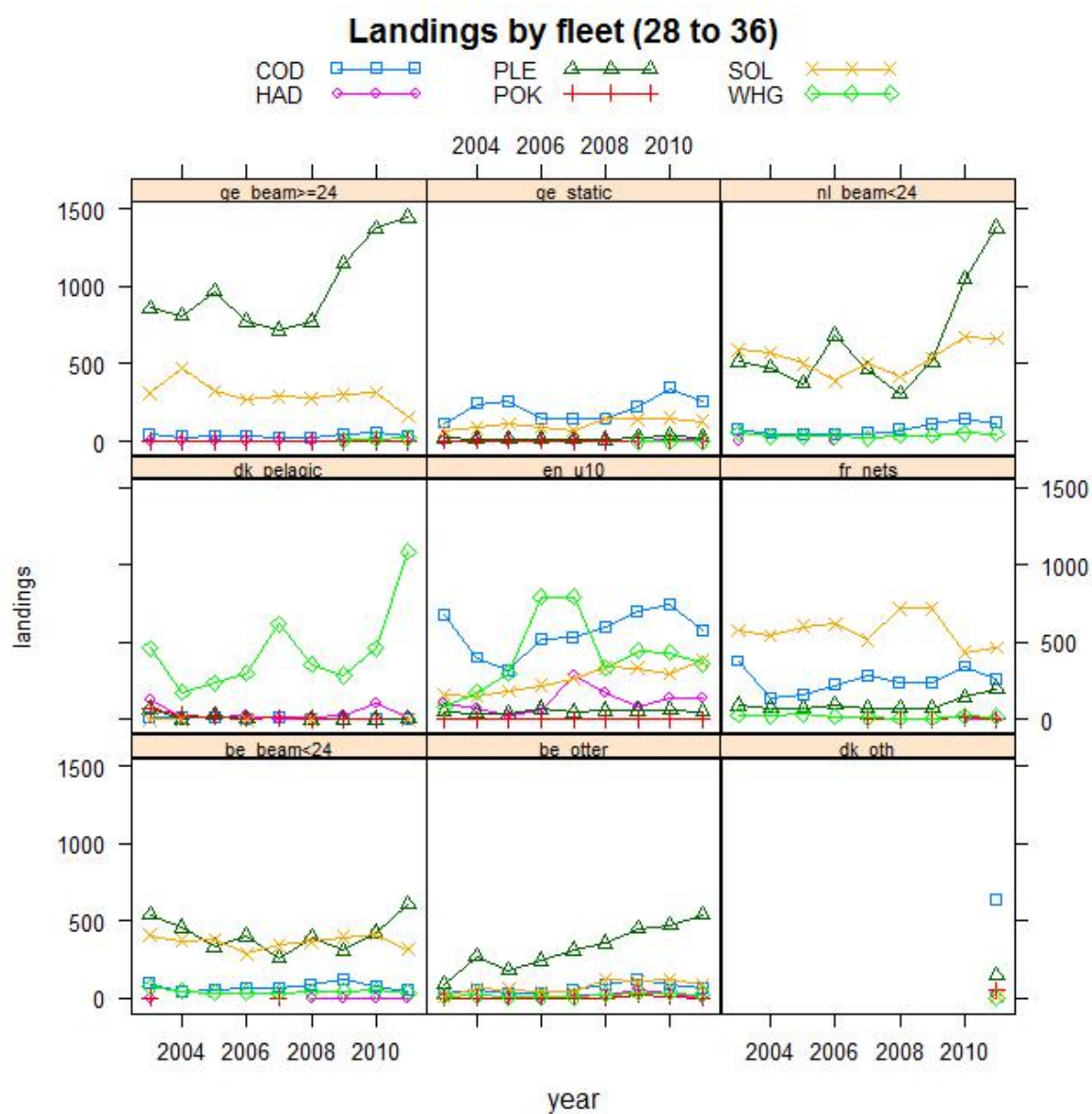


Figure 3.2.3.4 (cont). Landings by fleet, stock and year. Fleets are shown in decreasing groups of total landings and with different scales

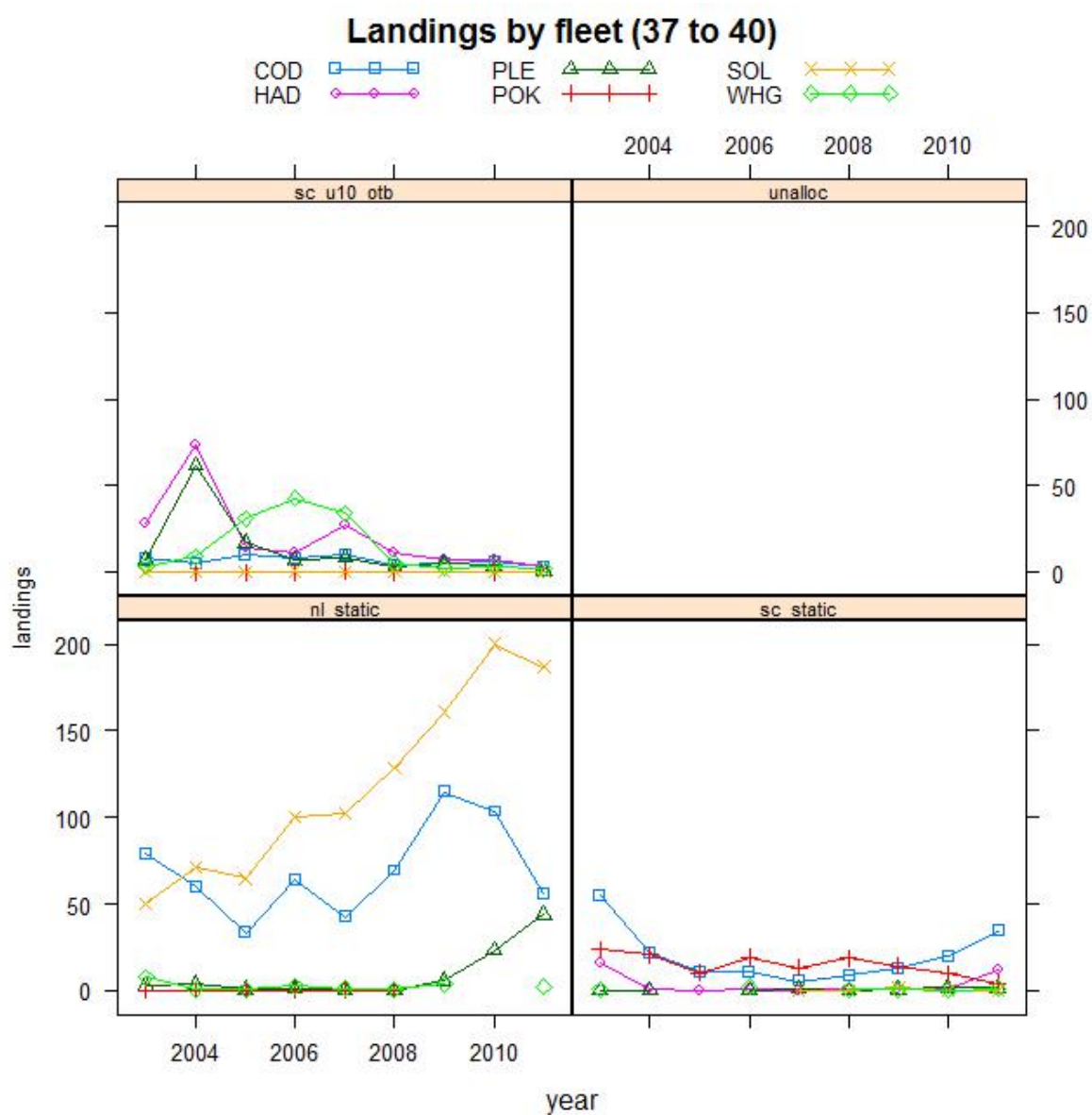


Figure 3.2.3.4 (cont). Landings by fleet, stock and year. Fleets are shown in decreasing groups of total landings and with different scales.

