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Report of the Ad hoc Group on Mixed Fisheries in the North Sea (AGMIXNS)

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Contents

Executive summary

The ICES' Ad hoc Group on Mixed Fisheries Advice for the North Sea [AGMIXNS] (Chair: Carl O'Brien (UK and ICES)) met at ICES HQ, 3-4 November 2009 to further develop mixed fisheries advice for the North Sea. The investigations of this group built upon the work of the ICES' Workshop on Mixed Fisheries Advice for the North Sea [WKMIXFISH] which met earlier in August this year.

The current report demonstrates the feasibility of producing results which are of practical use for mixed fisheries management advice; rather than being merely illustrative. 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 whiting and *Nephrops*.

The mixed fishery advice is based on the CFP TAC regime and amongst others, considers two scenarios as lower and upper boundaries of the range of possibilities:

i) fishing does effectively stop when the catch for the first quota species meets the upper limit corresponding to single stock exploitation boundary for agreed management plan or in relation to precautionary limits; and

ii) fishing stops when the last quota species is fully utilised with respect to the upper limit corresponding to single stock exploitation boundary for agreed management plan or in relation to precautionary limits.

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 proxy for relative stability used as input to the model. The results show that only minor deviations are observed across all scenarios, indicating that the approach used does not lead to violation of the underlying hypothesis of relative stability in the TAC sharing (quotas) across nations.

The main finding from this study indicates the feasibility of ICES providing mixed fisheries advice from 2010 in the North Sea. However, this will be dependent upon an ICES' data call for which AGMIXNS has provided a proposal and a rationale.

The format of a candidate template for mixed fisheries advice has been developed by AGMIXNS and presented in this report for ACOM's consideration; together with a format for a candidate mixed fisheries annex that parallels the ICES' single stock annex.

In the light of the data deficiency identified with respect to *Nephrops* stocks, the figures presented in this report are merely indicative of the approach and should not be overly interpreted at present. As such the results presented in this report demonstrate the feasibility of the approach rather than their immediate application to next year's advice. Further agreement on the presentation of scenarios is recommended.

1 Introduction

1.1 Background

The **Ad hoc Group on Mixed Fisheries Advice for the North Sea** [AGMIXNS] (Chair: Carl O'Brien (UK and ICES)) met at ICES HQ, 3-4 November 2009 to further develop mixed fisheries advice for the North Sea. The investigations of this group built upon the work of the ICES' Workshop on Mixed Fisheries Advice for the North Sea [WKMIXFISH] which met in August 2009.

The Group was convened as a small expert group based on participation at the WKMIXFISH in August 2009 to demonstrate the feasibility of producing results which are of practical use for mixed fisheries management advice; rather than being merely illustrative. 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 whiting and *Nephrops*.

The mixed fishery advice will be based on the CFP TAC regime and take relative stability into account. The advice will consider at least two scenarios as lower and upper boundaries of the range of possibilities:

i) fishing does effectively stop when the catch for the first quota species meets the upper limit corresponding to single stock exploitation boundary for agreed management plan or in relation to precautionary limits; and

ii) fishing stops when the last quota species is fully utilised with respect to the upper limit corresponding to single stock exploitation boundary for agreed management plan or in relation to precautionary limits. The overshoot that will result will be assumed to be discarded.

Other scenarios will be investigated depending upon the availability of time at the meeting.

The main conclusion from this study was to point to conflicts in the allocation between country taking relative stability into account and to indicate the feasibility of ICES providing mixed fisheries advice from 2010 in the North Sea.

The input data and mixed fisheries forecasts are as described in ICES (2009a), augmented by the inclusion of the *Nephrops* stocks in the North Sea by functional unit (FU).

1.2 Effort limitations

These were presented in Section 1.2 of ICES (2009a) and there was nothing further to add.

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 whiting and *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 imposed 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 involved, and as such have never been evaluated in an integrated approach.

The full details and references of these plans were collected together in ICES (2009a).

1.4 Definitions

Two basic concepts were of primary importance when dealing with mixed fisheries – fleet and métier. These were described in Section 1.4 of ICES (2009a) and there was nothing further to add.

2 Software

In the mixed-fisheries analyses, the Fcube model was used and all forecasts were undertaken with the same FLR forecast method (Kell *et al*. (2007); www.flr-project.org).

Brief details are presented.

2.1 Fcube

The Fcube model was presented and described in Ulrich *et al.* (2006; 2008; 2009) and summarised in ICES (2009a). The basis of the model is to estimate the potential future levels of effort by 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.

The following five options were explored:

1) **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 for agreed management plan or in relation to precautionary limits.

2) **max**: The underlying assumption was that fishing stops when the last quota species is fully utilised with respect to the upper limit corresponding to single stock exploitation boundary for agreed management plan or in relation to precautionary limits.

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 simply set as equal to the effort in the most recently recorded year for which there is landings and discard data.

5) **Ef_Mgt**: The effort in métiers that used gear controlled by the EU effort management regime (TR1 and TR2) had effort adjusted according to the regulation (see Council Regulations (EC) No 1342/2008 and No 43/2009.

3 Input data and recent trends

3.1 Stocks

3.1.1 Data

The assessment data for the different stocks were taken from the ICES (2009b) report and discussed in ICES (2009a).

In contrast to the ICES' WKMIXFISH analyses undertaken in August 2009, the *Nephrops* stocks were incorporated in the evaluation. 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 NorthSea were omitted in the projections.

3.1.2 Trends and advice

Recent trends were described on a stock-by-stock basis in ICES (2009b), and latest advice by stock were available on the ICES' website and summarised in ICES (2009a) except for the *Nephrops* stocks.

3.1.3 Software

This was discussed in Section 3.1.3 of ICES (2009a) and there was nothing further to add.

3.2 Fleets and métiers

3.2.1 Catch and effort Data

To be incorporated into Fcube each métier-stock combination must have an associated catchability (mortality on the stock per unit of effort from the métier). This was used to calculate the effort required by each métier to fully utilise its quota for that species. On completion of an Fcube run each métier received an effort level associated with the input assumption on which quota was to be exhausted. The yield for each species given that effort level (and the catchability) was then calculated.

The complicating factor when incorporating *Nephrops* was 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). The approach adopted by this *ad hoc* group AGMIXNS was 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. The métier specific data used by WKMIXFISH was based on that provided to STECF for fleet effort assessment and as such is aggregated to ICES' Division level. Data provided for the ICES' *Nephrops* assessments was member state specific for each FU but not for landings recorded from outside of the FUs, (known as landings from *other rectangles*). Also, when annual landings totals for the FUs were taken from the fleet- métier totals the remainder was not consistent with the *other rectangles* landings recorded by ICES.

AGMIXFISH agreed that the only way to distinguish data compilation errors in the national submissions from data related to these *other rectangles* was to issue a data call

modelled on the STECF data call but different in that for *Nephrops* it should request effort and catch data by FU; together with the *other rectangles* category. Using a unique data call also would allow data to be split according to vessel length categories consistent with STECF economic data. A specification for the ICES' data call is presented in the Annex 2 of this report.

3.2.2 Definitions of fleets and métiers

Two basic concepts were of primary importance when dealing with mixed fisheries – fleet and métier. These were described in Sections 1.4 and 3.2.2 of ICES (2009a) and there is nothing further to add.

3.2.3 Trends

These were presented graphically by the figures in Section 3.2.3 of ICES (2009a) and there was nothing further to add.

4 Mixed fisheries forecasts

4.1 Description of scenarios

4.1.1 Baseline Run and Single-stock TAC constraint Run

The objectives of this single species stock baseline run were to:

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

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

In this run, a forecast was run for each stock separately following the same settings as in the ICES' single species forecast (Table 4.1.1.1). For example, for cod the assumption was for catches corresponding to a 25% reduction in F in 2009 (F_{09}) compared to F_{08}. For stocks where ICES advice was made according to a long term management plan the rules of the plan were implemented in the baseline script. The resulting TACs for 2010 were expected to equal those advised by ICES. For *Nephrops* stocks the recommendations for each functional unit (FU) made by ICES were replicated. In future years landings of *Nephrops* from *other rectangles* were expected to be treated as if *other rectangles* was another FU. However the difficulties of allocating landings of *Nephrops* from *other rectangles* across metiers from this year's data lead to landings values for the FUs being raised by a (common) amount necessary to redistribute the *other rectangles*' landings.

It should be noted that TAC levels are often not accounted for in the specification of the intermediate year in single species forecasts, because it is assumed that TACs do not control sufficiently the level of fishing mortality by stock due to mixed fisheries interactions. In 2009, only the forecasts for haddock and *Nephrops* used a TAC constraint.

Table 4.1.1.1: Overview of target F, settings used for the intermediate year and the rules (harvest control rules from management plans except for whiting and Nephrops) applied to single-stock ICES advice. All 2010 TAC values were agreed by STECF (2009) and (except for whiting) were consistent with results obtained by applying the TAC setting rules of annex II of the EU com 2009/224 on Fishing opportunities for 2010.

SPECIES	TARGET F	FORECAST AND HCR SETTINGS	EXPECTED LANDINGS 2009	UPPER LIMIT CORRESPONDING TO SINGLE STOCK EXPLOITATION BOUNDARY FOR AGREED MANAGAMENT PLAN OR IN RELATION TO PRECAUTIONARY LIMITS
COD IV, IIIa and VIIb	0.4	25% reduction in 2009 F08 ref man plan, and then, in 2010,a further 10 % reduction: 0.65*F09	41900	40300 (incl. all catches)
HADDOCK IV, IIIa and VIIb	0.3	TAC constraint in 2009, then 15% TAC constraint applies	44700	38000
PLAICE IV	0.3	3 yr average, scaled to 2008. Man.plan 10% reduction in F, then 15% TAC constraint applies	59500	63825
SOLE IV	0.2	3 yr average, scaled to 2008. Man.plan 10% reduction in F, with 15 % TAC constraint which does not apply	15140	14100
SAITHE IV, IIIa and VI	0.3	3 yr average, not scaled, 15 % TAC constraint applies	110000	118000
WHITING IV and VIId		No decline in SSB, 3 yr average, scaled to 2008.	19000	9293
Nephrops FU5	-			-
Nephrops FU6	-			1210
Nephrops FU7	-			16419
Nephrops FU8	-			1567
Nephrops FU9	-			1372
Nephrops FU10	-			-
Nephrops FU32	-			-
Nephrops FU33	-			-

4.1.2 Mixed fisheries runs

4.1.2.1 Fcube analyses of the intermediate year

The single species stock forecast settings and target F for 2009 from the baseline run were used to perform some Fcube scenario analyses for 2009 (Run "SSF09" – Single-Stock TargetF 2009). The aim of these analyses was to provide alternative sets of plausible levels of F by stock in 2009 accounting for mixed-fisheries interactions. As such, its configuration was similar to the base case run described and analysed in ICES (2008).

