

**A case study review of the potential economic implications of the proposed CFP landings obligation**



**Final Report**

**Prepared by**



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## EXECUTIVE SUMMARY

### Introduction

The reform of the Common Fisheries Policy (CFP) introduces a landing obligation to eliminate discarding. The objective of this research, requested by the UK Discard Action Group (convened by Seafish) was to determine the potential economic implications of this discards ban on selected case study UK fleets through establishing:

1. How would the landing obligation affect fleet economic performance?
2. At fleet level, and given current discards, what would the quota requirements amount to?
3. Are there 'choke' species that could limit operations of the fleet?

To answer the above questions an economic model was developed using:

- Fleet economic performance;
- Landings data;
- Discard rates observed in the fisheries; and
- Quota allocation use by Producer Organisation statistics.

The above data were applied to three case study fleets (Irish Sea *Nephrops*, North Sea mixed whitefish and North Sea *Nephrops*) for the three most recent years (2010, 2011 and 2012) wherever available to determine the impact of various potential landing obligation elements on the case study fleets compared to the status quo.

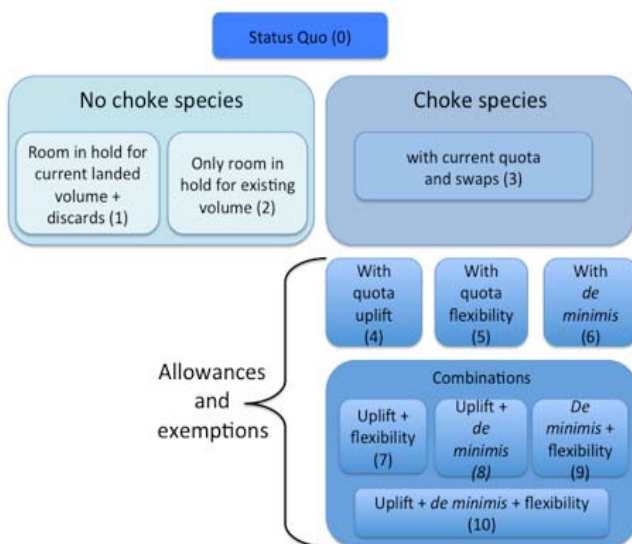


Figure A: Scenarios explored in the discards model

The model is retrospective: it considers the economic implications of the discard ban for specific fleets. It identifies likely 'choke' species and estimates how these may affect fleet economic performance with the various allowances and exemptions being proposed in the landing obligation. Management authorities are expected to adopt a variety of these measures to help mitigate the economic impact of the discard ban.

The model is not predictive: it does not explore changes in behaviour that may occur with the introduction of the landing obligation (changes to selectivity, fishing patterns, etc.). Catch quota trials by MMO and Marine Scotland investigate this further.

The coping strategies employed by individual vessel owners will be dependent on their specific quota holdings, which vary enormously from vessel to vessel.

The details and interpretation of provisions for a landing obligation as outlined in the current draft CFP regulation, may not be clarified or tested before the implementation of discard management plans. Various assumptions are made within the model as a result of these continued uncertainties.

Consultations with relevant industry contacts were important to ground-truth some of the assumptions within the model, and to identify additional potential impacts of the landings obligation on the sector. These are further described in section 6 of the report, but include:

- **Quota management:** Will a phased introduction mean the ‘target species’ retained in some fisheries is still discarded in others? How will uplift be applied? How will the quota market react?
- **Handling, sorting and storing:** the additional effort and costs incurred for unwanted by-catch at sea and ashore.
- **Gear selectivity:** How to further reduce unwanted catch without losing wanted catch
- **Compliance:** the introduction of Fully Documented Fisheries (FDF) to enforce the landing obligation.

These aspects are outside the scope of this research, but remain significant concerns for the industry.

## Results

### *Irish Sea Nephrops Trawl Fleet*

The key ‘choke’ species for the Irish Sea *Nephrops* trawl fleet, i.e. where available quota is not sufficient to cover discards, is **whiting**, allowing only around 10 fishing days at estimated average discard rates before all UK VIIa whiting quota is used up.

Quota swaps and quota uplift/increases (increasing current quota levels to include discards) would not provide a complete solution. This is primarily due to the very low whiting TAC compared to other species being targeted. Quota would need to be provided for more than 75% of current whiting discards if the fleet is to remain viable.

The provision for a *de minimis* element to the discards ban is important for the Irish Sea *Nephrops* fleet where juvenile whitefish are still retained in ‘highly selective’ gear. The sorting to species level to enable allocation of quota would result in additional crew being required, which could be deemed a disproportionate cost.

However even if *de minimis* is interpreted as 5% of TAC, as the overall EU VIIa whiting quota is 84 tonnes, only 2 additional fishing days would be provided, creating an unviable situation for the existing fleet.

A ‘flexibility’ allowance enabling up to 9% of target quota to be used for unwanted catch would enable the current Irish Sea *Nephrops* trawl fleet to remain viable and continue to fish for 130 days on average (i.e. 95% of the 2012 average for the fleet of 137 days) with 552 tonnes of *Nephrops* quota being caught as whiting (and some secondary choke species). However, quota flexibility is dependent upon the non-target stock being within safe

biological limits. Whiting is assessed as a data limited stock with ICES advising lowest possible catch for 2014 (ICES, 2013). The likelihood of *Nephrops* being able to be used for whiting by-catch therefore appears highly unlikely.

Developing and implementing gear with the selectivity characteristics to avoid the main choke species (whiting), while maintaining current selectivity (cod-avoidance), should be a priority for the Irish Sea *Nephrops* trawl fleet.

### ***North Sea mixed whitefish Fleets***

To date improved gear selectivity has focused on cod, however the discard ban will require the North Sea mixed whitefish fleet to consider numerous other whitefish as potential choke species; hake & saithe in particular. A balance is required as further gear selectivity risks losing target species such as haddock; an important component of the catch.

The continuation of current swaps for choke species such as hake is critical for the viability of the North Sea whitefish trawl fleets under a landing obligation, as UK hake quota would be exhausted after an average of 29 days based on recent discard rates.