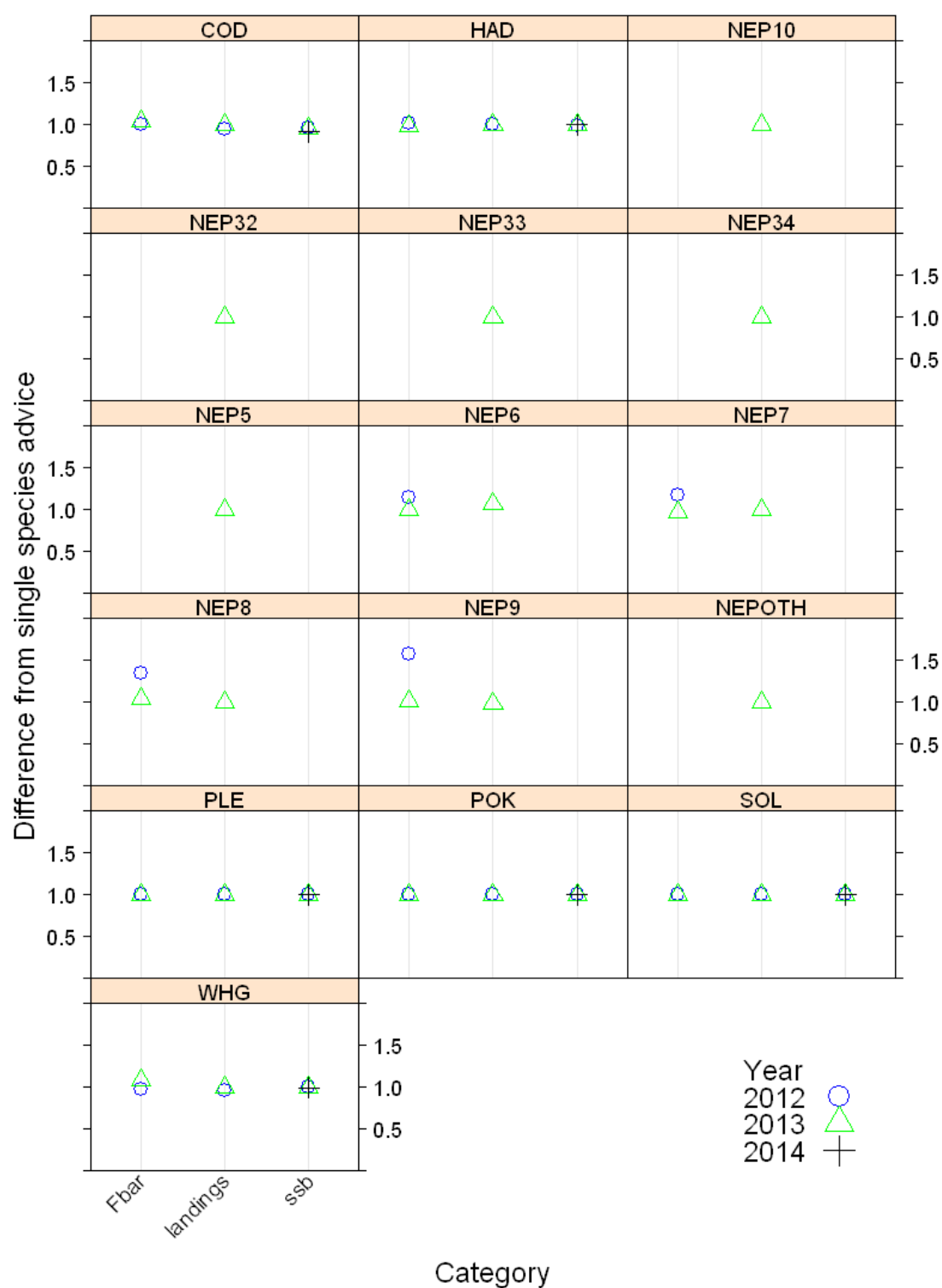


Figure 4.2.1.1 Difference in Fcube outcome from Single Species advice for Fbar (2012-2013), landings (2012-2013) and SSB (2012-2014). For *Nephrops* the harvest ratio (Fbar proxy) in the intermediate year (2012) may be quite different between the single species and the FCube baseline because the single species forecast uses an average harvest ratio over the last 3 years whereas the FCube value is based on a share of the 2012 TAC applied to the abundance estimates in 2012 for that FU. This does not have a material impact on single species or FCube TAC year Fbar or TAC advice.

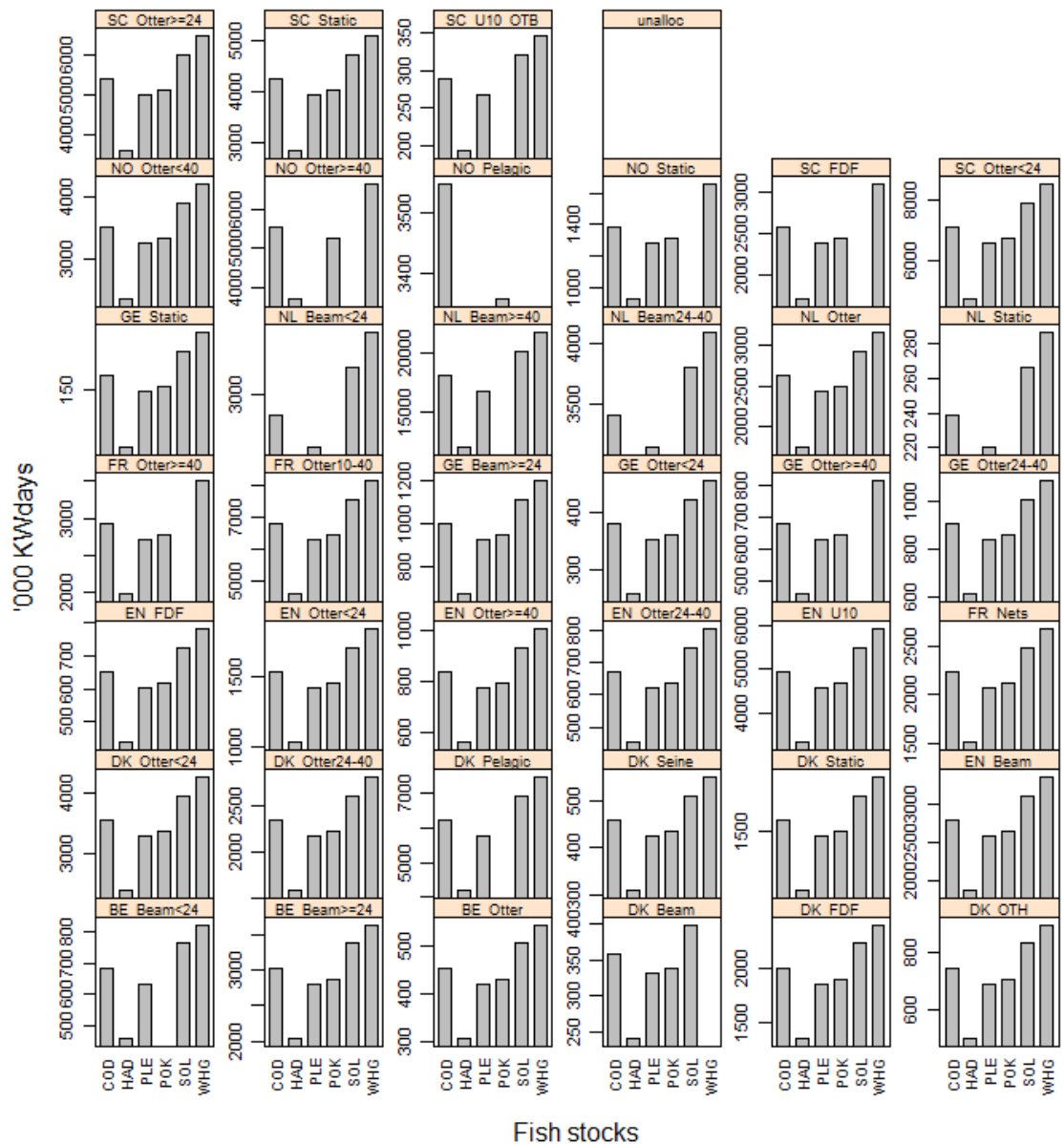


Figure 4.2.2.1.1. Intermediate year results. Single-Stock Target F in 2012; Fcube estimates of effort by fleet corresponding to the individual "quota share" (or partial target F) by stock in 2012. Finfish species.