The Fcube scenarios **min**, **max**, **cod**, **sq_E** and **Ef_Mgt** were performed (see Section 2.1).

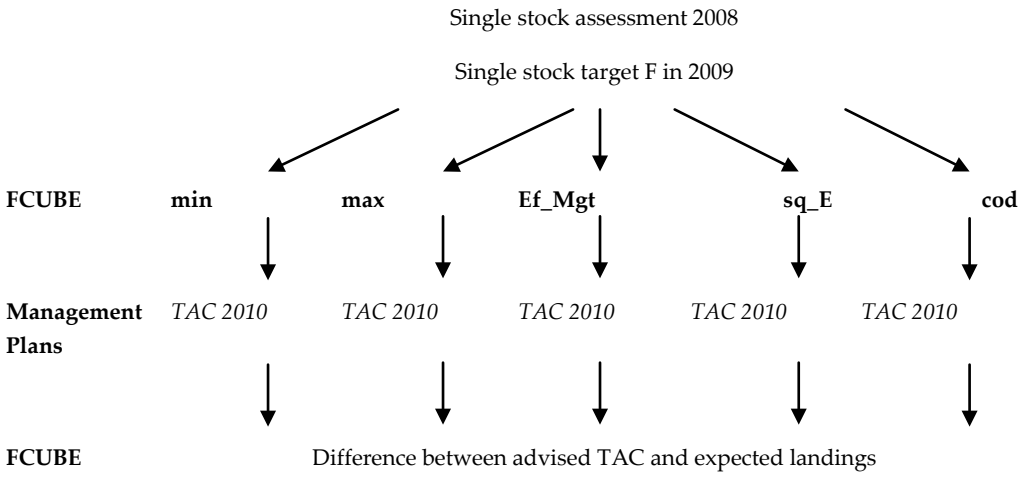
4.1.2.2 Mixed-fisheries advice for 2010 and Fcube analyses for 2010

The new F09 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 again projected to 2011, using the same settings (objec-

tives and constraints) for 2010 as in the Baseline Run. The aim was to derive single species stock TAC advice for 2010 following single species stock management plans but as if catch resulting from the assumed mixed-fisheries interactions in 2009 had come about and the data were available for the intermediate year.

Finally, for each Fcube scenario, the same scenario was applied in 2010 to the stock results (numbers-at-age) resulting from applying that scenario for 2009. In this way both differences in recommended TACs for 2010 resulting from the stock status of different scenarios and an estimate of the cumulative difference between on the one hand the baseline run intermediate year catch plus TAC and on the other realised catches over two years could be calculated.

In summary, the Fcube runs followed the scheme below:



4.2 Results of Fcube runs

4.2.1 Baseline run

Reproducing exactly the single species ICES' advice proved a difficult task. As pointed out previously, the assessment and forecast software and settings used differ among individual stocks. For the needs of mixed-fisheries analyses it was necessary to integrate all stocks in one common framework using generic FLR forecasting methods. These methods include a number of options which are mostly consistent with the traditional short-term forecast procedures used by WGNSSK, thus allowing some flexibility in the parameterisation of the forecast.

The baseline outputs obtained were as follows (Table 4.2.1.1)

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

		COD	HAD	PLE	POK	SOL	WHG**
2009	**Fbar**	0.59	0.22	0.25	0.29	0.34	0.47
	FmultVsF08	0.75	0.89	1	0.95	1	1
	landings	41226	44600	59557	110110	15137	21306
	SSB	59591	223879	388131	263377	37670	93845
2010	**Fbar**	0.51	0.32	0.24	0.34	0.3	0.19
	FmultVsF08	0.65	1.29	0.98	1.13	0.9	0.42
	landings	38740	37910	63825	118150	14140	9293
	SSB	64444	195134	442260	234548	37664	89027
2011	**SSB**	73186	166460	488400	212326	39609	93845

** Including industrial by-catch.

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

		NEP5	NEP6	NEP7	NEP8	NEP9	NEP10	NEP32	NEP33
2009	**Fbar***		0.1	0.09	0.24	0.17			
	FmultVsF08		1.22	1.22	1.22	1.22			
	landings	1228	1556	15378	2786	1721	197	693	1379
2010	**Fbar***		0.08	0.09	0.14	0.14			
	FmultVsF08		1	1.3	0.68	1			
	landings		1281	16420	1563	1416			

* Harvest rate.

This can be compared with the actual single-species ICES advice for landings (Table 4.2.1.2).

Table 4.2.1.2: Comparison between baseline run and ICES advice. Figures for 2009 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. No values are given in the advice year for Nephrops FUs that do not receive an absolute abundance estimate. 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.

	COD	HAD	PLE	POK	SOL	WHG**	NEP5	NEP6	NEP7	NEP8	NEP9	NEP10	NEP32	NEP33
2009														
Baseline	41226	44600	59557	110110	15137	21306	1228	1556	15378	2786	1721	197	693	1379
ICES Advice	41900	45000	59500	110000	15140	20800								
Difference	-1.6%	-0.9%	0.1%	0.1%	0.0%	2.4%								
2010														
Baseline	38740	37910	63825	118150	14140	9293		1281	16420	1563	1416			
ICES Advice	40300	38000	63800	118000	14100	9200		1210	16419	1567	1372			
Difference	-3.9%	-0.2%	0.0%	0.1%	0.3%	1.0%		5.9%	0.0%	-0.3%	3.2%			

For all species other than cod it was possible to reproduce the single-species advice (minor differences arising from the rounding effect from the ICES advice and in the case of Nephrops the small inflation in landings needed to account for the other rectangles landings).

For cod, it was not possible to fully reproduce the ICES' advice, although the differences were small. The cod forecast is produced internally in B-Adapt directly on the bootstrapped populations, and the median of the forecasted assessment may be slightly different from the forecast of the median assessment. However, the WKMIXNS group considered that while this was a source of slight concern which the group tried to solve, the inconsistency between the B-ADAPT and FLR derived advice was too small to affect significantly the outcomes of the mixed fisheries work.

4.2.2 Mixed fisheries analyses

4.2.2.1 Fcube analyses of the intermediate year

The Target F by stock for 2009 were set as the landings component of the F used in the Baseline (see table 4.2.1.1), i.e. a F reduction of 25%, 11% and 5% for cod, haddock and saithe respectively, and no F reduction target for plaice, sole and whiting. It is to be noted that for cod, plaice, sole and whiting, the single-species forecast assumptions used by ICES' WGNSSK (and reproduced here in the *baseline*) imply to some extent expected landings for 2009 higher than the actual TAC.

The Fcube scenarios **min**, **max**, **sq_E**, **cod** and **Ef_Mgt** were applied to these target Fs.

Results of the SSF09 Fcube runs are presented below:

	COD	HAD	PLE	POK	SOL	WHG
TAC2009	34600	44600	55500	139000	14000	19200
Baseline	41226	44600	59557	110110	15137	21306
max	64394	86603	105217	160027	26375	24861
min	32421	43179	45575	72205	11562	12384
sq_E	53354	70396	59725	116146	14509	19705
cod	41226	48793	49235	95168	12579	15916
Ef_Mgt	42400	45047	52064	92466	14365	13141

	NEP5	NEP6	NEP7	NEP8	NEP9	NEP10	NEP32	NEP33
TAC2009*								
Baseline	1128	1556	15378	2786	1721	197	693	1379
max	1278	3158	16193	3079	1869	223	785	1562
min	630	1556	8006	1509	916	110	387	771
sq_E	1133	2338	14721	2788	1693	198	696	1385
cod	755	1857	9589	1816	1102	132	464	924
Ef_Mgt	644	1375	8339	1578	958	112	396	788

* *Nephrops* TAC was allocated on a North Sea area basis and not by functional unit.

Considering the **cod** scenario, the mixed fisheries analyses indicated that the 25% reduction in F required for cod also implies that the quotas for other species, notably plaice and sole, would be undershot. By contrast the **Ef_Mgt** scenario left catches for these species similar to the **sq_E** scenario, which are themselves close to the baseline values. This reflected how the EU effort management plan targets effort reductions on those gears most significant in terms of cod catches.