The expected levels of uplift as proposed by ICES advice would ensure continued viable fleet operations. However no advice is currently given for the identified choke species of hake and saithe, making assumptions about the extent of uplift even more uncertain.

A substantial increase in quota requirements is expected as a result of the landing obligation, increasing lease costs by more than 5 times current amounts. The overall cost increase could be even more significant as the lease price may be expected to increase with greater demand, and a reduced willingness of other fleets and Member States to swap/lease quota given increased requirements of their own.

With current swaps, the North Sea whitefish fleet would be able to continue operating profitably using the potential exemptions and flexibilities. However the model does not take size grades into account. As smaller, less valuable grades may be landed under the obligation, the profitability of these mixed North Sea fisheries could be negatively impacted. Future iterations of the model could include consideration of size grade.

### ***North Sea Nephrops fleet***

To date improved gear selectivity has focused on cod, however the discard ban will require the *Nephrops* trawl fleet to consider numerous other whitefish as potential choke species: hake, saithe, haddock and whiting.

Expected levels of uplift based on ICES advice would enable continued viable fleet operations. However no advice is currently given for the identified choke species of hake and saithe, making assumptions about the extent of uplift even more uncertain.

The continuation of current swaps for choke species such as hake is critical for the viability of the North Sea *Nephrops* trawl fleets under a landing obligation as UK hake quota would be exhausted after an average of 28 days.

A substantial increase in quota requirements (2.5 times current lease costs) is expected due to the landing obligation. The overall cost increase could be even greater as the lease price may be expected to increase with greater demand.

The interpretation of *de minimis* is critical; if 5% of total catch, fishing could continue with 80% of current fishing days; if 5% of Member State TAC, only 47% of current fishing days would be possible.

With current swaps and the potential exemptions and flexibilities, the North Sea Nephrops fleet would be able to continue operating albeit with reduced profitability.

### **Recommendations**

Accessing additional quota is critical to the implementation of the discards ban. Under a discards ban there is no certainty that the quota lease market or international swap arrangements will operate in the same manner. Mechanisms should be explored to ensure the trade in quota and international swaps continue.

The model results are based on reported discard rates between 2010 and 2012. Outcomes would be substantially improved with lower discard levels. Gear development focused on identified choke species should be a priority to reduce their impact.

Research on survival and the evidence required to apply *de minimis* (catch differentiation and disproportionate cost) should be a priority.

The model can be used to identify priority issues for specific fisheries and can be applied to other fleets if the necessary data on landings, discard levels and cost & earnings are available.

The size grade of fish determines price and so profitability. The change in landed size grades may be critical to mixed whitefish fisheries and this aspect could be incorporated into future iterations of the model.

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## Acronyms

AFBI	Agri-Food Biosciences Institute
CEFAS	Centre for Environment Fisheries and Aquaculture Science
CFP	Common Fisheries Policy
CPUE	Catch Per Unit Effort
DAG	Discard Action Group
DEFRA	Department of Environment, Food and Rural Affairs
FDF	Fully Documented Fisheries
ICES	International Council for Exploration of the Seas
MLS	Minimum Landing Size
MMO	Marine Management Organisation
MSY	Maximum Sustainable Yield
PO	Producer Organisation
TAC	Total Allowable Catch

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## 1. INTRODUCTION

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### 1.1 INTRODUCTION AND BACKGROUND

The proposed reform of the Common Fisheries Policy (CFP) introduces a number of key Articles in the regulation that are focused on the gradual introduction of landings obligations with the elimination of discarding being the intended effect. At the time of writing the CFP reform regulation is not finalised, but further details associated with the landing obligation were agreed in October 2013<sup>1</sup> on the basis that:

*“Measures are needed to reduce the current high levels of unwanted catches and gradually eliminate discards....An obligation to land all catches of species which are subject to catch limits...should be established and gradually implemented and rules that have so far obliged fishermen to discard should be repealed..”*

The UK Discard Action Group (DAG) requested Seafish to commission research into the potential economic implications of the landing obligation on parts of the UK fishing fleet.

### 1.2 OBJECTIVES OF THIS RESEARCH

The objective of the research is to gain a better understanding of the likely and potential economic impacts of the discards ban on selected case study UK fleets.

This output intends to answer the following questions for the trawl fleets in the case study fisheries:

4. How would the landing obligation affect fleet economic performance?
5. At fleet level, and given current discards, what would the quota requirements amount to?
6. Are there ‘choke’ species that could limit operations of the fleet?

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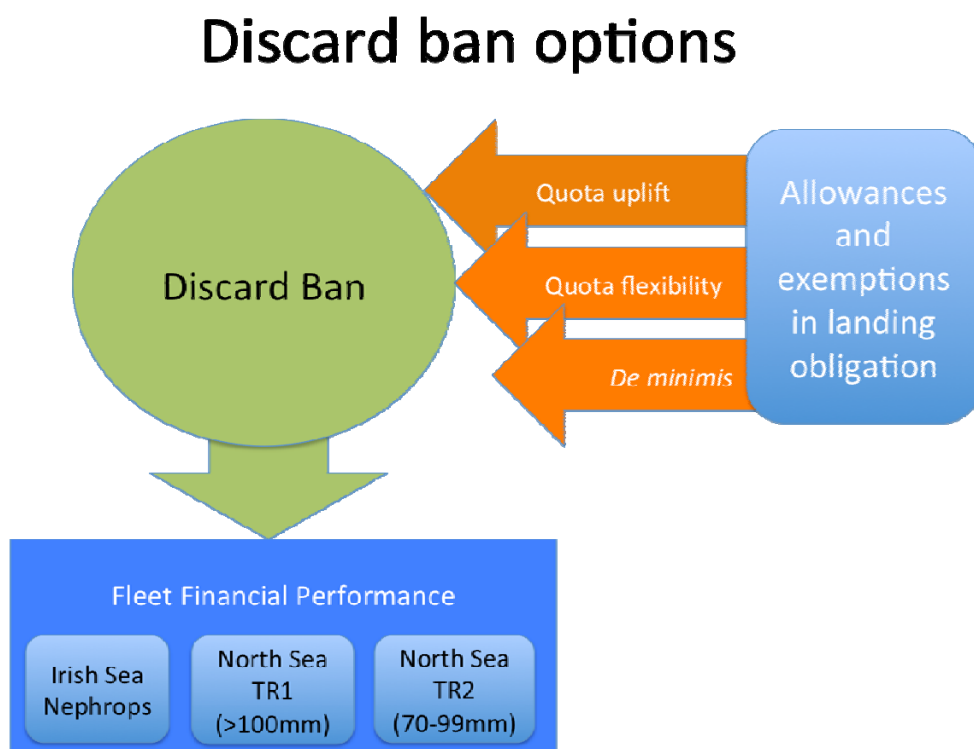
<sup>1</sup> Position of the Council at first reading with a view to the adoption of a Regulation of the European Parliament and of the Council on the Common Fisheries Policy, amending Council Regulations No EC 1954/2003 and EC No 1224/2009 and repealing Council Regulations EC No 2371/2002, No 639/2004 and Council Decision EC No 2004/585. October, 2013.