2012 Effort corresponding to single-stock quota share, nep stocks

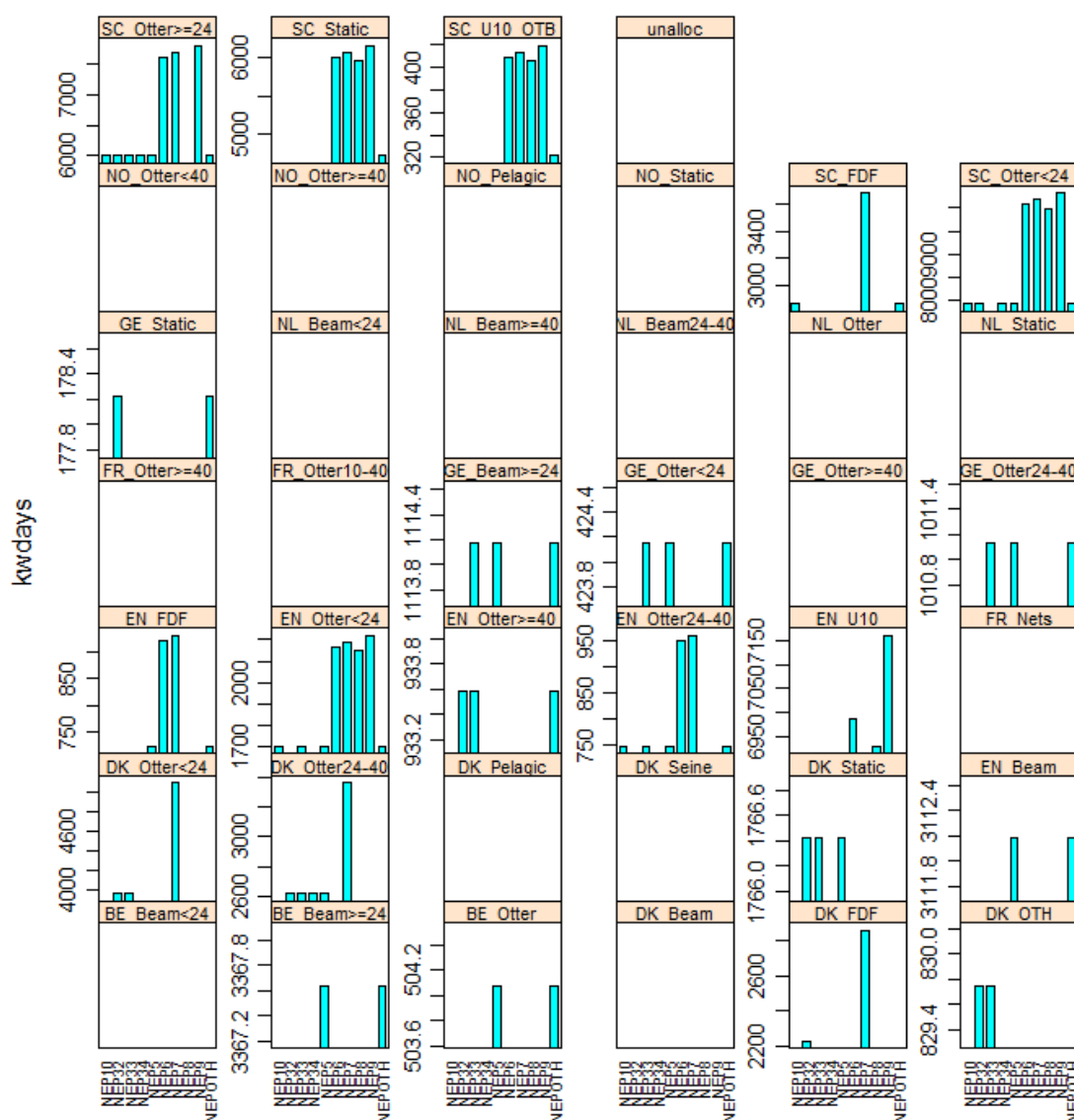


Figure 4.2.2.1.2. Intermediate year results. Single-Stock Target F in 2012; Fcube estimates of effort by fleet corresponding to the individual "quota share" (or partial target F) by stock in 2012 when applying the five scenarios. *Nephrops* FUs.

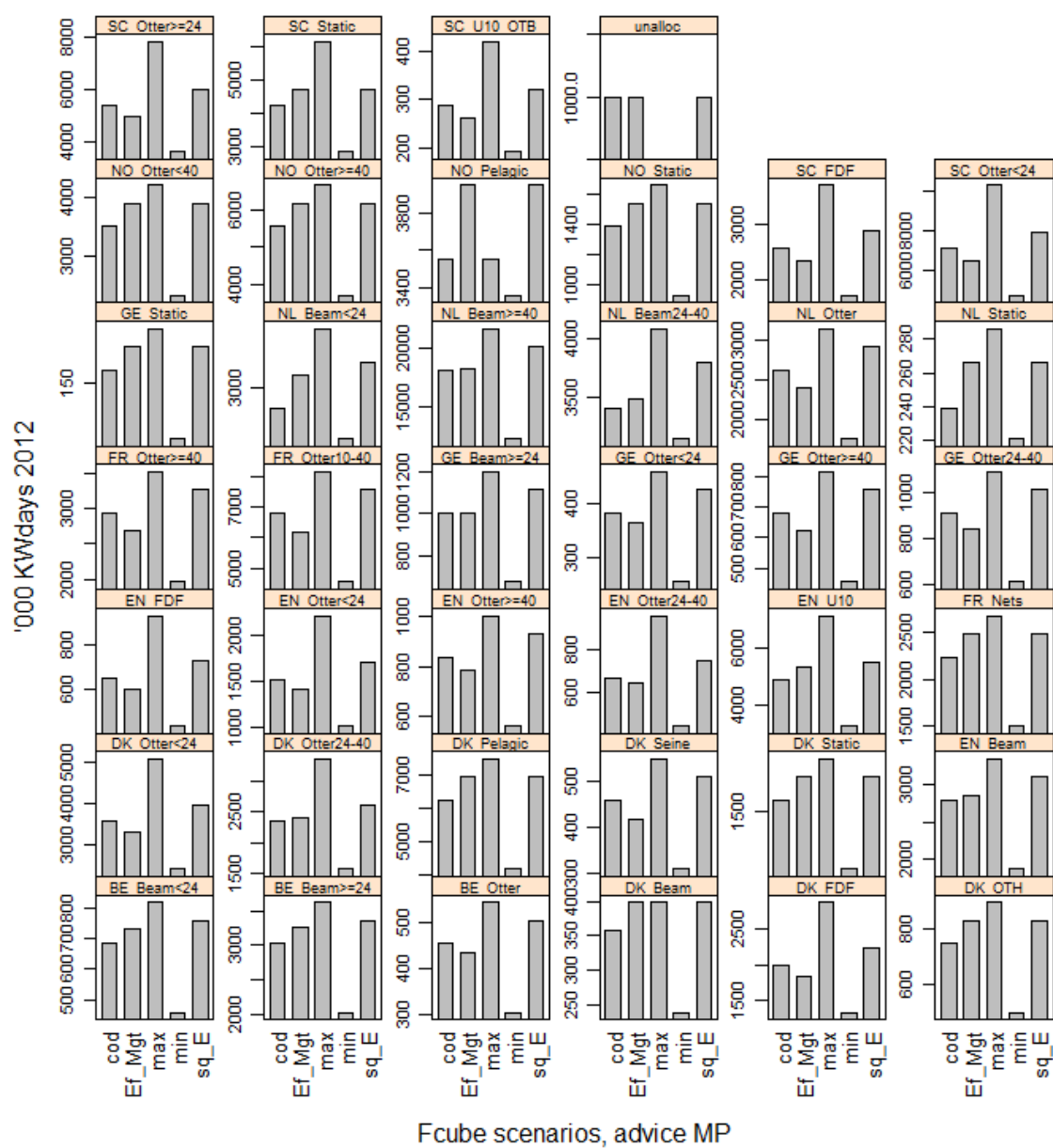


Figure 4.2.2.1.3. Intermediate year results. Fcube estimates of effort by fleet implied by the Fcube scenarios in the intermediate year (2012).