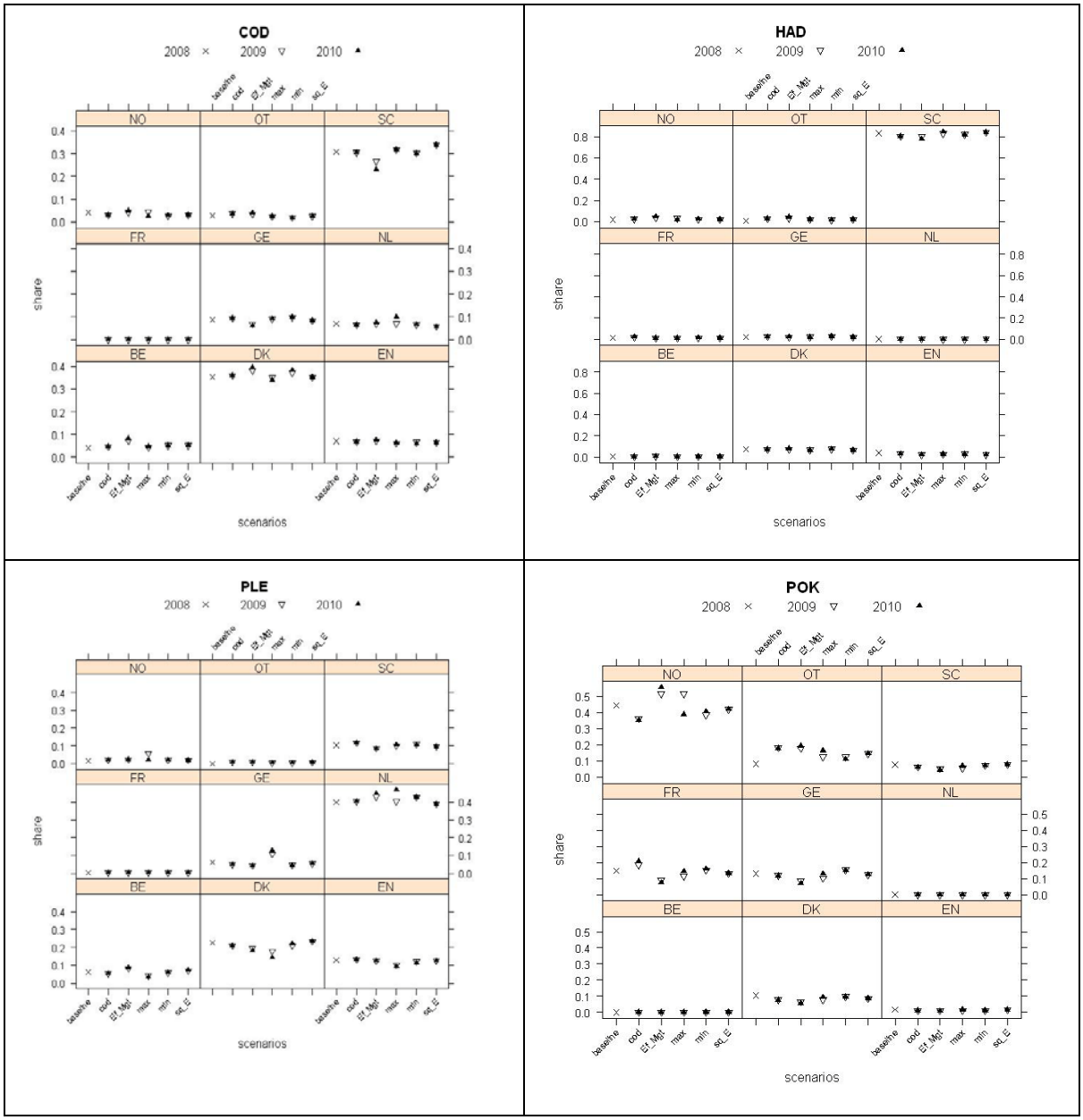
In addition, measures such as checks on quota and effort uptake and a ban on high-grading have been introduced which are intended to reduce the possibility of the cod

quota being exceeded. These changes mean that the cod catches achieved under the **cod** scenario may be realistic for at least some national fleets.

4.2.2.2 Relative stability

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 proxy for relative stability used as input to the model (Figure 4.2.2.2.1). The results show only minor deviations across all scenarios, indicating that the Fcube model did not lead to violation of the underlying hypothesis of relative stability in the TAC sharing (quotas) across nations.

Figure 4.2.2.2.1: Changes of relative share of species' landings by country between 2009 and 2010 compared to the 2008 share, for the 5 scenarios: cod, Ef_Mgt, max, min and sq_E, respectively



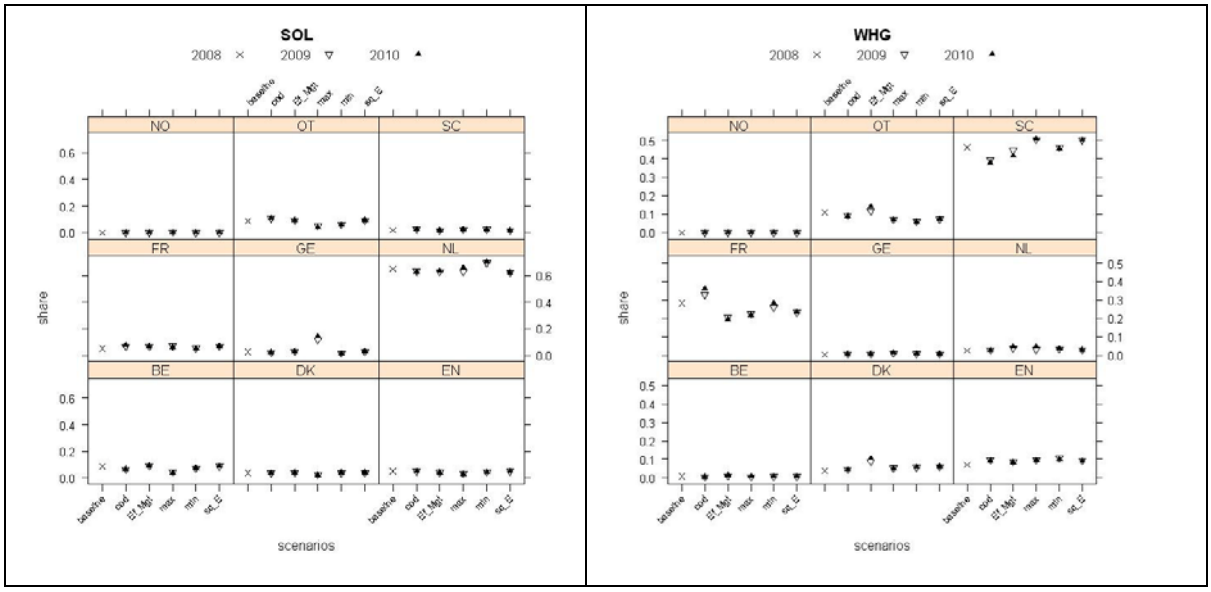


Figure 4.2.2.2.1 (continued): Changes of relative share of species' landings by country between 2009 and 2010 compared to the 2008 share, for the 5 scenarios: cod, Ef_Mgt, max, min and sq_E, respectively.

4.2.2.3 Mixed-fisheries advice for 2010 and Fcube analyses for 2010

The full overview of the runs up to 2010 is presented in table 4.2.2.3.1 below.

The reader should consult Section 4.2.3.2 of ICES (2009a) where a schematic is presented to aid in the interpretation of Table 4.2.2.3.1.

These results are now used to form the basis of mixed fisheries advice for the North Sea in the following Section 5 and the Annex 3 of this report.

Table 4.2.2.3.1: Results of the final Fcube run.

Landings		**COD**	**HAD**	**PLE**	**POK**	**SOL**	**WHG**	**NEP6**	**NEP7**	**NEP8**	**NEP9**	**NEP10**	**NEP32**	**NEP33**	**NEP5**
Applying Advice on 2008 data (SINGLE-STOCK ADVICE = BASELINE)															
2009	baseline	41226	44600	59557	110110	15137	21306	1556	15378	2786	1721	197	693	1379	1128
2010	baseline	38740	37910	63825	118150	14140	9293	1281	16420	1563	1416				
Applying Fcube on 2008 data															
2009	min	37721	43179	45575	72205	11562	12384	1556	8006	1509	916	110	387	771	630
	max	64394	86703	105217	160027	26375	24861	3158	16193	3079	1869	223	785	1562	1278
	sq_E	53354	70396	59725	116146	14509	19705	2338	14721	2788	1693	198	696	1385	1133
	cod	41226	48793	49235	95168	12579	15916	1857	9589	1816	1102	132	464	924	755
	Ef_Mgt	42400	45047	52064	97766	14365	13141	1375	8339	1578	958	112	396	788	644
Applying Fcube on 2009 Fcube results															
2010	min	38774	24033	47220	70645	11070	12188	1280	6646	1233	748	78	273	543	445
	max	46798	49267	127245	120078	28761	26539	3836	18811	3589	2179	222	784	1559	1275
	sq_E	44755	37559	65320	105482	15013	19139	2338	14721	2788	1693	169	594	1182	967
	cod	38740	25568	49491	83064	12056	15044	1610	8311	1574	955	97	343	683	559
	Ef_Mgt	39373	21604	56042	87717	14859	11632	1062	6293	1190	723	73	256	508	416
Applying Single-Stock advice on 2009 Fcube results (e.g. management plan)															
2010	min	40946	37910	63825	118150	11900	16119	1281	16420	1563	1416				
	max	27680	37910	61795	118150	16100	6649	1281	16420	1563	1416				
	sq_E	31128	37910	63825	118150	13723	10498	1281	16420	1563	1416				
	cod	38740	37910	63825	118150	12354	13386	1281	16420	1563	1416				
	Ef_Mgt	38002	37910	63825	118150	13626	15530	1281	16420	1563	1416				

FmultVsF08		**COD**	**HAD**	**PLE**	**POK**	**SOL**	**WHG**	**NEP6**	**NEP7**	**NEP8**	**NEP9**	**NEP10**	**NEP32**	**NEP33**	**NEP5**
Applying Advice on 2008 data (SINGLE-STOCK ADVICE = BASELINE)															
2009	baseline	0.75	0.89	1	0.95	1	1	1.22	1.22	1.22	1.22				
2010	baseline	0.65	1.29	0.98	1.13	0.90	0.42	1.00	1.30	0.68	1.00				
Applying Fcube on 2008 data															
2009	min	0.67	0.86	0.74	0.58	0.73	0.54	1.22	0.63	0.66	0.65				
	max	1.47	1.99	1.95	1.51	2.04	1.20	2.47	1.28	1.34	1.32				
	sq_E	1.08	1.52	1.00	1.01	0.95	0.91	1.83	1.16	1.22	1.20				
	cod	0.75	0.98	0.81	0.80	0.81	0.71	1.45	0.76	0.79	0.78				
	Ef_Mgt	0.78	0.90	0.86	0.82	0.94	0.58	1.07	0.66	0.69	0.68				
Applying Fcube on 2009 Fcube results															
2010	min	0.61	0.77	0.66	0.55	0.63	0.49	1.00	0.53	0.54	0.53				
	max	1.82	2.42	2.95	1.41	3.41	1.50	2.99	1.49	1.57	1.54				
	sq_E	1.08	1.52	1.00	1.01	0.95	0.91	1.83	1.16	1.22	1.20				
	cod	0.65	0.85	0.70	0.71	0.71	0.65	1.26	0.66	0.69	0.67				
	Ef_Mgt	0.68	0.70	0.82	0.76	0.94	0.47	0.83	0.50	0.52	0.51				

Table 4.2.2.3.1 (continued). Results of the final Fcube run.