## 2 APPROACH

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The research questions are addressed through the development of a model that applies different implementation scenarios to fleet economic performance. The model explores these aspects within defined scenarios to assess their impacts on key costs/earnings variables on three case study fleets:

- Irish Sea *Nephrops* trawl (80-99mm mesh size);
- North Sea mixed whitefish trawl (TR1 gear, >100mm mesh); and
- North Sea *Nephrops* trawl (TR2 gear, 70-99mm).



**Figure 1 Schematic illustrating approach to modelling discard ban options**

The model incorporates analysis of available data provided by the Seafish Economics Unit, the Marine Management Organisation (MMO) and the Department for Agriculture and Rural Development in Northern Ireland (DARD NI) on:

- Fleet economic performance (Source: Seafish economics);
- Landings data (Source: MMO);
- Discard rates observed in the fisheries (Source: DARDNI, CEFAS, Marine Scotland); and
- Quota allocation use by Producer Organisation statistics (Source: MMO).

The above data were used for the three most recent years (2010, 2011 and 2012) wherever available and combined with that same years' cost and earnings data<sup>2</sup> to determine the impact of various potential landing obligation elements on the case study fleets, compared to the status quo.

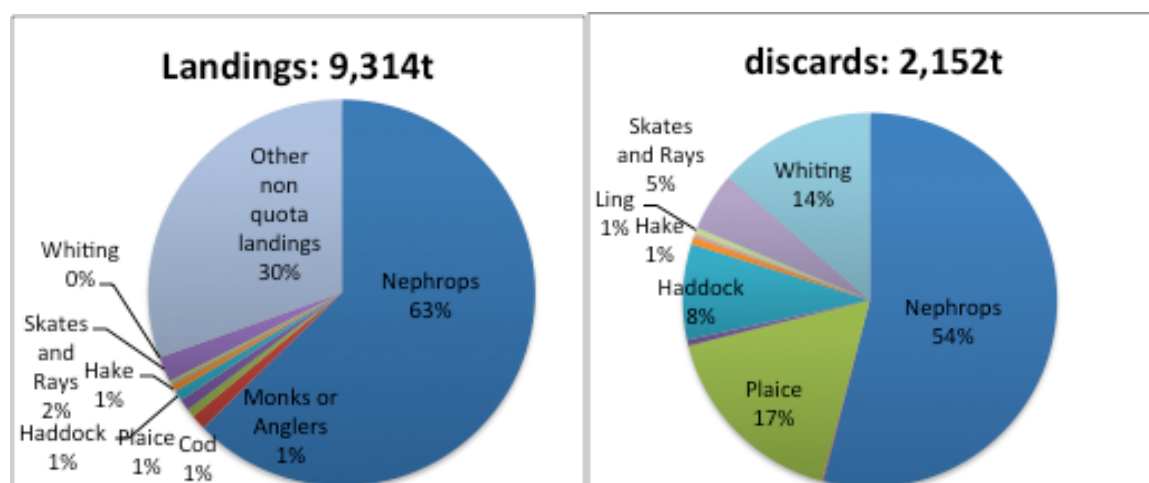
Consultations with relevant industry contacts have been used to ground-truth certain assumptions within the model, and to identify additional potential impacts of the discards ban on the sector (see section 6). This enabled the development of a model to quantify the impacts of various elements of the landing obligation and highlight priority areas to minimise the negative economic consequences of the discard ban for the case study fleets.

## 2.1 CASE STUDIES

A case study approach was adopted using available data on the Irish Sea *Nephrops* trawl fleet, and two North Sea fleet segments: mixed whitefish trawl (TR1 gear, >100mm mesh), and the *Nephrops* trawl (TR2 gear, 70-99mm).

### 2.1.1 Irish Sea *Nephrops* trawl

The *Nephrops* ('prawn') fishery is the largest and most valuable fishery in the Irish Sea and the mainstay of Northern Ireland's (NI) fishing industry. In a Northern Ireland over 10m fleet of 149 vessels in 2012, an estimated 99 vessels were *Nephrops* trawlers. The Northern Ireland fleet has a very high dependence on *Nephrops*, which between 2006 and 2010 represented an average of 42% of total fleet landings by volume and 69% by value (Poseidon, 2012). In 2012 the fleet landed 5,800t of *Nephrops*, 645t of quota species and 2,800t of non-quota species (9,314t in total, valued at £19.6m). Discards by the fleet in 2012 were estimated to total 2,152t based on AFBI data. Vessels in the fleet an average of 137 days per year.



**Figure 2 Irish Sea *Nephrops* landings (left) & discards (right) composition in 2012 (Source: MMO, AFBI)**

Most vessels in Northern Ireland's *Nephrops* trawl fleet are members of one of two Producer Organisations: the Anglo-Northern Ireland Fish Producers Organisation (ANIFPO)

<sup>2</sup> An exception being discard data in the 2012 Irish Sea 2012 model where an average of the 2008-2011 data was used.

or the Northern Ireland Fish Producers Organisation (NIFPO). The *Nephrops* trawl fleet also accounts for the great majority (over 80%) of UK fishing effort in the Irish Sea. Consequently the Irish Sea quota allocation and use data as reported by the MMO can be assumed to relate primarily to this fleet<sup>3</sup>.