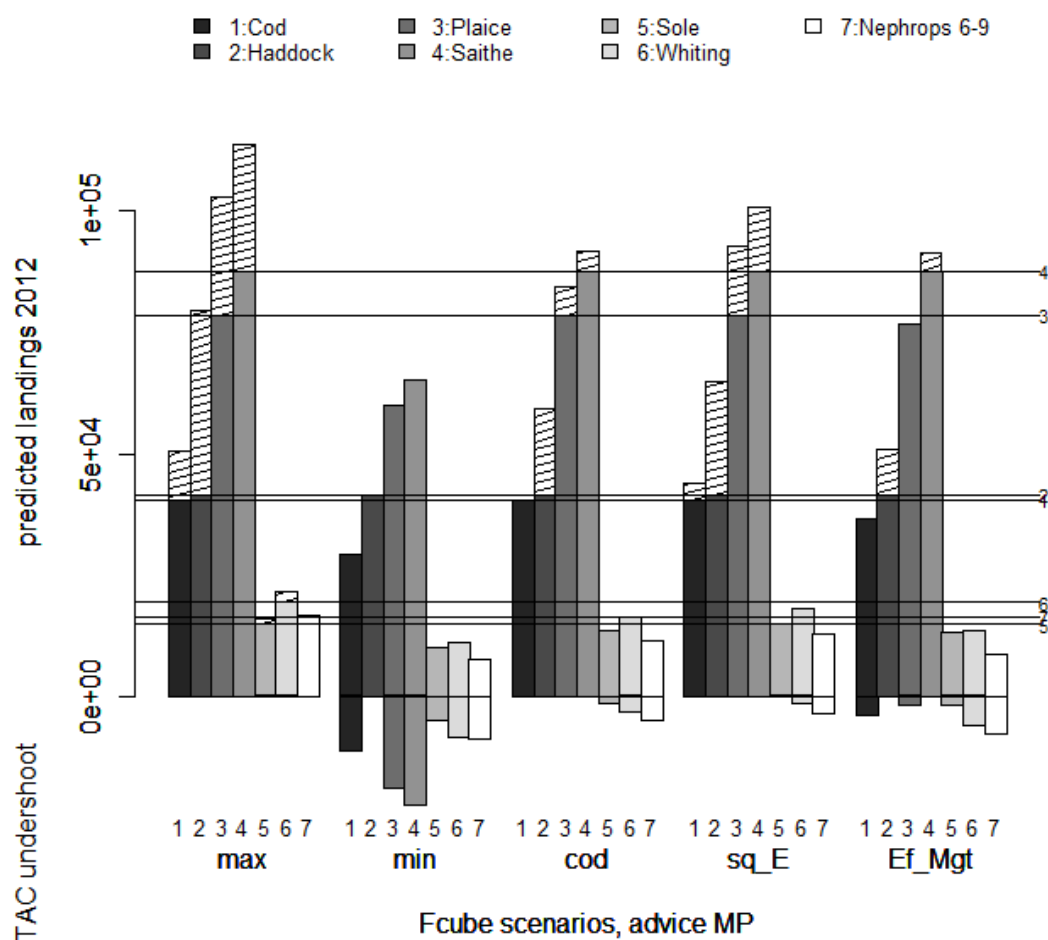


Figure 4.2.2.1.4. Intermediate year results. Fcube estimates of potential landings by stock for the Fcube scenarios in the intermediate year (2012). Numbered horizontal lines correspond to the intermediate year assumptions for landings from the single species stock assessments (as reproduced by the 'baseline run'). Bars below the value of zero show the scale of undershoot (compared to the intermediate year assumptions for landings from the single species stock assessments) in cases where landings are predicted to be lower when applying the scenario.

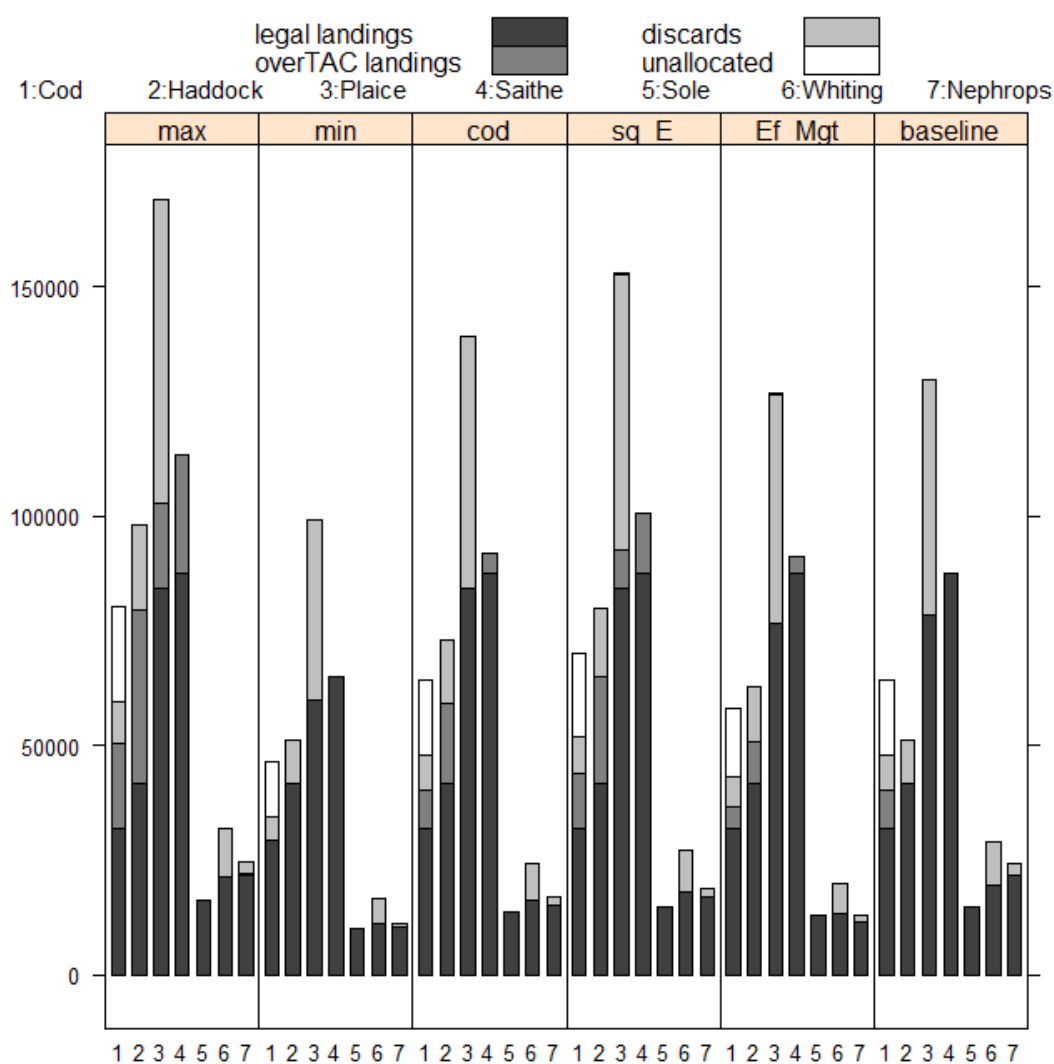


Figure 4.2.2.1.5. Intermediate year results. Total estimated catches by stock and Fcube scenario in 2012. Bars represent from bottom to top: potential landings (as estimated from previous ratios of landings vs. discards) up to the actual 2012 TAC; potential landings (as estimated from previous ratios of landings vs. discards) above the actual 2012 TAC; Discards; Unallocated removals (maintained constant across scenarios). Numbered columns relate to species.

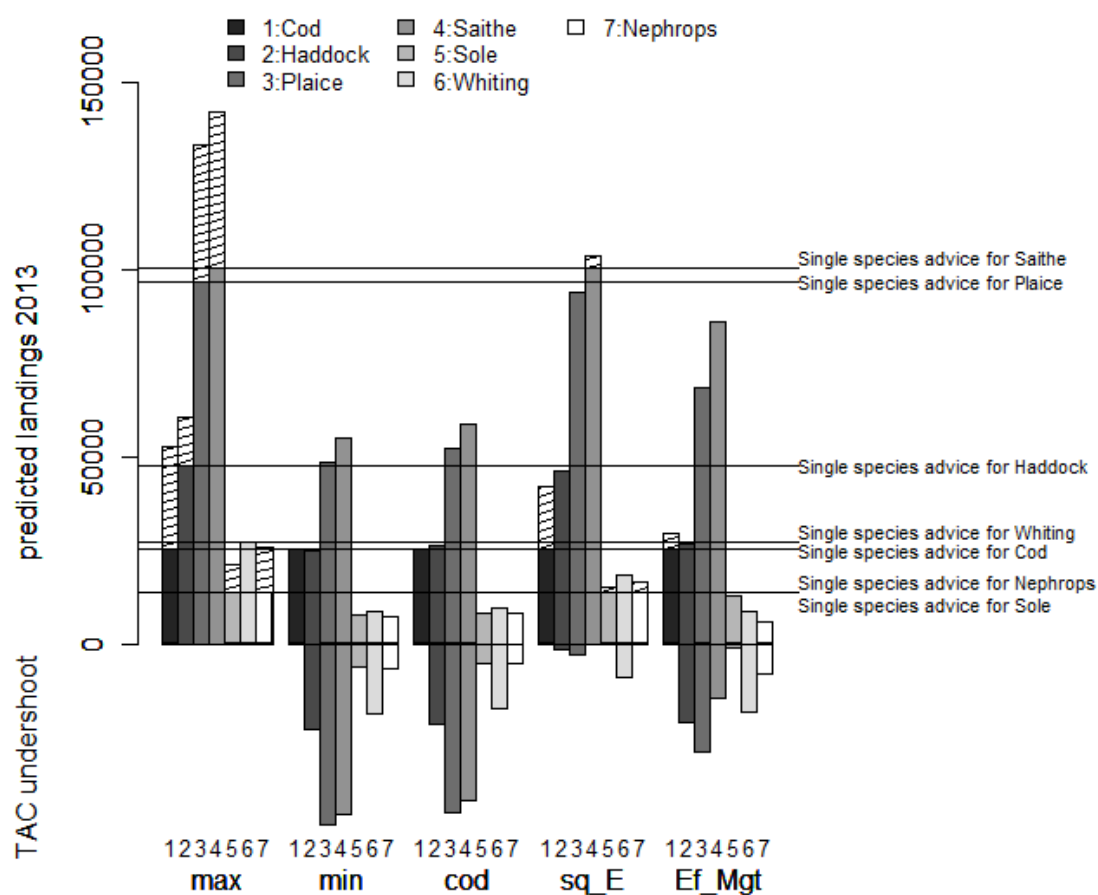


Figure 4.2.2.2.1 TAC year results (2013). Fcube estimates of potential landings by stock after two successive years of applying the Fcube scenarios. Horizontal lines correspond to the TAC set by the single stock advice. Bars below the value of zero show the scale of undershoot (compared to the single species TAC) in cases where landings are predicted to be lower when applying the scenario.