SSB		COD	HAD	PLE	POK	SOL	WHG	NEP6	NEP7	NEP8	NEP9	NEP10	NEP32	NEP33	NEP5
Applying Advice on 2008 data (SINGLE-STOCK ADVICE = BASELINE)															
2009	baseline	59591	223879	388131	263377	37670	93845								
2010	baseline	64444	195134	442260	234548	37664	89027								
2011	baseline	73186	166460	488400	212326	39609	93845								
Applying Fcube on 2008 data															
2010	min	68637	196697	466993	269446	41008	103641								
	max	37320	149064	362860	189580	27238	87991								
	sq_E	50098	166842	441964	229047	38251	94389								
	cod	64444	190523	460501	248235	40055	99154								
	Ef_Mgt	63045	194642	455491	245848	38385	102677								
Applying Fcube on 2009 Fcube results															
2011	min	80204	183457	549696	294269	46015	98991								
	max	18534	107203	277560	161596	15190	68182								
	sq_E	41716	138257	485501	217456	39381	82585								
	cod	73186	175529	537093	258970	44081	91677								
	Ef_Mgt	70030	184096	519316	252075	39668	98953								
Applying Single-Stock advice on 2009 Fcube results (e.g. management plan)															
2011	min	77444	168038	521863	250776	45217	93845								
	max	41155	119838	385228	163218	26942	93845								
	sq_E	58546	137866	488001	206286	40615	93845								
	cod	73186	161807	513067	227380	43795	93845								
	Ef_Mgt	71763	165965	506286	224751	40848	93845								

5 Candidate template for mixed fisheries advice

Mixed fisheries management advice was dependent upon the choice of species considered and the criteria selected. In contrast to single species advice there is no single recommendation but a range of plausible options. The species considered here as part of the mixed demersal 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 whiting and *Nephrops*. Herring, mackerel and the industrial fisheries (sandeel, Norway pout and sprat) were not considered in a mixed fisheries advice given the targeted nature of their fleets.

Five options were explored by AGMIXNS (see Section 2.1) and in future, ICES is willing to consider further options that may be suggested by ICES' clients. After much discussion within AGMIXNS a candidate template for mixed fisheries advice was proposed and is presented in Annex 3 of this report.

In the light of the data deficiency identified with respect to *Nephrops* stocks, the figures presented are merely illustrative of the approach and should not be overly interpreted at present. As such the results presented in this report demonstrate the feasibility of the approach rather than their immediate application to next year's advice.

6 Conclusions and Recommendations

The work undertaken during this meeting has demonstrated the feasibility of ICES to provide mixed fisheries advice from 2010 in the North Sea. It is recommended that the North Sea mixed fisheries advice for 2011 should follow the procedure outlined below:

i) Single species exploitation boundaries and advice should be agreed in early June 2010 by ACOM.

ii) ICES should send out a data call to be fulfilled by the end of June 2010 requesting catch (both landings and discards) and effort data for the years 2003-2009 (see Annex 2).

iii) WKMIXFISH should become an ICES' working group [WGMIXFISH] under the chairmanship of Steven Holmes (UK) and meet for four days on 31 August – 3 September 2010 to undertake mixed fisheries projections for the North Sea (see Annex 5).

iv) An ACOM review group should work during the period 13-17 September 2010 to review the work of WGMIXFISH.

v) An ACOM advice drafting group should work during the period 20-24 September 2010 using the report from WGMIXFISH.

vi) ACOM should approve mixed fisheries advice for the North Sea during the ICES' ASC meeting in September 2010.

Further, it is suggested that before ACOM can adopt this proposal ICES will need to solicit input from the EC and Norway.

7 References

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Annex 1: List of participants

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Annex 2: Proposal for the specification of the ICES' data call

The text that follows in this Annex 2 is a proposal from AGMIXNS for the ICES' data call for catch (both landings and discards) and effort data for the years 2003-2009 which should be fulfilled by the end of June 2010 if ICES is to provide mixed fisheries advice next year in the North Sea. Modifications to this could be provided depending on potential modifications in the related STECF data call.

Start of text and Appendices of call:

Data reports can be provided in simple comma separated text files, Microsoft EXCEL or ACCESS formats. All missing values (empty data cells) must be indicated by a -1.

A. Mandatory Catch data for 2003-2009 aggregated (sum) by ID. Please ensure that data entries are fully consistent with coding given in Appendixes.

1) *ID (this is a unique identifier; e.g. the combination of country, year, quarter, vessel length, gear, mesh size range, and area; this is free text with a maximum of 40 characters without space)*

2) *COUNTRY (this should be given according to the code list provided in Appendix 1)*

3) *YEAR (this should be given in four digits), like 2004*

4) *QUARTER (this should be given as one digit), like 1, 2, 3, or 4*

5) *VESSEL_LENGTH (this should be given according to the code list provided in Appendix 2)*

6) *GEAR (gear should be given according to the code list provided in Appendix 3, which follows the EU data regulation 1639/2001)*

7) *MESH_SIZE_RANGE (the mesh size range should be given according to the code list provided in Appendix 4, which largely follows the Council regulation 850/98)*

8) *AREA (the ICES division or sub-area should be given according to the code list provided in Appendix 5)*

9) *SPECIES (the species should be given according to the code list provided in Appendix 6, which follows the Council Regulation EC 2287/2003)*

10) *LANDINGS (estimated landings from domestic and foreign ports in metric tonnes should be given)*

11) *DISCARDS (estimated discards in metric tonnes associated with the landings should be given)*

B. Mandatory effort data for 2003-2009, aggregated (sum) by ID.

1) *ID (this is a unique identifier; e.g. the combination of country, year, quarter, gear, mesh size range, fishery or metier, and area; this is free text with a maximum of 40 characters without space)*

2) *COUNTRY (this should be given according to the code list provided in Appendix 1)*

3) *YEAR (this should be given in four digits)*

4) *QUARTER (this should be given as one digit)*

5) *VESSEL_LENGTH (This should be given according to the code list provided in Appendix 2)*

6) *GEAR (this identifies gear, and should be given according to the code list provided in Appendix 3, which follows largely the EU data regulation 1639/2001)*

7) *MESH_SIZE_RANGE (the mesh size range should be given according to the code list provided in Appendix 4, which follows largely the Council regulation 850/98). Note that this list might be reduced to the new categories in Council regulation 43/2009: Trawl : >=100, 70-99, <70, Beam >=120, 80-119, <80, passive : all (or keep the categories 110-150-220).*

8) *AREA (the ICES division or sub-area should be given according to the code list provided in Appendix 5)*

9) *KW_DAYS_EFFORT (effort should be given in kWdays, i.e. engine power in kW times days at sea; if kWdays effort is not available, "-1" should be given)*

10) *DAYS_AT_SEA_EFFORT (effort should be given in days at sea; if Days_at_sea effort is not available "-1" should be given)*

11) *NO_VESSELS (simple integer value of the number of vessels, if the number is not available, "-1" should be given.*

Appendix 1 Country coding

COUNTRY	*CODE*
Belgium	*BEL*
Denmark	*DEN*
Estonia	*EST*
Finland	*FIN*
France	*FRA*
Germany	*GER*
Ireland	*IRL*
Latvia	*LAT*
Lithuania	*LIT*
Netherlands	*NED*
Norway	*NOR*
Poland	*POL*
Portugal	*POR*
Spain	*SPN*
Sweden	*SWE*
United Kingdom (Jersey)	*GBJ*
United Kingdom (Guernsey)	*GBG*
United Kingdom (Alderny/Sark/Herm)	*GBC*
United Kingdom (England and Wales)	*ENG*
United Kingdom (Isle of Man)	*IOM*
United Kingdom (Northern Ireland)	*NIR*
United Kingdom (Scotland)	*SCO*

Other countries	*OTH*

Appendix 2 Vessel Length

Vessel Length	*Code*
Under 12m	*u12m*
≥ 12m < 24m	*o12t24m*
≥ 24m < 40m	*o24t40m*
≥ 40m	*o40m*

Appendix 3 Gear coding

TYPES OF FISHING TECHNIQUES			***Code***
Mobile gears	*Beam trawl*		*BEAM*
	Demersal trawl & demersal seine	*Bottom trawl*	*OTTER*
		Danish & Scottish seiners	*DEM_SEINE*
	Pelagic trawl & Seiners	*Pelagic Trawl*	*PEL_TRAWL*
		Pelagic seiner & purse seiner	*PEL_SEINE*
	Dredges		*DREDGE*
Passive gears	*Longlines*		*LONGLINE*
	Drift & fixed Nets except Trammel Nets		*GILL*
	Trammel Nets		*TRAMMEL*
	Pots & traps		*POTS*

Appendix 4 Mesh size coding

Gear type	Code
Mobile gears	<16
	16-31
	32-54
	55-69
	70-79
	80-89
	90-99
	100-119
	>=120
Passive gears	10-30
	31-49
	50-59
	60-69
	70-79
	80-89
	90-99
	100-109
	110-149
	150-219
	>=220

Appendix 5 Area coding

Finfish

3an

4

7d

Nephrops (North Sea)

FU5

FU6

FU7

FU8

FU9

FU10

FU32

FU33

*FUOTHER**

* *landings/discards from the other ICES' rectangles in the North Sea*

Appendix 6 Species coding according to Council Regulation (EC) No. 2298/2003

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

End of text and Appendices of call.

Annex 3: Format of a candidate template for mixed fisheries advice

Mixed fisheries advice

Area	North Sea
Fisheries	Demersal

What is mixed fisheries advice?

[Explanatory paragraph]

Mixed fisheries advice is dependent upon the choice of species considered and the criteria selected. In contrast to single species advice there is no single recommendation but a range of plausible options.

[One scenario is presented as the ICES' mixed fisheries advice and an explanation given. In addition, the status quo effort case is presented for comparison]

Species involved

Species	ICES single stock advice area	Mgt area
Cod	Subarea IV, Divison VIId and IIIa West (Skagerrak)	• EU TAC Skagerrak • EU TAC VIId • IV; EC waters of IIa; that part of IIIa not covered by the Skagerrak and Kattegat
Haddock	Haddock in Subarea IV and Division IIIa West (Skagerrak)	• EU TAC IIIa, EC waters of IIIb, IIIc and IIId • IV; EC waters of IIa
Whiting	IV and VIId (MF advice covers human consumption landings (...%) + industrial landings (...%))	• IV • EU TAC VII
Saithe	Subarea IV, Division IIIa West (Skagerrak) and Subarea VI	• IIIa and IV; EC waters of IIa, IIIb, IIIc and IIId • VI; EC waters of Vb; EC and international waters of XII and XIV
Plaice	Sub-area IV	• IV; EC waters of IIa; that part of IIIa not covered by the Skagerrak and the Kattegat
Sole	Sub-area IV	• EC waters of II and IV
Nephrops	Functional Units: 5, 6, 7, 8, 9, 10, 32, 33, other areas outside FUs	• EU: TAC for IV • Norway: no TAC

Management objectives

All of these are subject to multi-annual management plans [references] apart from whiting (jointly managed between EU and Norway) and *Nephrops* (separately managed). For the last two ICES assumes TAC setting along the lines of the Policy document presented every year by the EU that describe the rules used to prepare the TAC proposal based on the stock status or trends.