Current discard rates are available from data collated via on-board observers and self-sampling (Table 1). Discard rates of cod by the *Nephrops* fleet were low in 2008 and 2009 (0.4% and 5% respectively), but higher rates were observed in 2010 (48%) and 2011 (11%). Species with poor selection such as *Nephrops* and flatfish have not shown any decrease in discard rates, and discard rates for whiting and haddock remain high at around 99% and greater than 70%, respectively.

Discarding of cod, haddock and whiting are predominantly of juvenile fish (based on length frequency distributions), with the notable exception of cod in 2010. The levels of discarding fluctuate with recruitment levels and to a lesser extent with changes in fishing patterns. There is very little evidence of marketable size haddock and whiting being discarded.

Discard rates of marketable size cod showed a marked increase based on sampling in 2010. This was only observed in quarter 1 of the year, during the spawning season when cod were on the *Nephrops* grounds and were discarded due to individual vessel quota restrictions.

Discard rates for *Nephrops* are market driven as the minimum landings size is low and depends on crew selection.

**Table 1: Average discard rates in the Northern Ireland fleet 2008-2011**

	<b>Average discard rate</b>	<b>Average % above MLS</b>
Cod	11%	34%
Haddock	69%	4%
Whiting	99%	4%
Plaice	85%	unknown
Anglerfish	2%	unknown
Hake	22%	unknown
Sole	15%	unknown
<i>Nephrops</i>	17%	unknown
<b>Total</b>	<b>36%</b>	unknown

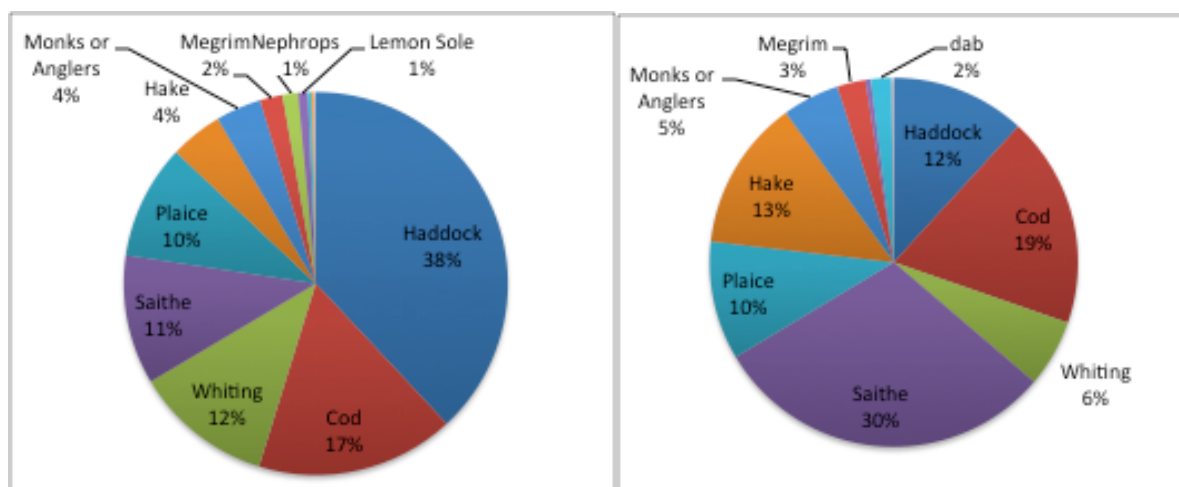
Source: Agri-Food Biosciences Institute (AFBI)

### 2.1.2 North Sea mixed whitefish trawl (TR1) fleet

Since the introduction of the cod recovery plan, fleet segments have often been described and managed in relation to whether the fishing gear deployed by the vessels is used to target whitefish (including cod) or not. Therefore the North Sea mixed whitefish trawl fleet is fishing with 100mm+ trawl gear targeting whitefish. Haddock, cod, whiting and saithe are the main landed and discarded species. In 2012 there were 124 UK vessels within this segment according the Seafish cost and earnings data. Over the last 3 years they fished an

<sup>3</sup> There are also a small number of English *Nephrops* trawlers operating in Area VIIa.

average of 165 days at sea. Total landings by the UK North Sea TR1 fleet totalled 63,845t in 2012 valued at £94m. Discards by the fleet in 2012 were estimated to total 21,730t based on STECF data.



**Figure 3 North Sea mixed demersal trawl (TR1) fleet landings (left) & discards (right) composition in 2012 (Source: MMO, STECF)**

Table 2 presents the average discard rate per species for UK TR1 gear in the North Sea as reported to STECF. The table illustrates the wide variation in discard rates observed as there are numerous market, management and natural variables that influence discarding in the fishery. When compared to the *Nephrops*-targeted TR2 gear, however, the larger mesh size of the TR2 gear does show lower discard levels. The proportion of catch below MLS is also far lower in this TR1 fishery with 100mm+ mesh sizes compared to the TR2 fisheries. Recent catch quota trials reported that around 6% of cod in 100-120mm mesh trawls were below MLS and this decreased to 0.5% with 120mm+ mesh<sup>4</sup>.