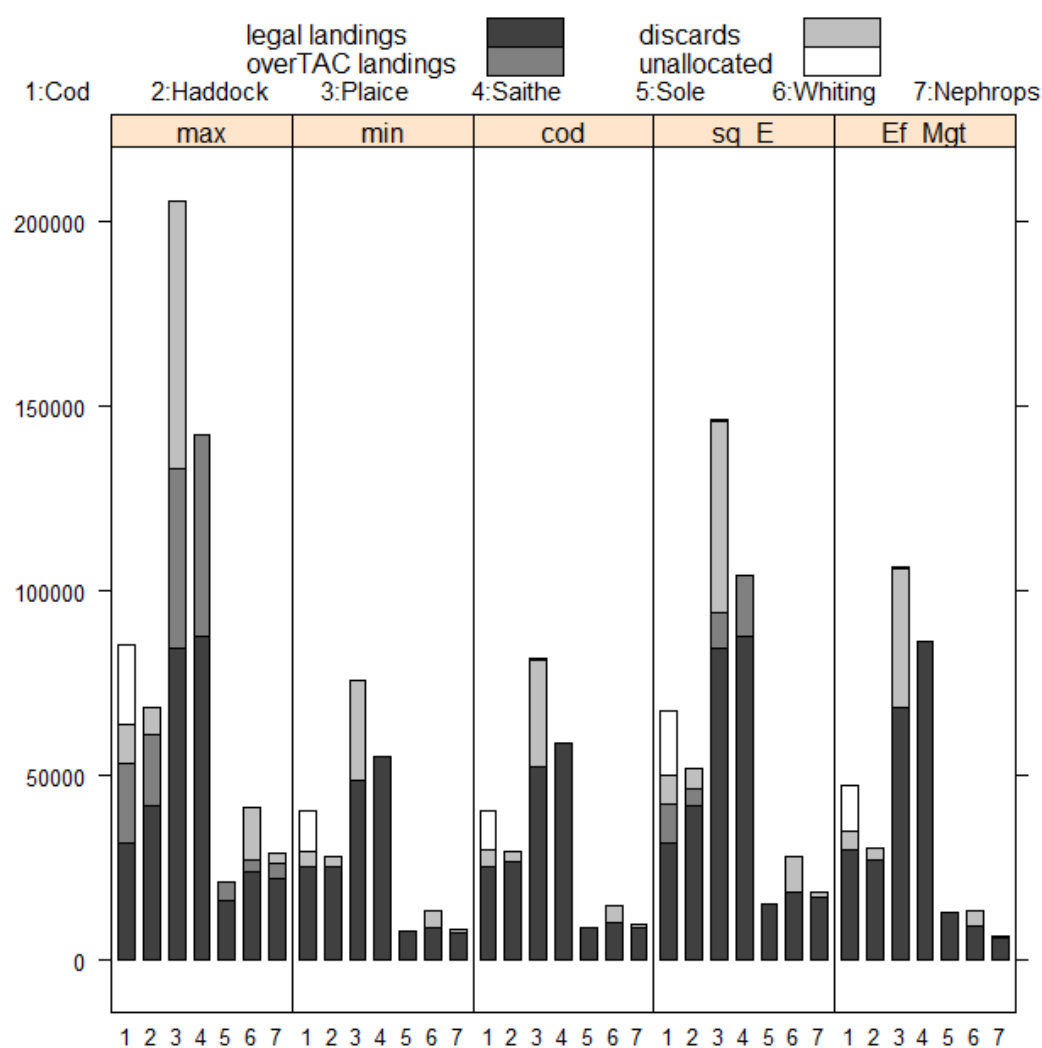


Figure 4.2.2.2.2. TAC year results (2013). Total estimated catches by stock and Fcube scenario in 2013. Bars represent from bottom to top: potential landings (as estimated from previous ratios of landings vs. discards) up to the advised single stock 2013 TAC; potential landings (as estimated from previous ratios of landings vs. discards) above the advised single stock 2013 TAC; discards; unallocated removals (maintained constant across scenarios).

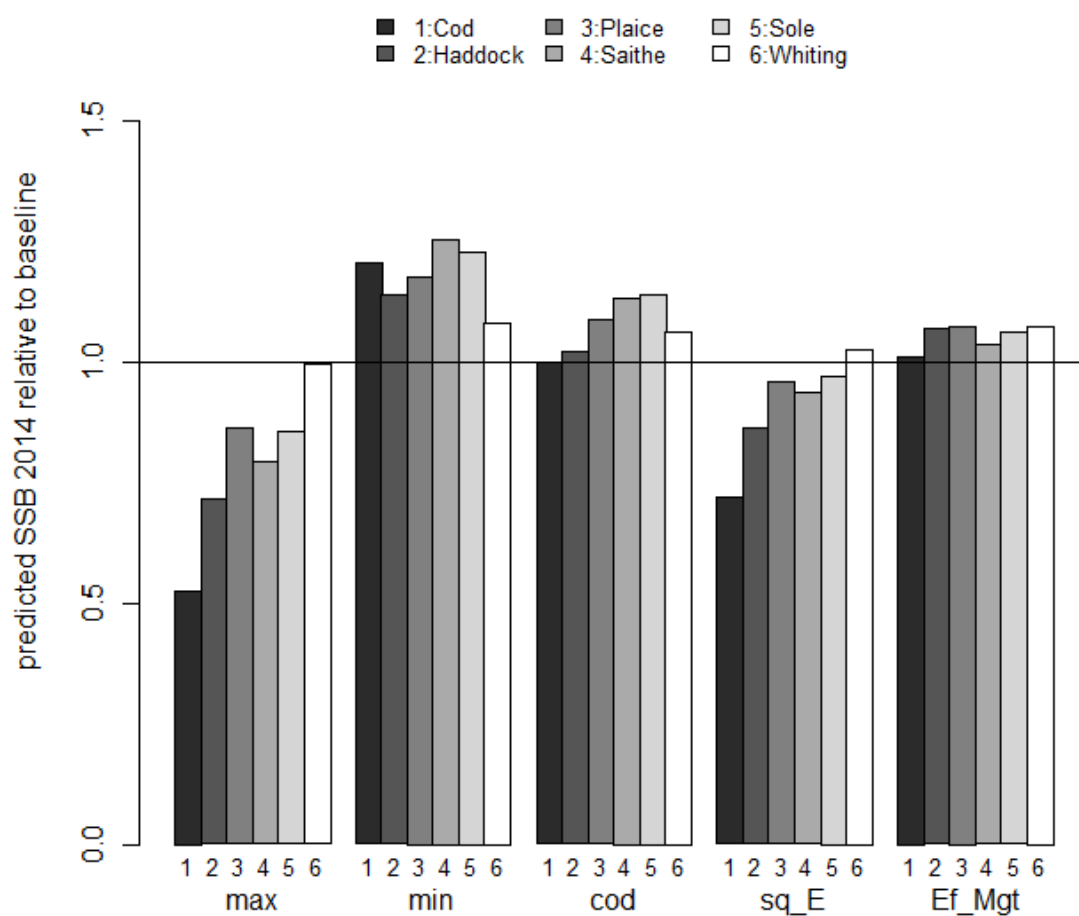


Figure 4.2.2.2.3. Estimates of potential SSB at the start of 2014 by stock after applying the mixed fisheries scenarios, expressed as a ratio to the single species advice forecast. Horizontal line corresponds to the SSB resulting from the single stock advice (at the start of 2014). Nephrops are not included as abundance is not forecasted from the mixed fisheries model.