Outlook for 2010 [next year]

Advice option: Cod management, TAC set so that F_{09}=07.5F_{08} and F_{10} = 0.65*F_{08}. Scenario assumes all fleets set their effort at the level corresponding to their cod quota share, regardless of other stocks.

Results on biological stock level	**Single stock expl. boundaries**	**Mixed fisheries advice framed by Mgt TAC rules ***	**Resulting SSB**	**Change in F implied**	**Mixed fisheries advice. expected results If SCENARIO APPLIED FOR TWO YEARS**	
Scenario		**cod**			**cod**	**sq_E**
	Landings 2010	**Landings 2010**	**2011**	**2010**	**Landings 2010**	
Cod	40.3	38.7	73.2	-35%	38.7	44.8
Haddock	37.9	37.9	161.8	-15%	25.6	37.6
Plaice	63.8	63.8	513.1	-30%	49.5	65.3
Saithe	118.2	118.2	227.4	-29%	83.1	105.5
Sole	14.1	12.4	43.8	-29%	12.1	15.0
Whiting	9.3	13.4	93.8	-35%	15.0	19.1
Nephrops FU5	-	-	-		0.6	1.0
Nephrops FU6	1.2	1.3	-	+26%	1.6	2.3
Nephrops FU7	16.4	16.4	-	-34%	8.3	14.7
Nephrops FU8	1.6	1.6	-	-31%	1.6	2.8
Nephrops FU9	1.4	1.4	-	-33%	1.0	1.7
Nephrops FU10	-	-	-	-	0.1	0.2
Nephrops FU32	-	-	-	-	0.3	0.6
Nephrops FU33	-	-	-	-	0.7	1.2
Nephrops outside FU's	-	-	-	-	-	-

Weights in '000 tonnes

*** i.e. Single species management plan rules applied to stock outcomes (F &/or SSB) after assuming scenario in intermediate year. For stocks for which no management plans are agreed the single stock exploitation boundaries are applied**

**** i.e. Scenario applied to stock outcomes (F &/or SSB) after assuming scenario in intermediate year.**

ICES advises, on the basis of complying to all management plans considered precautionary, to reduce landings for <u>stocks in area IV</u> to less than:

Cod	<	t
Haddock	<	
Plaice	<	
Saithe	<	
Sole	<	
Whiting	<	
Nephrops FU5	<	
Nephrops FU6	<	
Nephrops FU7	<	
Nephrops FU8	<	
Nephrops FU9	<	
Nephrops FU10	<	
Nephrops FU32	<	
Nephrops FU33	<	
Nephrops outside FU's	<	

The actual ICES advice is the result in the table above multiplied by the share of the average catches of area IV of this stock in the whole assessment area (see table at the end of the doc).

The advice scenario

[What does the scenario mean? Why was it chosen?]

ICES single species advice provides TACs expected to keep a species above a biomass level regarded as safe for the stock, or to return a species to a safe biomass level within a precautionary timeframe. To be consistent with these biological objectives a scenario is sought that delivers the SSB and/or F objectives of the single species stock advice for all stocks considered simultaneously. The *minimum* scenario guarantees this outcome. However, this scenario was not chosen as the reference because it assumes that fleets would stop fishing when their first quota share is exhausted, regardless of the actual importance of this quota share, thus leading to a distorted perception of plausible fleet behaviour. Therefore, the cod scenario was chosen as the reference, considering that the cod LTMP is the most restrictive in terms of F decrease in the short-term. Full compliance with the cod LTMP will therefore lead to compliance with the other MP as well.

[One scenario is presented as the ICES' mixed fisheries advice and the status quo effort case is presented for comparison]

Relevant assumptions within the advice scenario

- Intermediate year effort reduction %
- Etc...

Management considerations

Fleet management

Effort management

Environment

Economics

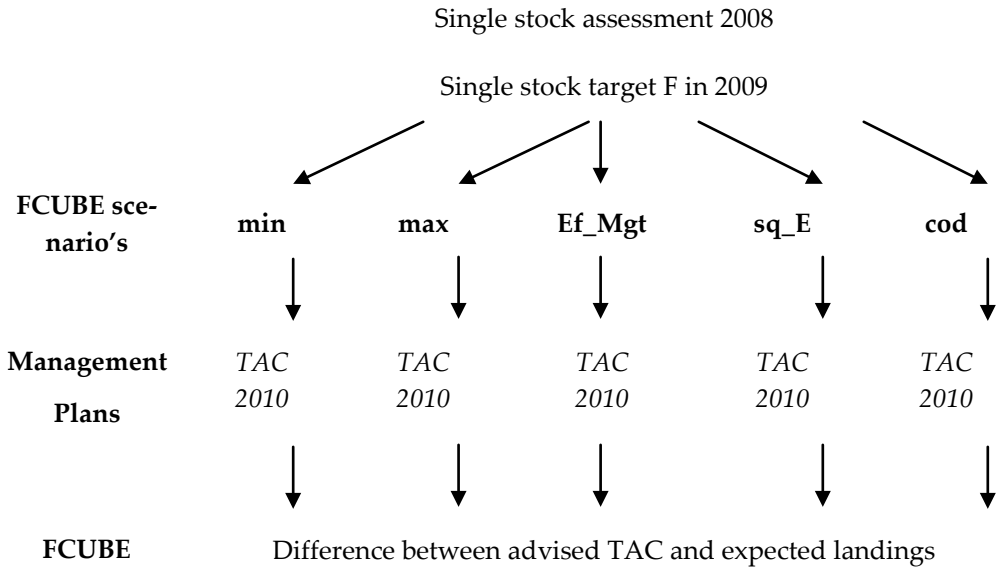
ANNEX

Technical information

Explain mixed fisheries model

The mixed fisheries Fcube model was developed in order to be able to predict the effect of, and to advise on, TAC and effort management of stocks in mixed fisheries circumstances. The North Sea demersal fisheries have been used as a starting point for this modelling.

The model takes into account the effort and catches of separate metiers and predicts catches on the basis of different scenarios with effort and catch limitations.



Assumptions in Fcube

i) Fleet behaviour (relative catches between stocks, effort) is the same as the average behaviour over the last 3 years. It does not change within the management year as a result of restrictions.

ii) Discards are allocated to fleets based on available data

iii) Relative stability (of quota) and average landing shares

Scenario descriptions

	Underlying assumption
min	Minimum scenario: fishing stops when the catch for the first quota species meets the upper limit corresponding to single stock exploitation boundary for agreed management plan or in relation to precautionary limits.
max	Maximum scenario: fishing stops when the last quota species is fully utilised with respect to the upper limit corresponding to single stock exploitation boundary for agreed management plan or in relation to precautionary limits
cod	All fleets set their effort at the level corresponding to their cod quota share, regardless of other stocks
sq_E	Status quo Effort: The effort is simply set as equal to the effort in the most recently recorded year for which there is landings and discard data.
Ef_Mgt	Effort management: The effort in métiers using gear controlled by the EU effort management regime (TR1 and TR2) have their effort adjusted according to the regulation (see Council Regulations (EC) No 1342/2008 and No 43/2009).

ICES is willing to consider further options that may be suggested by ICES' clients.

Baseline for the prediction

Baseline values used in the prediction

	Landings	F multiplier	SSB
COD	41.2	0.75	59.6
HAD	44.6	0.89	223.9
PLE	59.6	1	388.1
POK	110.1	0.95	263.3
SOL	15.1	1	37.7
WHG	21.3	1	93.8
NEP5	1.1		
NEP6	1.6	1.22	
NEP7	15.4	1.22	
NEP8	2.8	1.22	
NEP9	1.7	1.22	
NEP10	0.2		
NEP32	0.7		
NEP33	1.4		

Explain results Fcube (Table XX) vs results applying single stock advice on current year Fcube results (Table YY).

Table XX: Result of applying the assumptions of each scenario for two successive years.

Estimated catches

Species	Target F	Single stock exploitation boundaries	Scenario A mixed fisheries MIN	Scenario b mixed fisheries MAX	Scenario c mixed fisheries Sq-E	Scenario d mixed fisheries Cod	Scenario e mixed fisheries Ef-mgt
Cod	0.4	40.3	38.8	46.8	44.8	38.7	39.4
Haddock	0.3	37.9	24.0	49.3	37.6	25.6	21.6
Plaice	0.3	63.8	47.2	127.2	65.3	49.5	56.0
Saithe	0.3	118.2	70.6	120.1	105.5	83.1	87.7
Sole	0.2	14.1	11.1	28.8	15.0	12.1	14.9
Whiting	-	9.3	12.2	26.5	19.1	15.0	11.6
Nephrops FU5	-	-	0.4	1.3	1.0	0.6	0.4
Nephrops FU6	-	1.2	1.3	3.8	2.3	1.6	1.1
Nephrops FU7	-	16.4	6.6	18.8	14.7	8.3	6.3
Nephrops FU8	-	1.6	1.2	3.6	2.8	1.6	1.2
Nephrops FU9	-	1.4	0.7	2.2	1.7	1.0	0.7
Nephrops FU10	-	-	0.1	0.2	0.2	0.1	0.1
Nephrops FU32	-	-	0.3	0.8	0.6	0.3	0.3
Nephrops FU33	-	-	0.5	1.6	1.2	0.7	0.5
Nephrops outside FU's	-	-	-	-	-	-	-

Weights in '000 tonnes The preferred scenario is shaded

Table YY: Result of applying the assumptions of each scenario on the stocks to achieve stock indicator results (F, SSB) from the intermediate year, then applying the rules of the single species management plans.