<sup>4</sup> Marine Management Organisation (2013). Catch Quota Trials 2012: Final report. Available from [www.marinemanagement.org.uk/fisheries/management/quotas\\_cqt.htm](http://www.marinemanagement.org.uk/fisheries/management/quotas_cqt.htm)

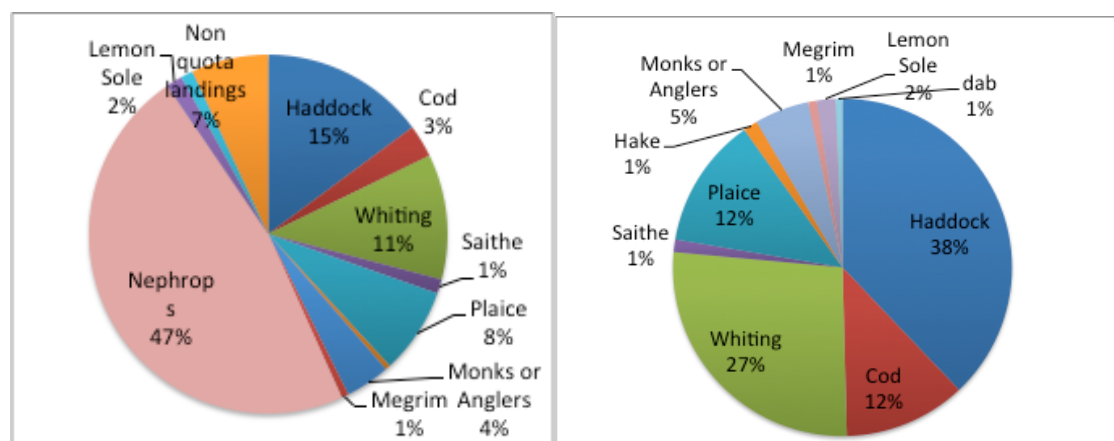
**Table 2: Average discard rates in the North Sea mixed whitefish trawl (TR1) fleet 2010-2012**

Species	Average discard rate		
	2010	2011	2012
COD	19%	11%	17%
DAB	18%	60%	89%
HADDOCK	14%	15%	5%
HAKE	25%	3%	45%
LEMON SOLE	1%	5%	9%
LING	69%	8%	6%
NEPHROPS	4%	0%	0%
PLAICE	9%	9%	16%
SAITHE	12%	18%	42%
TURBOT	0%	0%	0%
WHITING	31%	13%	8%
WITCH	7%	8%	3%
Average	19%	12%	18%

Source: the Scientific Technical and Economic Committee for Fisheries (STECF)

### 2.1.3 North Sea *Nephrops* trawl (TR2) fleet

The North Sea TR2 fleet operates trawl gear with a mesh of 70-99mm and is targeting *Nephrops*. This is shown in the figure below, which also illustrates that a significant bycatch of whitefish is landed and discarded in the fishery. In 2012 there were 179 UK vessels in the fleet (Seafish cost and earnings data). Over the last 3 years the *Nephrops* trawl fleet fished an average of 147 days at sea. Total landings by the UK North Sea TR2 fleet totalled 18,323t in 2012 valued at £46m. Discards by the fleet in 2012 were estimated to total 8,480t based on STECF data.



**Figure 4 North Sea *Nephrops* trawl (TR2) fleet landings (left) & discards (right) composition in 2012 (Source: MMO, STECF)**

Table 3 presents the average discard rates for quota species based on STECF data, showing a significantly higher discard rate than the TR1 fishery, which would be expected with the smaller mesh sizes of 80-100mm in use in the TR2 fishery. As Figure 4 illustrates, discards

are not of the target species, *Nephrops*, but of various whitefish (mainly haddock, whiting, cod and plaice) with a significant proportion below the MLS.

**Table 3: Average discard rates in the North Sea *Nephrops* trawl (TR2) fleet 2010-2012**

Species	Average discard rate		
	2010	2011	2012
COD	64%	76%	79%
DAB	76%	73%	61%
HADDOCK	66%	70%	51%
HAKE	1%	0%	62%
LEMON SOLE	14%	9%	24%
LING	1%	0%	0%
NEPHROPS	0%	0%	0%
PLAICE	22%	44%	32%
SAITHE	34%	79%	19%
TURBOT	2%	1%	1%
WHITING	64%	61%	48%
WITCH	1%	7%	17%
Average	27%	36%	26%

Source: STECF

### 3 CFP REFORM LANDING OBLIGATION DETAILS

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In this section we highlight a few important aspects of the CFP reform text<sup>5</sup>, of relevance to the landing obligation/discard ban, and therefore to the model constructed.

#### 3.1 LANDING OBLIGATION

Article 2 of the CFP reform regulation states that the CFP shall “gradually eliminate discards on a case by case basis and taking into account the best available scientific advice by reducing unwanted catches and gradually ensuring that all catches are landed”. Article 15 details that this will apply to “All catches subject to catch limits and in the Mediterranean also catches subject to minimum landing sizes...” It goes on to detail specific fisheries and timelines for introduction:

Landing obligations for all quota species are specified as follows:

- From 1<sup>st</sup> January 2015 in pelagic fisheries;
- From 1<sup>st</sup> January 2016 for “species defining the fishery” and all other species no later than 1 January 2019 in other UK fisheries.

Details of the discard ban will be included Multi- Annual Plans (MAPs). These may be regionally agreed plans as defined in Article 18 (Regionalisation) of the CFP regulation. Details can include:

- Any specific provisions needed;
- Provisions on documentation;
- Minimum conservation reference sizes (below which fish cannot be used for human consumption); and
- Limited exemptions.

The above suggests that the ambiguities surrounding the current details of the landing obligation will be debated and agreed between Member States ahead of the timing for implementing the landing obligation.

The reform text provides for a number of possible exemptions from the landing obligation as follows

- Species for which fishing is prohibited;
- Species for which scientific evidence demonstrates high survival rates;
- Catches under *de minimis* exemptions (see below)

Currently there is no agreement on what proportion of live returns would constitute a ‘high survival rate’ or what evidence would be acceptable in determining survival rates.

In the context of the model, we have assumed that skates and rays may be viewed as complying with this condition, but this is not certain. As quota species they are therefore included in the model, but in any case they are not expected to be critical choke species.

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<sup>5</sup> <sup>5</sup> Position of the Council at first reading with a view to the adoption of a Regulation of the European Parliament and of the Council on the Common Fisheries Policy (October,2013)



### 3.2 DE MINIMIS EXEMPTION

Up to 5% of total annual catches\* of all species subject to an obligation to land may be included under a *de minimis* exemption (7% in years one and two of a landing obligation, 6% in years three and four), where either:

- i) Scientific evidence shows selectivity is difficult; or
- ii) There are disproportionate costs in switching to more selective fishing gear.

The article states that portions of the catch meeting either of the above criteria would not be counted against quotas, but would need to be fully recorded.

The exemption would be invoked, with further detail, through MAPs or other “Discard Plans” but if none of these are agreed, the Commission shall adopt exemptions (no more than 5% of total annual catches) by means of delegated acts.