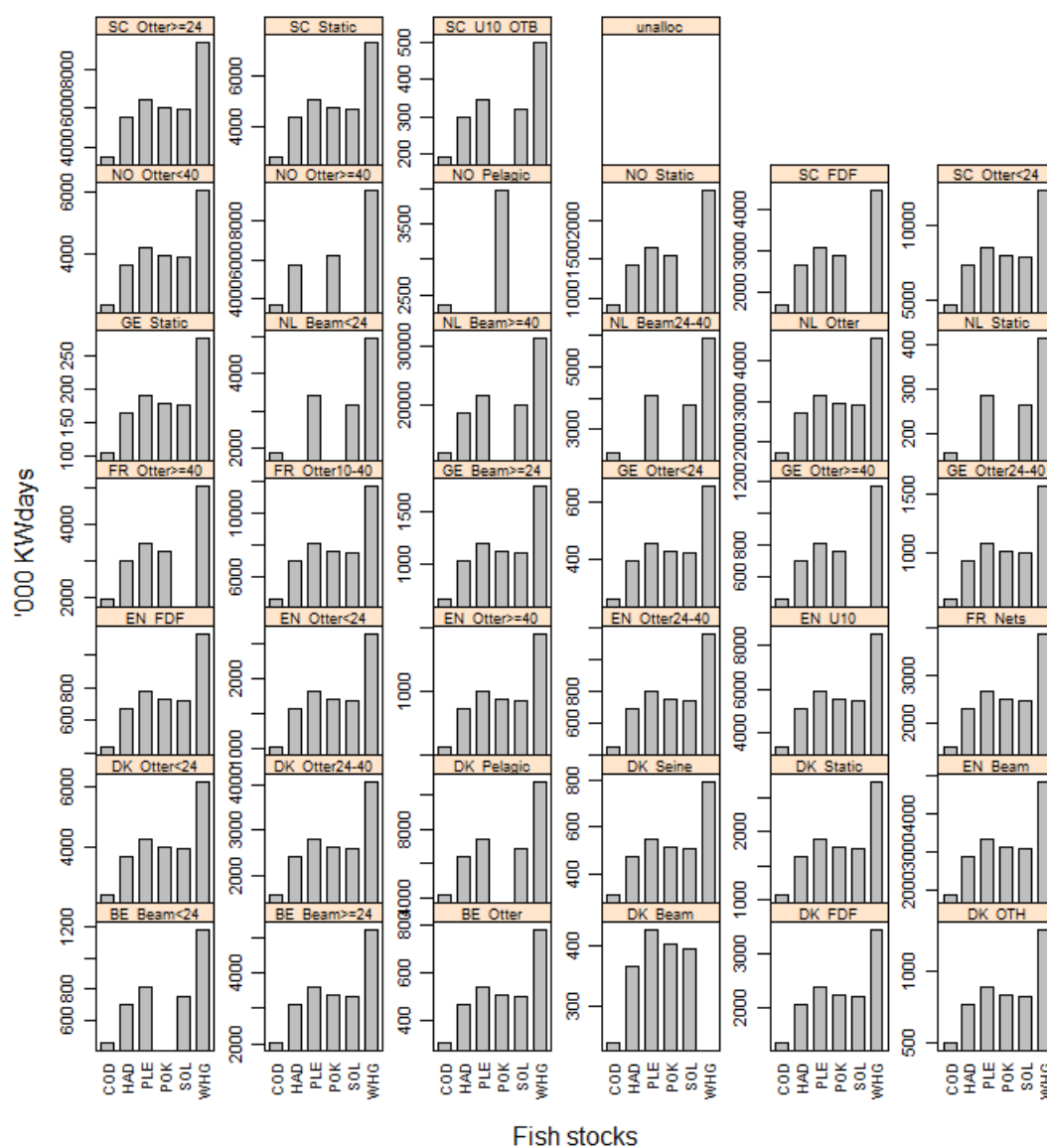


Figure 4.2.2.2.4. TAC year results (2013). Fcube estimates of effort by fleet corresponding to the individual “quota share” (or partial target F) by stock in 2013 (baseline run). Finfish species.

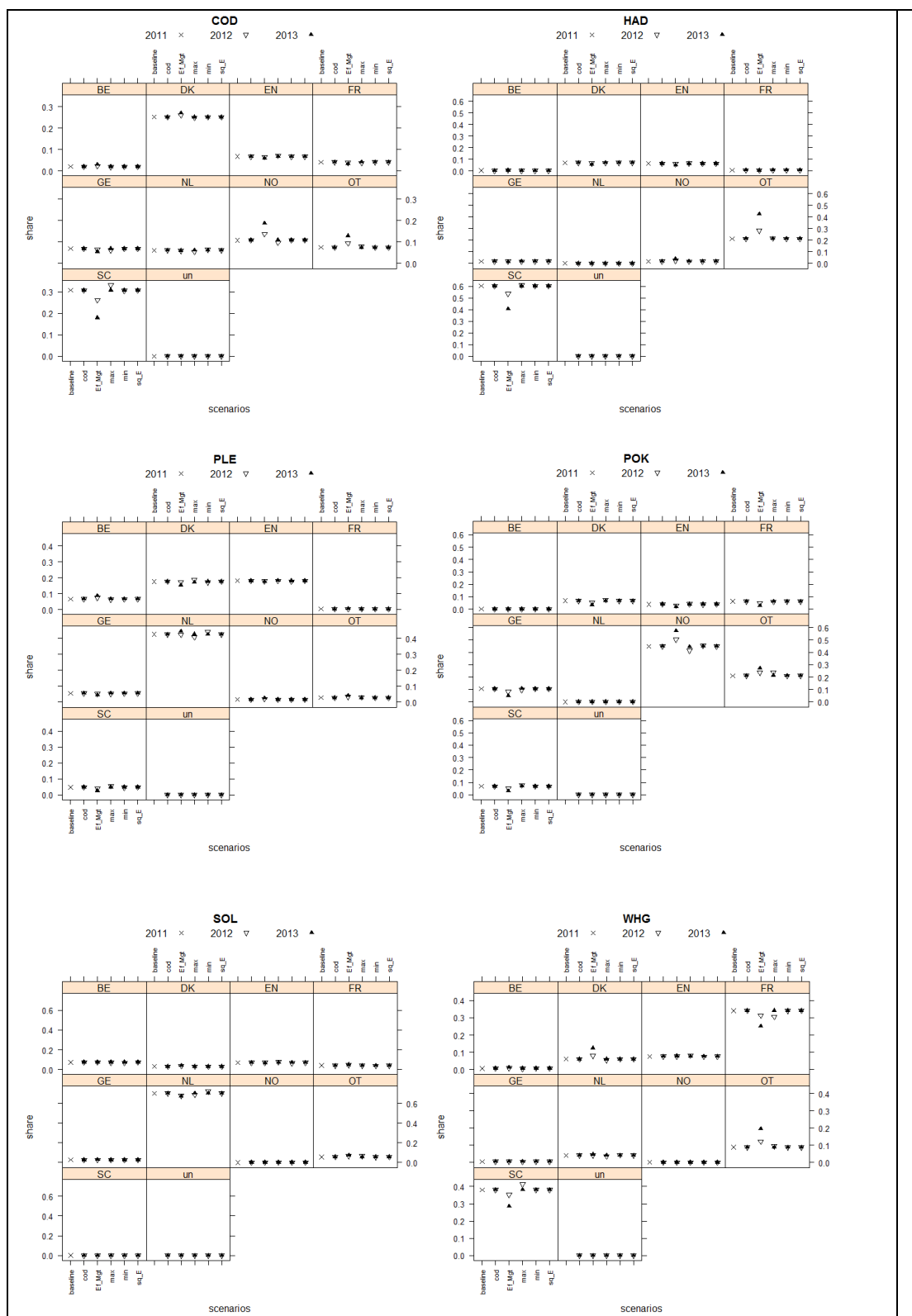


Figure 4.2.2.3 : Test for relative stability. Changes of relative share of species' landings by country in 2012 and 2013 compared to the 2011 share, for the 'baseline' and 5 Fcube scenarios.

Annex 1: List of participants

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Annex 2: Specification of the ICES' data call

Following intercessional debate and a workshop held at WGMIXFISH 2011 data for 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.

It was briefly considered to try and harmonise 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 metier structure given in Appendix IV of Commission Decision 2008/949/EC. The Level 6 metiers are defined by gear type, target assemblage, mesh size and physical characteristics of any selectivity devices fitted. The metier 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/metiers 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 metier (corresponding to BT1).
- 3) Species specific fleets/metiers (i.e. fleets/metiers 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 metier 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 metier 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 landings only for those metiers 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 was to be submitted to InterCatch for safe storage and to allow allocations of

discards and age distributions to unsampled metiers. To reduce the number of metiers forming the stock data a description of sampling designs along with a map of metiers to samples and likely categorisation (raised or unsampled) was requested from contributing nations. After consideration of those metiers important to the North Sea demersal stocks a reduced set of 'metier-tags', using the DCF level 6 naming convention but often merging over metiers was defined in the data call.