SPECIES	MANAGEMENT PLAN RESULT 2010	SCENARIO A MIXED FISHERIES MIN	SCENARIO B MIXED FISHERIES MAX	SCENARIO C MIXED FISHERIES SQ-E	SCENARIO D MIXED FISHERIES COD	SCENARIO E MIXED FISHERIES EF-MGT
Cod	38.7	40.9	27.7	31.1	38.7	38.0
Haddock	37.9	37.9	37.9	37.9	37.9	37.9
Plaice	63.8	63.8	61.8	63.8	63.8	63.8
Sole	118.2	118.2	118.2	118.2	118.2	118.2
Saithe	14.1	11.9	16.1	13.7	12.4	13.6
Whiting	9.3	16.1	6.6	10.5	13.4	15.5
Nephrops FU5	-	-	-	-	-	-
Nephrops FU6	1.3	1.3	1.3	1.3	1.3	1.3
Nephrops FU7	16.4	16.4	16.4	16.4	16.4	16.4
Nephrops FU8	1.6	1.6	1.6	1.6	1.6	1.6
Nephrops FU9	1.4	1.4	1.4	1.4	1.4	1.4
Nephrops FU10	-	-	-	-	-	-
Nephrops FU32	-	-	-	-	-	-
Nephrops FU33	-	-	-	-	-	-
Nephrops outside FU's	-	-	-	-	-	-

Weights in '000 tonnes The preferred scenario is shaded

[Numerical difficulties using FLR aside, column 2 above corresponds to the column 3 (single stock exploitation boundaries) in Table XX and should have the same heading but this may lead to unnecessary confusion]

Explain this comparison and why we present it

Explain what different scenarios show to managers

The results under the scenarios in table XX give the expected outcome if TAC and effort management measures specified under single species advice remain unchanged and the assumptions of each scenario hold true in both the intermediate year and TAC year. If the scenario total is lower than the single stock exploitation boundary for a given species the difference is an estimate of unused TAC. If the scenario total is higher than the single stock exploitation boundary for a given species the difference is an estimate of overall discards of that species. Scenario E (Ef_Mgt) is considered the most realistic scenario out of those presented and therefore its predictions of catches under or above quota are considered the best forecast of the outcome of applying the proposed TACs and effort limits to the current fleet mix operating within the North Sea region. Scenario D (cod) is chosen as the advice scenario because the resulting TACs are equal to or lower than the TACs set for all species under the single species advice regime (except for whiting).

[AGMIXNS decided to include this as the advice during its meeting but subsequently, other views were expressed. Presented here for illustration]

Catches predicted to be above the single stock exploitation boundary can be for two reasons

1) The scenario predicts over-exploitation in both the intermediate and TAC year, in which case the biomass of the stock at the end of the TAC year will be reduced compared to if catches remained at the single stock exploitation boundary.

2) The scenario predicts under-exploitation in the intermediate year leading to an enhanced SSB at the end of the intermediate year. The single species HCR for the TAC year may then be fulfilled even if catches are higher than the single stock exploitation boundary for the TAC year.

The catch predictions for each species must therefore be considered in combination with the predicted SSB at the end of the TAC year.

Table YY gives an indication of the robustness of the TAC setting rules of the current single species management plans – or of the ICES precautionary approach in the absence of management plans. It demonstrates the variation between TACs set for the TAC year when applying the single species management plans (or the precautionary approach) to stock indicators from the intermediate year produced by the different scenarios or as used in the single species assessments.

Explain why other scenarios are not chosen for advice

[The advice scenario should describe the scenario itself, as well as why it is chosen. This paragraph can then describe which scenarios were not as suitable and why.]

Table ..... Effort reduction by TR1 / TR2 by fleet/métier**.**

[Comparison to be inserted here]

Table ..... % Share of Subarea IV (North Sea) in landings compared to the total assessment area for the biological stock.

[Note that the relative landings must be updated each year, they are based on avg last 3 years landings unless otherwise specified in the single stock advice sheet**]**

SPECIES	AREA IV	AREA IIIA	AREA VI	AREA VIID	CALCULATED
Cod	82%	5%		12%	Last 3 year avg landings
Haddock	94%	6%			Average TAC split
Plaice	100%				n.r.
Saithe	93.6% incl IIIa		6.4%		Different from landings split of 90.6%/9.4% based on 1993-1998
Sole	100%				n.r.
Whiting	80%			20%	Last 3 year avg landings
Nephrops stocks	Not relevant				n.r.

Shaded cells are part of the stock assessment area

Easy to understand figures and tables

Figure Estimates of landings by stock for the various scenarios in 2009. Horizontal lines are the in year TAC by stock.

Annex 4: Format for a candidate North Sea mixed fisheries annex

Mixed Fisheries Annex

Regional specific documentation of standard assessment procedures used by ICES.

Eco-Region North Sea

Date: November 2009

Revised by AGMIXNS

A. General

A.1. Area definition

This mixed fisheries advice will consider finfish species in the ICES area IV, IIa, IIIa, VI and VIId and for *Nephrops norvegicus* in functional units FU5, FU6, FU7, FU8, FU9, FU10, FU32, FU33 and ICES' rectangles outside of these eight functional units – denoted FUOTHER.

The species considered are part of the demersal mixed fisheries of the North Sea, and are cod, haddock, whiting, saithe, plaice, sole and *Nephrops norvegicus*. There are eight *Nephrops* functional units in the North Sea, which are considered as separated stocks. However, only four of these can be assessed through fishery-independent abundance estimates from underwater video surveys, and these were kept as distinct stocks. These cover the stocks along the English and Scottish coast; i.e. FU 6 (Farn Deep), FU 7 (Fladen Ground), FU 8 (Firth of Forth) and FU 9 (Moray Firth). The four other functional units (FU 5, FU 10, FU 32 and FU 33) have no independent abundance estimates.

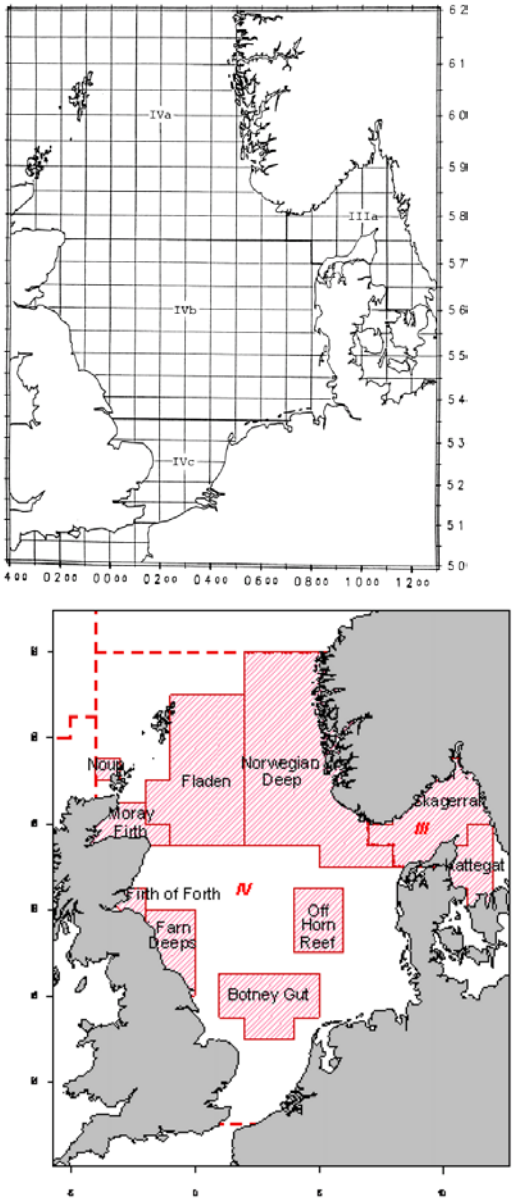


Figure xx.xx Area description for finfish advice and Nephrops Functional Units (FU) in the North Sea and Skagerrak/Kattegat region.

Table XX.XX Nephrops Functional Units (FU) in the North Sea.

FU no.	Name	ICES area	Statistical rectangles
5	Botney Gut - Silver Pit	IVb,c	36-37 F1-F4; 35F2-F3
6	Farn Deeps	IVb	38-40 E8-E9; 37E9
7	Fladen Ground	IVa	44-49 E9-F1; 45-46E8
8	Firth of Forth	IVb	40-41E7; 41E6
9	Moray Firth	IVa	44-45 E6-E7; 44E8
10	Noup	IVa	47E6
32	Norwegian Deep	IVa	44-52 F2-F6; 43F5-F7
33	Off Horn Reef	IVb	39-41E4; 39-41F5

Finfish stocks

Species	ICES single stock advice area
Cod	Subarea IV, Divison VIId and IIIa West (Skagerrak)
Haddock	Subarea IV (North Sea) and Division IIIa West (Skagerrak)
Whiting	IV and VIId
Saithe	Subarea IV, Division IIIa West (Skagerrak) and Subarea VI
Plaice	Sub-area IV
Sole	Sub-area IV

Herring, mackerel and the industrial fisheries (sandeel, Norway pout and sprat) are not considered in a mixed fisheries advice context given the targeted nature of their fleets.

A.2. Fishery

Cod in IIIa – IV – VIId

Cod are caught by virtually all the demersal gears in Sub-area IV and Divisions IIIa (Skagerrak) and VIId, including beam trawls, otter trawls, seine nets, gill nets and lines. Most of these gears take a mixture of species. In some of them cod are considered to be a by-catch (for example in beam trawls targeting flatfish), and in others the fisheries are directed mainly towards cod (for example, some of the fixed gear fisheries). An analysis of landings and estimated discards of cod by gear category (excluding Norwegian data) highlighted the following fleets as the most important in terms of cod for 2003-5 (accounting for close to 88% of the EU landings), listed with the main use of each gear (STECF SGRST-07-01):

- Otter trawl,≥ 120 mm, a directed roundfish fishery by UK, Danish and German vessels.
- Otter trawl, 70-89mm, comprising a 70-79mm French whiting trawl fishery centered in the Eastern Channel, but extending into the North Sea, and an 80-89mm UK Nephrops fishery (with smaller landings of roundfish and angler-fish) occurring entirely in the North Sea.
- Otter trawl, 90-99mm, a Danish and Swedish mixed demersal fishery centered in the Skagerrak, but extending into the Eastern North Sea.
- Beam trawl, 80-89mm, a directed Dutch and Belgian flatfish fishery.
- Gillnets, 110-219mm, a targeted cod and plaice fishery.