There are a number of ambiguities associated with this exemption. Critically, recent discussions at a European level suggest that the *de minimis* limit is for 5% of the Member States Total Allowable Catch (TAC) for a given species (i.e. 5% of its quota) rather than 5% of the Member State’s total catch. The implications of this different interpretation are explored in the results.

Exactly what constitutes scientific evidence and what is considered disproportionate cost are both yet to be clarified and may be left to the individual Member States or the relevant bodies drawing up the discard plans to propose and or define.

### 3.3 QUOTA FLEXIBILITY

The latest agreed text states: “An ultimate option should consist in counting by-catch species against the quota of the target species, depending on the conservation status of the by-catch species.”

There is therefore a provision to enable the counting of unwanted catch against up to 9% of target quota, where the non-target stock is within ‘safe biological limits’.

It is yet to be clarified whether this 9% provision can be applied across all by-catch species or to specific by-catch components. In this analysis we assume that quota flexibility *can* be applied to specific catch components (i.e. the choke species) and that ‘within safe biological limits’ means above  $B_{lim}$ <sup>6</sup>. However there are several stocks for which  $B_{lim}$  is not defined.

### 3.4 QUOTA UPLIFT

The latest agreed text for the CFP regulation states in Article 16: “.When the landing obligation in respect of a fish stock is introduced, fishing opportunities shall be fixed taking into account the change from fixing fishing opportunities that reflect landings to fixing

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<sup>6</sup>  $B_{lim}$  is defined as the biological limit reference point for Spawning Stock Biomass

fishing opportunities that reflect catches, on the basis of the fact that, for the first and subsequent years, discarding of that stock will no longer be allowed.”

There is therefore an expectation that under the landing obligation, the quota for a number of stocks will experience an ‘uplift’ as the discards component can be included in what would become a catch quota rather than the current landings quota. ICES has provided advice on what a total catch may amount to for some, but not all, quota species in the North Sea. Where available these uplifts have been included in the model.

There is a year-to-year flexibility to “bank” or “borrow” up to 10% of quota. As the model is applied to the situation in individual years, this element is not included in the model.

## **4 MODEL SCENARIOS & ASSUMPTIONS**

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### **4.1 THE MODEL**

The model is retrospective: it considers the economic implications of the discard ban for specific fleets in each of the years considered (2010, 2011 and 2012). It identifies likely 'choke' species and estimates how these may affect fleet economic performance with the various allowances and exemptions being proposed in the landing obligation. Management authorities are expected to adopt a variety of these measures to help mitigate the negative economic consequences of the discard ban.

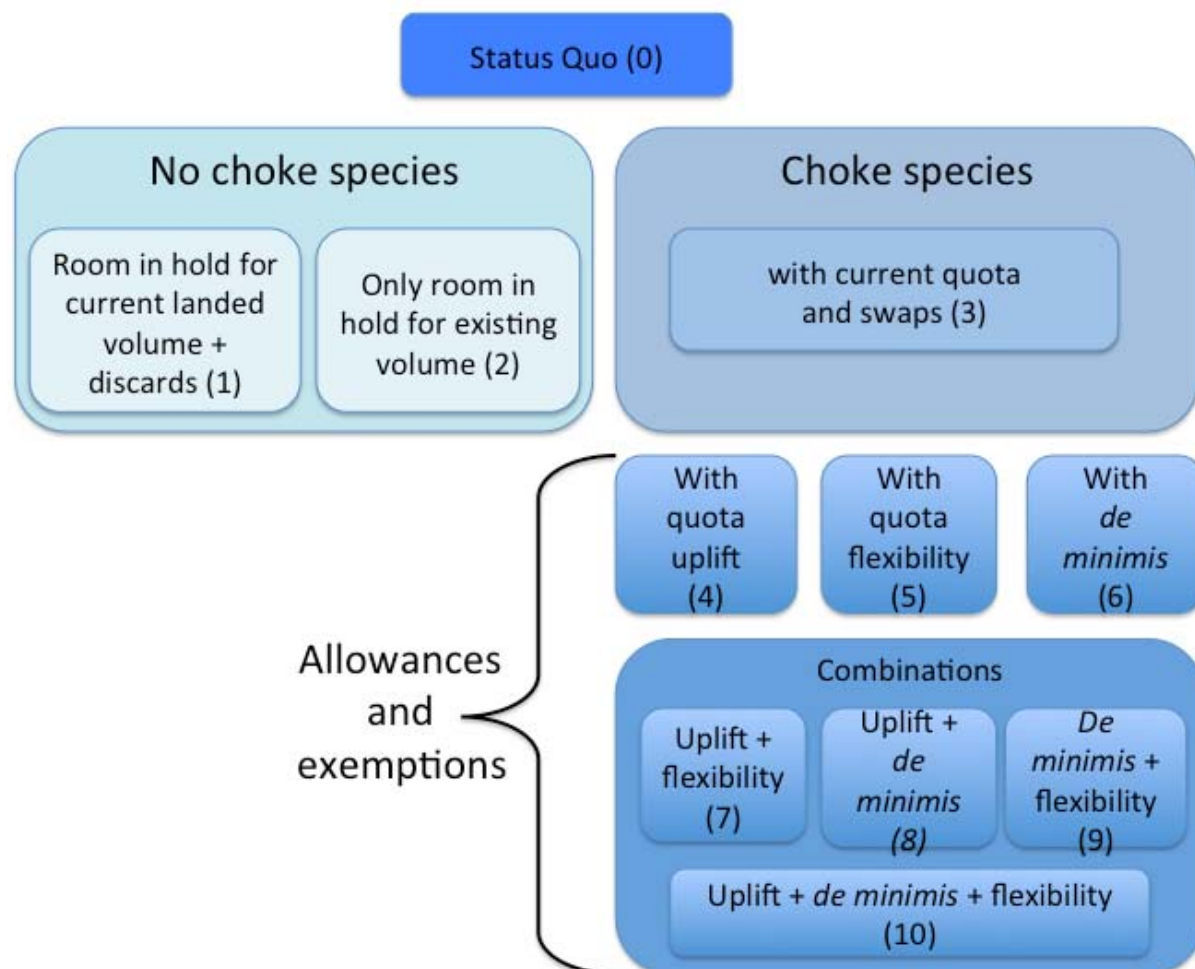
The model is not predictive: it does not explore changes in behaviour that may occur with the introduction of the landing obligation (changes to selectivity, fishing patterns, etc.). Catch quota trials by the MMO and Marine Scotland investigate this further. The coping strategies employed by individual vessels will be dependent on their specific quota holdings, which vary enormously throughout a fleet.