During the data call design process it was realised 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 was 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

Rationale

The mix 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.

Scope of call

ICES Countries are requested to supply landings, discards, biological sample and effort data from 2011. This information should be according to one or more of the metiers listed in Annex 1. The minimum list of species for which data should be prepared according to Annex 1 is given below and in Appendix 8. The species should be reported for the areas in the area list below.

	Common species name	Code	Scientific species 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	Norway lobster	NEP	Nephrops norvegicus

Area list

Area	Area code
North Sea (IV)	IV
Skagerrak (IIIaN)	IIIaN
Eastern Channel (VIId)	VIId

Deadline

30 March 2012.

Data to be reported

Landings, discards, sample and effort data from 2011 according to one or more of the metiers listed in Annex 1.

Additionally information by vessel length categories are also requested, 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 by vessel length categories should be electronically sent to:

Clara Ulrich [clu@aqua.dtu.dk]	-- Chair of WGNSSK
Steven Holmes [s.holmes@marlab.ac.uk]	-- Chair of WGMIXFISH

The entries in Annex 1 follow closely the naming convention used for the EU Data Collection Framework (DCF). An explanation of the elements of these metier 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. *METIER 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 metier 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 metier tag defines a fully documented fishery add "_FDF" after length class – but see note below).

An underscore separates these elements.

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 is 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 **2011**.
- If discard data is 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. Effort is recorded in position 11 of the InterCatch header information.

Fully Documented Fisheries

To prevent a requirement for large numbers of metier tags to be held within Inter-Catch metier tags for fully documented fisheries will be added on a case by case basis. If national data submitters have a fully documented fishery for which there is landings and discard data and which they wish to submit as a unique metier they should contact Henrik Kjems-Nielsen [henrikkn@ices.dk], the contact point for Inter-Catch.

Aggregations

If national data are aggregated over several DCF level 6 categories, the metier 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 metier 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 is best raised and entered to InterCatch using metiers / groups of vessels that match national sampling schemes. For 2011 data this means that the vessel length categories will be omitted in the data submitted to InterCatch (e.g. metier tag TBB_DEF_>=120_0_0_all). This is sufficient to address the data needs for WGNSSK. However, - for otter and beamtrawl gears only - these aggregations may be too broad for WGMIXFISH needs (leading to overly large fleet entries in the mixed fisheries projections). To fulfil the additional WGMIXFISH specific need for information by vessel length categories¹, we kindly request estimates of catch weight totals and effort in a format similar to previous WGMIXFISH data calls (albeit using the Metier Tags as used to supply InterCatch) i.e.:

A comma separated (CSV) ‘effort’ file containing the following entries:

ID, Country, Year, Quarter, Length disaggregated Metier Tag, Area, KW_Days, Days At Sea, No Vessels

A CSV ‘catch’ file containing the following entries:

ID, Country, Year, Quarter, Length disaggregated Metier Tag, Area, Species, Landings (tonnes), Discards (tonnes), Value (average price*landings at first sale, expressed in Euros).

¹ Also, in order to insure consistency and continuity with the data time series previously collected by WGMIXFISH.

- Length categories are <10m; 10<24m; 24<40m and ≥40m.
- Vessel length splits are only required for metier tags starting OTB or TBB.

Sums of effort and catch across metier tags disaggregated by vessel length should equal the corresponding totals submitted to InterCatch.

Example:

If a nation submitted data to InterCatch according to TBB_DEF_>=120_0_0_all but this data comes from vessels of 24<40m and ≥40m WGMIXFISH requests CSV files for entries of

TBB_DEF_>=120_0_0_24<40 and

TBB_DEF_>=120_0_0_>=40

The CSV files should be submitted electronically to

Clara Ulrich [clu@aqua.dtu.dk]	-- Chair of WGNSSK
Steven Holmes [s.holmes@marlab.ac.uk]	-- Chair of WGMIXFISH

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

Clara Ulrich [clu@aqua.dtu.dk]	-- Chair of WGNSSK
Steven Holmes [s.holmes@marlab.ac.uk]	-- Chair of WGMIXFISH

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 down-

loaded 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

Area	Gear type	Available metier tags For fully documented fisheries add “_FDF” after length class.
IIIaN (Skagerrak) Area Type = SubDiv		TBB_DEF_90-99_0_0_all
		TBB_DEF_>=120_0_0_all
	Otter trawl	OTB_CRU_13-31_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
		OTB_DEF_>=120_0_0_all
	Seines	SDN_DEF_>=120_0_0_all
		SSC_DEF_>=120_0_0_all
	Gill, trammel, drift nets	GNS_DEF_100-119_0_0_all
		GNS_DEF_120-219_0_0_all
		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
	Others (Human consumption)	DemHC
	Others (Industrial bycatch)	DemIBC
IV – (North Sea) Area type = SubArea & VIId (Eastern Channel) Area Type = SubDiv		TBB_DEF_70-99_0_0_all
		TBB_DEF_>=120_0_0_all
	Otter trawl	OTB_CRU_13-31_0_0_all
		OTB_CRU_32-69_0_0_all
		OTB_SPF_32-69_0_0_all
		OTB_CRU_70-99_0_0_all
		OTB_DEF_>=120_0_0_all
	Seines	SDN_DEF_>=120_0_0_all
		SSC_DEF_>=120_0_0_all
	Gill, trammel, drift nets	GNS_DEF_100-119_0_0_all
		GNS_DEF_120-219_0_0_all
		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
	Pots and Traps	FPO_CRU_0_0_0_all
	Others (Human consumption)	DemHC
	Others (Industrial bycatch)	DemIBC

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

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

Code available in WGNSSK-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	Trammel net
LLS	LHP	Pole lines
	LHM	Hand lines
	LLS	Set longlines
FPO	FPO	Pots and Traps
DemHC	FYK	Fyke nets
	FPN	Stationary uncovered pound nets
	DRB	Boat dredge
	HMD	Mechanised/ Suction dredge
	OTH	Other

Appendix 2 Target assemblage (métier code)

The codes in the table below are those permitted under the DCF. Those highlighted in yellow are not yet implemented but can be used.

Code	Definition
DEF	Demersal fish
CRU	Crustaceans
SPF	Small pelagic fish
LPF	Large pelagic fish
MOL	Molluscs
DWS	Deep-water species
FIF	Finfish
CEP	Cephalopods
CAT	Catadromous
GLE	Glass eel
MPD	Mixed pelagic and demersal fish
MDD	Mixed demersal and deepwater species
MCD	Mixed crustaceans and demersal fish
MCF	Mixed cephalopods and demersal fish

Appendix 3 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 is 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 4 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 5 Vessel Length

Length categories permitted under the DCF are shown. For 2012 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 metier tags to be added in future years.

DCF categories	
Vessel Length	Code
Under 10m	<10
10 to 12 m	10<12
≥ 12m <18m	12<18
≥ 18m < 24m	18<24
≥24m < 40m	24<40
≥ 40m	>=40

Appendix 6 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 7 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)	FU5 ¹	IV5	Div
IV (ICES sub-area IV)	FU6	IVb6	SubDiv
VIIId (ICES division VIIId)	FU7	IVa7	SubDiv
	FU8	IVb8	SubDiv
	FU9	IVa9	SubDiv
	FU10	IVa10	SubDiv
	FU32 ¹	IV32	Div
	FU33	IVb33	SubDiv
	FU34	IVb34	SubDiv

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	Division
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 8.

Species for inclusion in WGNSSK-WGMIXFISH joint data call.

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

	<i>Common name</i>	<i>Code</i>	<i>Scientific name</i>
1	Cod	COD	<i>Gadus morhua</i>
2	Common sole	SOL	<i>Solea solea</i>
3	Haddock	HAD	<i>Melanogrammus aeglefinus</i>
4	Plaice	PLE	<i>Pleuronectes platessa</i>
5	Saithe	POK	<i>Pollachius virens</i>
6	Whiting	WHG	<i>Merlangius merlangus</i>
7	Norway lobster	NEP	<i>Nephrops norvegicus</i>

Annex 2

The documentation spreadsheet

Example of how to describe specific DCF categories contributing to supra-metiers 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 10<12 12<18 18<24 24<40 >=40	OTB OTT PTB SSC	70-99	Bottom trawls with mesh size >=70 & < 100 mm. No distinction between gear with or without selective devices. Notes NEP7 - majority of vessels 18<24 length with use of OTT gear. NEP8 & NEP9 - majority of vessels 12<18 length.
OTB_DEF_>=120_0_0_all	4	<10 10<12 12<18 18<24 24<40 >=40	OTB OTT PTB SSC	100-119 >=120	Bottom trawls with mesh size >=100mm. No distinction between gear with or without selective devices.
FPO_CRU_0_0_0_all	4	<10 10<12 12<18 18<24 24<40 >=40	FPO	na	Creels There are very small amounts of creel landings - no sampling. 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 2011 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 2011 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 2011 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 $\geq 100\text{mm}$ 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 and 2011 data only.