For Norway in 2007, trawls (mainly bycatch in the saithe fishery) and gillnets account for around 60% (by weight) of cod catches, with the remainder taken by other gears mainly in the fjords and on the coast, whereas in the Skagerrak, trawls and gillnets account for up to 90% of cod catches.

With regard to trends in effort for these major cod fisheries since 2000, the largest changes in North Sea fisheries have involved an overall reduction in trawl effort and changes in the mesh sizes in use, due to a combination of decommissioning and days-at-sea regulations. In particular 100-119 mm meshes have now virtually disappeared, and instead vessels are using either 120 mm+ (in the directed whitefish fishery) or 80-99 mm (primarily in the Nephrops fisheries and in a variety of mixed fisheries). The use of other mesh sizes largely occurs in the adjacent areas, with the 70-79 mm gear being used in the Eastern Channel/Southern North Sea Whiting fishery, and the majority of the landings by 90-99 mm trawlers coming from the Skagerrak. Higher dis-

cards are associated with these smaller mesh trawl fisheries, but even when these are taken into account, the directed roundfish fishery (trawls with≥ 120 mm mesh) still has the largest impact of any single fleet on the cod stock, followed by the mixed demersal fishery (90-99 mm trawls) in the Skagerrak.

Apart from the technical measures set by the Commission, additional unilateral measures are in force in the UK, Denmark and Belgium. The EU minimum landing size (mls) is 35 cm, but Belgium operates a 40 cm mls, while Denmark operate a 35 cm mls in the North Sea and 30cm in the Skagerrak. Additional measures in the UK relate to the use of square mesh panels and multiple rigs, restrictions on twine size in both whitefish and Nephrops gears, limits on extension length for whitefish gear, and a ban on lifting bags. In 2001, vessels fishing in the Norwegian sector of the North Sea had to comply with Norwegian regulations setting the minimum mesh size at 120 mm. Since 2003, the basic minimum mesh size for towed gears targeting cod is 120 mm.

Haddock in IIIa – IV

The largest proportion of the haddock stock is taken by the Scottish demersal whitefish fleet. This fleet is not just confined to the North Sea, as vessels will sometimes operate in Divisions VIa (off the west coast of Scotland) and VIb (Rockall): it is also a multi-species fishery that lands a number of species other than haddock.

Plaice in IV

The Plaice fishery is dominated by Denmark, with Danish landings usually accounting for 80 to 90% of the total. Landings are taken year round with a predominance of the period from spring to autumn, by Danish seiners, flatfish gillnetters and beam trawlers. Plaice is also caught within a mixed cod-plaice fishery by otter trawlers, and is a by-catch of other gillnet fisheries. Plaice is also caught as by-catch in the directed Nephrops fishery. Most landings come from Skagerrak, along the Danish Northwestern coast close to the North Sea border. The fishery traditionally exploited mostly mature individuals (ages 4 to 6), but the landings proportion of fishes aged 2 and 3 has been increasing since 2000. The TAC is usually not restrictive. The use of beam trawl in the Kattegat is prohibited, but allowed in the Skagerrak. Minimum mesh size is 90 mm for towed gears, and 100 mm for fixed gears. The minimum landing size is 27 cm. Danish fleets are prohibited to land females in area IIIa from January 15th to April 30th.

Saithe in IIIa – IV – VI

Saithe in the North Sea are mainly taken in a direct trawl fishery in deep water along the Northern Shelf edge and the Norwegian Trench. Norwegian, French, and German trawlers take the majority of the catches. In the first quarter of the year the fisheries are directed towards mature fish in spawning aggregations, while concentrations of immature fish (age 3-4) often are targeted during the rest of the year. In recent years the French fishery has deployed less effort along the Norwegian Trench, while the German and Norwegian fisheries have maintained their effort there. A small proportion of the total catch is taken in a limited purse seine fishery along the west coast of Norway targeting juveniles (age 2-4). In the Norwegian coastal purse seine fishery inside the 4 nm limit (south of 62°N), the minimum landing size is 32 cm. For other gears in the Norwegian zone (south of 62°N) the current minimum landing size is 40 cm, while in the EU zone it is 35 cm. In 2008 the landings were estimated to be around 112 000 t in Sub-area IV and Division IIIa, and 7 000 t in Sub-Area VI, which both are well below the TACs for these areas (135 900 and 14 100 t respectively). Sig-

nificant discards are observed only in Scottish trawlers. However, as Scottish discarding rates are not considered representative of the majority of the saithe fisheries, these have not been used in the assessment.

Sole in IV

There is a directed fishery for sole by small inshore vessels using trammel nets and trawls, which fish mainly along the English and French coasts and possibly exploit different coastal populations. Sole represents the most important species for these vessels in terms of the annual value to the fishery. The fishery for sole by these boats occurs throughout the year with small peaks in landings in spring and autumn. There is also a directed fishery by English and Belgian beam trawlers who are able to direct effort to different ICES divisions. These vessels are able to fish for sole in winter before the fish move inshore and become accessible to the local fleets. In cold winters, sole are particularly vulnerable to the offshore beamers when they aggregate in localized areas of deeper water. Effort from the beam trawl fleet can change considerably depending on whether the fleet moves to other areas or directs effort at other species such as scallops and cuttlefish. In France, there are some few small beam trawlers operating inshore in a few local areas, and offshore trawlers fishing for mixed demersal species taking sole as a bycatch.

The minimum landing size for sole is 24 cm. Demersal gears permitted to catch sole are 80 mm for beam trawling and 90 mm for otter trawlers. Fixed nets are required to use 100 mm mesh since 2002 although an exemption to permit 90 mm has been in force since that time.

Whiting in IV – VIId

For whiting, there are three distinct areas of major catch: a northern zone, an area off the eastern English coast; and a southern area extending into the English Channel. In the northern area, roundfish are caught in otter trawl and seine fisheries, currently with a 120 mm minimum mesh size. Some vessels operating to the east of this area are using 130 mm mesh. These are mixed demersal fisheries with more specific targeting of individual species in some areas and/or seasons. Cod, haddock and whiting form the predominant roundfish catch in the mixed fisheries, although there can be important bycatches of other species, notably saithe and anglerfish in the northern and eastern North Sea and of *Nephrops* in the more offshore *Nephrops* grounds. Minimum mesh size in *Nephrops* trawls is 80 mm but a range of larger mesh sizes are also used when targeting *Nephrops*. Whiting is becoming a more important species for the Scottish fleet, with many vessels actively targeting whiting during a fishing trip and Scottish single seiners have been working closer to shore to target smaller haddock and whiting. The derogation in the EU effort management scheme allowing for extra days fishing by vessels using 90 mm mesh gears with a 120 mm square mesh panel close to the codend (a configuration which releases cod) has so far, been taken up by few vessels. Recent fuel price increases and a lack of quota for deepwater species has resulted in some vessels formerly fishing in deepwater and along the shelf edge to move into the northern North Sea with the shift in fishing grounds likely to result in a change in the species composition of their catches from monkfish to roundfish species including whiting.

Whiting are an important component in the mixed fishery occurring along the English east coast. Industry reports suggest better catch rates here than are implied by the overall North Sea assessment. There has been a displacement of some French vessels steaming from Boulogne-sur-Mer from their traditional grounds in the southern

North Sea and English Channel where they have reported very low catch rates during the past two years.

Whiting are a bycatch in some *Nephrops* fisheries that use a smaller mesh size, although landings are restricted through bycatch regulations. They are also caught in flatfish fisheries that use a smaller mesh size. Industrial fishing with small meshed gear is permitted, subject to bycatch limits of protected species including whiting. Regulations also apply to the area of the Norway pout box, preventing industrial fishing with small meshes in an area where the bycatch limits are likely to be exceeded.

WGFTFB (2008) reported use of bigger meshes in the top panel of beam trawler gear by Belgium vessels with an expected reduction in by-catch of roundfish species, especially haddock and whiting. Fluctuations in fuel costs can cause changes in fishing practices. WGFTFB (2008) reported a shift for Scottish vessels from using 100 mm-110 mm for whitefish on the west coast ground (Area VI) to 80 mm prawn codends in the North Sea (area IV), with increased fuel costs considered the major driver.

Nephrops

Nephrops is caught in a mixed fishery which takes a catch consisting of haddock, whiting, cod, anglerfish and megrim as well as *Nephrops*. Most of the catch (approx 21 of 25 thousand tons) is taken by UK. Days at sea limits apply to *Nephrops* trawlers when using mesh sizes 70-99 mm and in 2009, under the Scottish Conservation Credits Scheme (CCS), the number of days available to Scottish vessels is the same as 2008 and 2007.

A small but increasing proportion of the landings from Subarea IV are taken from statistical rectangles outside the defined *Nephrops* FUs. An example is the Scottish fishery at the Devil's hole which a few boats normally fishing the Fladen grounds prosecute for a few months at the end of the year.

A.3. Ecosystem aspects

These are described in the North Sea ecosystem overview in the ICES advisory report.

B. Data

The mixed fisheries assessment is based on catch and effort data that were compiled mostly on the basis of the data collected by STECF for the evaluation of the effort regime. The data structured by fleets and métiers were used as inputs, together with WGNSSK single-stock data and advice, in the integrated Fcube framework.

For haddock, plaice, saithe, sole and whiting, no modifications were needed to incorporate the assessment and forecast inputs into Fcube.

The cod assessment was performed with B-Adapt, which assumed "total removals" consisting of an "overall landings" estimate and a "discards estimates". The use of the reported landings data from the different fleets was therefore not consistent with the assessment data used by B-Adapt. It was decided to raise the reported landings data from the different fleets to "overall landings" estimates, using the catch multiplier from B-Adapt. This multiplier was applied to all fleets.

For *Nephrops* the data collected at ICES and at STECF level until 2009 were not compatible due to differences in aggregation levels. In order to be able to collate both assessment and fleet related data a specific ICES data call was issued for this stock in

2010. This information covers catches and effort exerted by Nephrops functional unit so that stock assessments (analytical for FU's 6-9 and trends based for others) can be incorporated into Fcube.

C. Assessment methodology

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), 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.

Model used:

Fcube

The Fcube model is presented and described in Ulrich *et al.* (2006; 2008; 2009). The basis of the model is to estimate the potential future levels of effort by 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 is in return used to estimate landings and catches by fleet and stock, using standard forecasting procedures.