Only the fleet performance in a single year is modeled and therefore multi-annual flexibility and other temporal issues are not explored. In reality, timing could play a significant role in the implementation of the discards ban as fleets are given time to adapt to the new regime with larger initial allowances and a phased introduction of the landing obligation.

### **4.2 SCENARIOS**

There is uncertainty over the various potential exemptions and allocations proposed for the landing obligation. A discard management plan, which may be agreed at a regional level (e.g. within the Regional Advisory Councils), will be required and these documents are expected to provide the detail that is currently missing from the draft regulation.

As present numerous permutations of the landing obligations are still possible. We have therefore made a number of assumptions within specific scenarios in order to examine the consequences of or use of these regulatory caveats. The various scenarios are presented and described below.



**Figure 5 Scenarios explored in the discards model (scenario numbers in brackets)**

**Scenario 0:** Status quo. For the purpose of the analysis, the status quo is deemed to be the situation in the given year of the model. The average fishing days as reported in the Seafish costs and earnings is an important component as the scenarios often influence the amount of fishing days in relation to the status quo.

**Scenario 1:** NO choke species as the required quota could be leased in and there is room in the hold for current landed volume plus discards. This highlights the ‘ideal’ scenario where sufficient quota can be leased in to cover all discards of quota species. However, this is expected to result in additional lease costs for the fleet.

**Scenario 2:** NO choke species (only room in hold for existing landed volume). Here, as with scenario 1, sufficient quota could be leased in, but the capacity of the vessel is assumed to be limiting. If discards must be landed, they take up room in the fish hold that would normally be filled with target catch and by-catch. This can be an issue for vessels operating at sea over several days. This scenario is also expected to result in additional lease costs.

**Scenario 3: CHOKE SPECIES.** The amount of current UK quota held and current swaps results in a year-end quota holding that may limit the fleet. The first species quota to be exhausted creates a 'choke' on fleet operations, which prevents any further fishing for the remaining quota.

### **Allowances and exemptions**

Scenarios 4, 5 and 6 explore the separate consequences of the various allowances and exemptions assuming choke species will occur.

**Scenario 4: Quota uplift.** It is expected that the landing obligation would mean that all fishing mortality could be allocated to vessels as 'catch' rather than being limited to the landed component (and the estimated discarded amount being held back). ICES has reported a total catch (i.e. landings + discards) for some North Sea species where information enables this. The difference between this and the usual TAC advice provides the proportion of 'quota uplift' applied to the catches. For some North Sea species without this ICES advice, the average amount of uplift across all species has to be applied. In the Irish Sea where no total catch levels are calculated, 25%, 50% and 75% of current discard levels are applied. The 75% quota uplift level is used in subsequent combinations involving uplift as this has been the level allocated in current quota trials.

**Scenario 5: Quota flexibility.** This option assumes that when the choke species becomes restricting, the vessels can substitute target quota for the shortfall choke species quota. This is up to 9% of target quota, where the non-target species (i.e. the choke species) is within safe biological limits. For the Irish Sea and North Sea *Nephrops* trawl fleets, *Nephrops* quota is assumed to be the target quota that would be used. For the North Sea mixed whitefish trawl fleet, defining a target quota in a mixed fishery is more problematic. Quota for North Sea plaice is currently plentiful and underutilised so for the purposes of this analysis we have assumed this stock as the target quota.

**Scenario 6: *De minimis* exemption.** This scenario assumes 5% of the total annual catch by the fleet can be applied to the choke species under the *de minimis* exemption. There are numerous different interpretations of the *de minimis* exemption. The implications of one alternative interpretation, i.e. 5% of Member State TAC, are also explored.

### **Combinations**

The remaining scenarios present combinations of the allowances and exemptions presented individually in scenarios 4, 5 and 6. The logical order in which they are applied is expected to be: quota uplift, *de minimis* and finally quota flexibility. Quota uplift is expected as a consequence of the landings obligation, *de minimis* must be evidenced before being approved and quota flexibility could result in the inefficient use of target quota making this latter option the last to be applied.

**Scenario 7: Quota uplift + quota flexibility**

**Scenario 8: *De minimis* + quota flexibility**

**Scenario 9: Quota uplift + *De minimis***

### Scenario 10: Quota uplift + *De minimis* + quota flexibility

Other scenarios were explored during the development of the model as the landing obligation details were being finalised. As the impact of measures to reduce discards, such as increased selectivity, closed areas and move-on rules, etc. are so dependent on the specific extent of the implementation of measures, it is felt that they are less informative than the final 10 scenarios described above, so are not reported in this text.

#### 4.3 ASSUMPTIONS

For the calculation of impacts in all three case studies, a fleet level approach is used. The impacts for a single vessel are dependent on the specific catch composition and quota holdings of that vessel, which will vary throughout a fleet. Therefore fleet averages are used within the model to give an indication of likely impacts.

This approach does not allow for assessment of differences in impacts of the landing obligation on vessels of different sizes, but the approach was felt to be sensible given that discard data are available for the fleet as a whole, and the use of any cut off size within any of the case studies to divide fleet segments into larger and smaller vessels would be necessarily arbitrary. Discussions with the industry indicated that vessel response to discard ban implementation is not expected to be determined by vessel size, unless different management measures are applied, i.e. quota allocation for over and under 10m fleets.

Data for the model outputs are presented in the standard Seafish format for fleet costs and earnings (e.g. turnover items, fishing expense items, vessel expense items, total expenditure). For each policy Option an operating profit is shown, as well as net profit before interest/finance charges and tax i.e. the operating profit less depreciation. Data for a number of indicators are also provided for each policy Option e.g. Gross Value Added (GVA) (e.g. crew earnings plus gross profit), change in GVA, and net profit as a % of turnover/sales values.