The Netherlands

WGNSSK data to InterCatch were not disaggregated by métier, due to the non-availability of the breakdown of commercial categories by métier for 2011 data. Consequently, all Dutch data were reported as "DemHC" métier. The additional specific data to WGMIXFISH were provided in the same format as in previous years but not according to the DCF métiers. A significant mismatch in discards estimates was discovered between the sources of information, but this could not be solved at the time of the meeting.

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. The Norwegian data used for this advice have been provided without any reliable information on mesh size in any gear. Thereby, the Norwegian fleets could not be distinguished according to the specifications given in the data request, and no distinction could be made between TR1 and TR2 gears. All data back to 2003 have been mapped to the OTTER category divided in vessel size groups.

UK (England, Wales and Northern Ireland)

Data were provided for England, Wales and Northern Ireland for 2011 according to the data call. Discard data were applied where available. 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. For the first time 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 metiers; 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 $\geq 27.432\text{m}$, targeting demersal species)
- LTR: Light trawl (bottom trawls, boat length $< 27.432\text{m}$, 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 $> 100\text{mm}$ were mapped to the DEF category. Vessels with OTTER gear with mesh $< 100\text{mm}$ 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 $\geq 100\text{mm}$
- ☐ TR2: Demersal otter and demersal seine gears with mesh ≥ 70 & $< 100\text{mm}$

Again discards were not attached to beam trawl landings.

The sampling of vessels $< 10\text{m}$ 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 $< 10\text{m}$ to STECF. Discard estimates are therefore not estimated for vessels in the u12m category (2003-2010) or $< 10\text{m}$ (2011).

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:

$$0.4 - (0.2 * (\text{Precautionary spawning biomass level} - \text{spawning biomass}) / (\text{Precautionary spawning biomass level} - \text{minimum spawning biomass level}))$$
 - 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: $0,4 - (0,2 * (\text{Precautionary spawning biomass level} - \text{spawning biomass}) / (\text{Precautionary spawning biomass level} - \text{minimum spawning biomass level}))$*
- (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, WGMIXFISH (WGSAM) by end of February 2013 to be fulfilled four weeks before the start of WGNSSK.	ICES' secretariat
2. ICES and STECF liaise in arranging expert group meetings for 2013 such that WGMIXFISH 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, WGCSE and WGMIXFISH.	ICES' secretariat and Commission through STECF
3. ICES data centre co-ordinate addition of non-EU data to the publically available spatial data resulting from the STECF 'effort meeting' data call (contact person Hans-Joachim Rätz, JRC).	ICES data centre
4. ICES data centre produce maps of the landings and effort data described under recommendation 3 to be hosted on the ICES website.	ICES data centre

Annex 6: Proposed ToR for 2013 WGMIXFISH Meeting

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

2012/#/ACOM## The **Working Group on Mixed Fisheries Advice for the North Sea** (WGMIXFISH), chaired by Steven Holmes, UK, will meet at ICES Headquarters, 20–24 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 and *Nephrops norvegicus* that is produced by WGNSSK in April 2013, and the management measures in place for 2014;
- b) Update the mixed fisheries annex for the North Sea;
- c) Produce a draft mixed-fisheries section for the ICES' advisory report 2013 that includes a dissemination of the fleet and fisheries data and forecasts ;

WGMIXFISH will report by 31 May 2013 for the attention of ACOM.

Supporting Information

Priority:	The work is essential for ICES to progress in the development of its capacity to provide advice on multi-species 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:	<p>The issue of providing advice for mixed fisheries remains an important one for ICES. However, in practice all recent advice in this area has resulted from the work and analyses done by sub-groups of STECF rather than 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.</p> <p>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 in 2010 and 2011.</p>
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 mechanism in fulfilment of the MoU with EC and fisheries commissions. It is also linked with STECF work on mixed fisheries.

Annex 7: Technical Minutes of the Mixed-fisheries Advice Review Group

Review of ICES	WGMIXFISH Report 2012
Dates	<i>4-5 June 2012</i>
Reviewer:	Jose Castro (Spain)
Chair WG:	Steven Holmes
Secretariat:	Barbara Schoute

General

The review group acknowledges the effort expended by the working group to produce the report, as well as the support of the ICES Secretariat throughout the review process.

The RG considered the mixed fisheries work done resulting in advice for:

- North Sea Mixed-fisheries advice (Mix-nsea)
- And mixed-fisheries advice items in:
 - Cod in Subarea IV and Divisions VIIId and IIIa (cod-347d)
 - Haddock in Subarea IV and Division IIIa (had-34)
 - Saithe in Subarea IV, Division IIIa and Subarea VI (sai-3a46)
 - Plaice in Subarea IV (ple-nsea)
 - Sole in Subarea IV (sol-nsea)
 - Whiting in Subarea IV and Division VIIId (whg-47d)
 - Nephrops in Subarea IV (Nep-IV)

General comments:

- Guidelines: The WG answered those TORs relevant to providing advice, and the assessments were carried out according to the “mixed-fisheries annex” description.
-

Report: The results are well presented in the report and figures generally referenced appropriately. Only some minor corrections are proposed below.

WGMIXFISH report

The introductory chapters of this report were clear and useful. The following minor corrections are proposed:

The section “Executive summary” indicates that NS mixed-fisheries Annex is unchanged from last year. However, this annex should be updated with the following information:

- Page 6 (and table in page 9): Cod assessment method (B-ADAPT) has been replaced by SAM model.
- Page 6 (and page 4 of the report): DCF regulation is misquoted.
- Page 7: Fcube reference must be updated (Ulrich et al., 2011).
- Page 9: All forecasts are now projected using the same fwd() function in the Flash Package.

In the “Introduction” section (page 3 and Table 1.2.1) the fishing effort regulation is incompletely quoted. In 2012, this regulation was split into two different documents, *i.e.* UE areas (Reg. (UE) n° 43/2012) and bilateral agreements (Reg. (UE) n° 44/2012), both including measures affecting the WGMIXFISH fleets.

Page 4: DCF “fleet segment” and “métier” definitions are actually provided by the Commission Decision (2010/93/UE).

Software

This was a well documented and ordered section. Just one minor error was detected in relation to the legal basis of scenario “Ef_Mgt” (page 6): the EU flatfish management plan is actually compiled in Reg. (UE) n° 44/2012.

Input data and recent trends

This was a well documented and considered section. Only minor corrections:

Section 3.1.1. The respective table 3.1.1.1 with the summary of the ICES advice is not cited in the text.

Page 11: all single-stock advices are compiled in agreement with the respective advice annex, except for whiting (19614t vs. 27242t).

Page 19: no sufficient explanations about the reasons to split fleets by nation, or métiers by geographical area. The direct use of DCF fleets segments (just LOA and gear category) and métiers surely facilitates analyses and the eventual explanation of results to stakeholders. It is assumed that this subdivision has been mainly forced by the “Ef_Mgt” scenario in order to better replicate the fleet disaggregation provided in this regulation.

Mixed fisheries forecasts

Input data appear to be correct and suitable. This section was well documented and ordered. Only some minor corrections:

Table 4.2.1.1. HAD SSB in 2013 is erroneously written.

Table 4.2.1.2. Percentage of difference for WHG in 2012 should give -3.93 instead of 1.4.

Page 22: the commented discrepancy between the ICES cod advice for 2012 and the WGMIXFISH replicate does not fit with Table 4.2.1.2.

Figure 4.2.2.1.4: apart from “min” scenario, “Ef-Mgt” is the only scenario with both flatfish stocks simultaneously underexploited. This is surely due to the extra effort reduction on beam trawlers established by the plaice and sole management plan.

Figure 4.2.2.3 does not need to be split into two captions.

Page 28: the violation of the relative stability principle in Ef_Mgt scenario could be better discussed. It would be interesting to check the differences between the plaice and sole TACs allocation among countries (quotas) and the effort allocation among national BT2 fleets.

“Mixed Fisheries advice” draft indicates the basis for mixed-fisheries options (management plan or, if these are not available, the MSY approach advice). However, the MSY approach was only applied to FUs with analytical assessment (FU6, FU7, FU8 and FU9), while the advice of the remained FUs (without analytical assessment) was based on the ICES approach for data limited stocks.