Partial fishing mortality F and catchability q by fleet Fl, métier m and stock St from observed landings LND, effort E and fishing mortality $Fbar$ are estimated for year Y:

$$F(Fl,m,St,Y) = Fbar(St,Y) * \frac{LND(Fl,m,St,Y)}{LNDtot(St,Y)} \quad (1)$$

$$q(Fl,m,St,Y) = F(Fl,m,St,Y) / E(Fl,m,Y) \quad (2)$$

To estimate future parameters value $q(Fl,m,St,Y+1)$ at year *Y+1* an average over recent years can be used. Alternatively, the user may choose to vary the value of q, if evidence exists of e.g. significant technical creep, or of a change in selectivity due to a change in mesh size.

The observed distribution of effort by fleet across métiers is estimated:

$$Effshare(Fl,m,Y) = E(Fl,m,Y) / E(Fl,Y) \quad (3)$$

As with catchability, the simplest approach to the forecast effort distribution $Effshare(Fl,m,Y+1)$ would be to estimate it from an average of past observed ef-

fort allocation. Alternatively, a more complex approach such as a behaviour algorithm could be used if available.

These variables are then used for the forecast estimates of catchability by stock for each fleet. This catchability cannot be directly estimated from observed data, as it is linked to the flexibility of the fleet. While catchability by métier is assumed to be measurable as being linked to the type of fishing, the resulting catchability by fleet varies with the time spent in each métier. The catchability of a fleet is thus equal to the average catchability by métier weighted by the proportion of effort spent in each métier for the fleet:

$$q(Fl, St, Y+1) = \sum_{m} q(Fl, m, St, Y+1) * Effshare(Fl, m, Y+1) \qquad (4)$$

A TAC is usually set in order to achieve a specific fishing mortality. This might be a particular short-term target, such as Fpa, or specific reduction in F as part of a longer-term management plan. This intended F is converted into forecast effort by fleet. This step is rather hypothetical, in that it introduces the concept of "Stock dependent fleet effort". The "stock-dependent fleet effort" is the effort corresponding to a certain partial fishing mortality on a given stock, disregarding all other activities of the fleet. The total intended fishing mortality *Ftarget(St)* is first divided across fleet segments (partial fishing mortalities) through coefficients of relative fishing mortality by fleet. These coefficients are fixed quota shares estimated from observed landings. In principle, these reflect the rigid sharing rules resulting from the principle of relative stability, combined with national processes of quota allocation across fleets. The simplest approach is thus to estimate these from observed mean proportions of landings by fleet. The resultant partial fishing mortalities are subsequently used for estimating the stock-dependent fleet effort:

$$F(Fl, St, Y+1) = Ftarget(St, Y+1) * QuotaShare(Fl, St) \qquad (5)$$
$$E(Fl, St, Y+1) = F(Fl, St, Y+1) / q(Fl, St, Y+1)$$

The final input required is the effort by each fleet during the forecast year. It is unlikely that the effort corresponding to each single-species TAC will be the same across fleets, and it is equally possible that factors other than catching opportunities could influence the amount of effort exerted by a given fleet. Rather than assume a single set of fleet efforts, the approach used in practice with Fcube has been to investigate a number of different scenarios about fleet effort during the forecast period. The user can thus explore the outcomes of a number of options or rules about fleet behaviour (e.g. continue fishing after some quotas are exhausted) or management scenarios (e.g. all fisheries are stopped when the quota of a particular stock is reached).

$$E_{Fl,Y} = rule(E_{Fl,St1,Y}, E_{Fl,St2,Y}, E_{Fl,St3,Y} \ldots)$$

For example, if one assumes that fishermen continue fishing until the last quota is exhausted, effort by fleet will be set at the maximum across stock-dependent effort by fleet ("max" option). Overquota catches of species which quota were exhausted before this last one, are assumed to be discarded.

$$E(Fl, Y+1) = MAX_{St}[E(Fl, St1, Y+1), E(Fl, St2, Y+1), \ldots] \qquad (6)$$

As a contrast, a more conservative option would be to assume that the fleets would stop fishing when the first quota is exhausted, and thus would set their effort at the minimum across stocks ("min" option). Alternatively, management plans for a particular stock could be explored, with the fleets setting their effort at the level for this stock ("stock_name" option). Different rules could also be applied for the various fleets.

The following options are explored:

1) **min**: The underlying assumption is that fishing stops when the catch for the first quota species meets the upper limit corresponding to single stock exploitation boundary for agreed management plan or in relation to precautionary limits.

2) **max**: The underlying assumption is that fishing stops when the last quota species is fully utilised with respect to the upper limit corresponding to single stock exploitation boundary for agreed management plan or in relation to precautionary limits.

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

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

5) **Ef_Mgt**: The effort in métiers using gear controlled by the EU effort management regime have their effort adjusted according to the regulation (see Council Regulation (EC) No 1342/2008).

Finally, this resulting effort by fleet is distributed across métiers, and corresponding partial fishing mortality is estimated.

$$E(Fl,m,Y+1) = E(Fl,Y+1) * Effshare(Fl,m,Y+1) \quad (7)$$
$$F(Fl,m,St,Y+1) = q(Fl,m,St,Y+1) * E(Fl,m,Y+1)$$

Partial fishing mortalities are summed by stock, and then used in standard forecast procedures similar to the ones used in the traditional single-species short-term advice. Corresponding landings are estimated and compared with the single-species TAC.

Software used:

The Fcube model has been coded as a method in R (R Development Core Team, 2008), as part of the FLR framework (Kell et al., 2007, www.flr-project.org). Input data are in the form of FLFleets and FLStocks objects from the FLCore 2.2 package, and two forecast methods were used, stf() from the FLAssess (version 1.99-102) and fwd() from the Flash (version 2.0.0) packages. As such, the input parameterisation as well as the stock projections are made externally using existing methods and packages, while only steps 4 to 6 are internalised in the method, thus keeping full transparency and flexibility in the use of the model.

D. Short-Term Projection methodology

Model used:

Overview of software used by WGNSSK.

Species	Assessment	Forecast
HADDOCK IV, IIIa and VIIb	FLR 1.4, FLXSA	MFDP
COD IV, IIIa and VIIb	Stochastic B-ADAPT	Stochastic B-ADAPT
PLAICE IV	FLR 2.x, FLXSA	FLR2.x, FLSTF
WHITING IV and VIId	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
NEPHROPS UWTV	none	none

In the mixed-fisheries runs, all forecasts were done with the same FLR forecasts method (see section C).

For every scenario, the following output is generated per stock:

	Description	Landings	F mult	SSB
Baseline forecast for current year	Applying single species forecast assumptions to last year's data (current year – 1)*	Current yr	Current yr	1st Jan TAC yr
Baseline forecast for TAC year	Applying single species HCRs** to current year results*	TAC yr	TAC yr	1st Jan TAC yr + 1
Current year Fcube results	Applying Fcube to last year's data	Current yr	Current yr	1st Jan TAC yr
Fcube estimate of catches in TAC year	Applying Fcube on current year Fcube results	TAC yr	TAC yr	1st Jan TAC yr + 1
TAC advice results (incl mgt plans)	Applying single species HCRs** to 2009 Fcube results	TAC yr	TAC yr	1st Jan TAC yr + 1

*** For the Baseline runs, a forecast was run for each stock separately following the same settings as in the ICES single species forecast.**

**** Harvest Control Rules – either from single species management plans or with reference to the precautionary approach.**

The following overview table will be produced to be able to judge the relevance of the different scenarios:

		COD HAD PLE POK SOL WHG NEP5 NEP6 NEP7 NEP8 NEP9 NEP10 NEP32 NEP33
Current year	Fbar FmultVsF(current-1) Landings SSB	
Current year + 1	Fbar FmultVsF(current-1) Landings SSB	
Current year + 2	SSB	

G. Biological Reference Points

The biological reference points that are used are the same values as referred to in the single stock advisory reports.

H. Other Issues

-

I. References

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Ulrich, C., Reeves, S.A., and S.B.M. Kraak (2008) Mixed Fisheries and the Ecosystem Approach. ICES Insight 45:36-39

Annex 5: Draft terms of reference for establishing WGMIXFISH

The **Working Group on Mixed Fisheries Advice for the North Sea** [WGMIXFISH] (Chair: S. Holmes, UK) will meet at ICES HQ, Copenhagen, Denmark from 31 August – 3 September 2010 to:

a) carry out mixed demersal fisheries projections for the North Sea taking into account the single species advice for cod, haddock, whiting, saithe, plaice, sole and *Nephrops norvegicus* that is produced by ACOM in June 2010, and the management measures in place for 2010;

b) update the mixed fisheries annex for the North Sea based upon the format provided by AGMIXNS; and

c) produce a draft mixed-fisheries section for the ICES' advisory report 2010 that includes a dissemination of the fleet and fisheries data and forecasts based upon the format provided by AGMIXNS.

WGMIXFISH will report by 10 September 2010 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:	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. 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. The new working group will be tasked with applying the mixed fisheries forecasts to the North Sea advice that is approved and released by ACOM.
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. The participants from the last WKMIXFISH meeting held in August 2009 are encouraged to attend; namely, Clara Ulrich (Denmark), Irene Huse (Norway), Stuart Reeves (UK), Willy Vanhee (Belgium) and Youen Vermard (France).
Secretariat facilities:	Meeting facilities, production of report.
Financial:	None
Linkages to advisory committees:	ACOM
Linkages to other committees or groups:	SCICOM through the WGMG.
Linkages to other organizations:	This work serves as a mechanism in fulfilment of the MoU with EC and fisheries commissions.

Annex 6: Recommendations

RECOMMENDATION	FOR FOLLOW UP BY:
1. ICES should send out a data call to be fulfilled by the end of June 2010 requesting catch (both landings and discards) and effort data for the years 2003-2009. Proposed format as specified in the Annex 2 of this report.	ICES' secretariat
2. WKMIXFISH should become an ICES' working group [WGMIXFISH] under the chairmanship of Steven Holmes (UK) and meet for four days on 31 August – 3 September 2010 to undertake mixed fisheries projections for the North Sea. Draft terms of reference are given in Annex 5 of this report.	ACOM
3. An ACOM review group should work during the period 13-17 September 2010 to review the work of WGMIXFISH.	ACOM leadership
4. An ACOM advice drafting group should work during the period 20-24 September 2010 using the report from WGMIXFISH.	ACOM leadership
5. ICES will need to solicit input from the EC and Norway.	ACOM Chair