The model itemises the impact of policy options on some key fishing costs and on depreciation costs, with other fishing costs grouped and assumed to relate to fishing days. The model assumes that vessel expenses would not change under any of the policy options.

Some other important assumptions underpinning the model are:

- **Fleet Cost & Earnings** The model is constructed to demonstrate annual performance across a fleet. This is based on the average performance of individual vessels as defined by the Seafish costs and earnings data. Use of Seafish costs and earnings data for the same year as landings and quota allocations and uptake data is assumed to be more appropriate than applying averages across 2010-2012 as landings, quota use, and potentially discard rates are inter-related. Only the results in terms of profit as a % of turnover are presented as averages across the three years. The main purpose of using the data is to assess the scale of change between different scenarios, irrespective of yearly costs and earnings fluctuations.
- **Fishing days:** A key assumption is that operating costs can be equally divided by day at sea, therefore a change in days at sea results in the same proportional change in

the main operating cost (fuel). Unless other options also affect the catch per unit effort (CPUE), the landings value calculated in the model also changes in proportion to days at sea.

- **Catch composition:** The average catch composition (i.e. landings plus discards) is determined by applying the discard rate to landings to determine total catch. This is assumed to be constant throughout the year and **no seasonality** is taken into account. Seasonality could impact positively or negatively depending on the fishery involved; with a choke species appearing earlier in the year, there is a risk it could restrict fishing operations earlier (if vessels must continue fishing to maintain revenues rather than avoiding this period) , if appearing later it may not be as restrictive as the model assumes with average catch composition.
- **Effort.** The model assumes that effort management is not as restrictive as quota and is not limiting quota uptake. Effort reductions are proposed for 2014 and at some point effort may become a limiting factor before quota, however, the average days fished in 2010-2012 were lower than the permitted days at sea. The average days at sea of the fleet are therefore assumed to be the optimal days in order to catch the available quota.
- **Fish prices** are assumed to be constant i.e. not to change as a result of changes in landed volumes and catch composition, which may result under the different scenarios. This approach has been taken because information on price elasticity of supply for all species is not available and such analysis is not within the scope of this assignment.
- **Quota allocation.** As data on quota allocations specific to the North Sea mixed whitefish and *Nephrops* trawl fleet are not available, the model operates under the assumption that all North Sea quota allocation and use was by the case study gear type. This assumption is less significant for the Irish Sea, as the *Nephrops* fleet accounts for the great majority of fishing effort and quota holdings in the Irish Sea.
- **UK quota.** For the choke species scenario, the analysis is based on the point at which the *UK quota* would be exhausted. It is assumed that the fleet in question can access and would utilise available UK quota. In reality several fleets own quota, not just the case study fleet and within that fleet quota ownership is not uniform. There are also 'non-active' quota holders that lease quota to active vessel owners, so called 'slipper skippers'. Accessing the necessary quota is therefore a challenge that will be different for individual vessel owners, depending on their existing quota holdings.
- **Current Swaps.** The model assumes that the quota swapping pattern with other EU Member States are maintained. The model identifies the fishing days at which UK quota is used up and then the additional fishing days that international swaps enables. There is no certainty that current swaps would continue with the introduction of the landing obligation as each Member State would re-evaluate what quota should be held to account for discards that must now be landed.
- **Quota uplift.** The model is based on quota levels and allocations for the given year. However Option 4 assumes additional quota (uplift) in relation to ICES advice on total catch for 2014 or on proportional current discards (25% to 100%). There is no confirmation that there will be an increase in quota and there is no indication of the

scale of any uplift or new quota for any given species, beyond the suggestion that this should be in line with scientific advice.

- **Quota lease prices.** For Options where quota is available for leasing in as necessary for current discards, quota lease prices are based on recent industry consultation (POs and quota traders). Quota lease prices are not assumed to rise with increased demand for quota under possible discard bans, because a) there is no reliable basis on which to estimate any increases and b) increased quota leasing costs would actually represent a small proportion of fishing expenses under discard ban options with no choke species, and under discard ban options with choke species (the most realistic options perhaps) there would be little/no possibility to lease in more quota so there would be no additional costs incurred.
- **Constant discard rate.** A constant average discard rate is used based on available discards data; i.e. discard levels are directly proportional to landings. However, in reality discards may not be proportional to landings. Running the model using data for 2010 (when landings of by-catch species were higher than normal) results in far larger impacts on the fleet following the introduction of the discard ban.
- **Marketable discards.** The model distinguishes (in terms of landings prices) between current discards that are of a marketable size (at or above Minimum Landing Size (MLS)), and those discards that are below the MLS, where data allows. This is based on AFBI discard length frequency data and industry consultation.
- **Under marketable size.** For all scenarios, it is assumed that while there would be no minimum landing size (MLS) under the landing obligation (instead a Minimum Conservation Size is proposed), fish over the current MLS would be sold at current market prices and all fish under the MLS would be sold at an average price for fish going to fishmeal (£150 per tonne). This may cover landings costs (boxes/ice, etc.), but is unlikely to cover quota lease costs.
- **Un-used quota.** Under no scenarios are vessels assumed to be able to lease out un-used quota beyond that already identified in the Seafish costs and earnings data as the model operates on a fleet-wide basis.
- **Extent of impacts.** Impacts of different policy options are considered only for the fleet operators. Additional commentary in Section 6 considers potential cost implications on POs and fisheries administrations in a more qualitative manner.



## 5 CASE STUDY RESULTS

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### 5.1 LEASING IN QUOTA

The Commission proposed the landing obligation on the assumption of an ability to exchange quota on a permanent or temporary basis to ensure each vessel holds, or can access, sufficient quota for its catch. In this 'ideal' scenario therefore there would be no restriction on the target fishery due to limited availability of quota for a by-catch species.

Scenario 1 assumes all required quota could be leased in, but this would be at additional cost to the fleet.

The ability to lease in all required quota is unrealistic at a fleet level as UK quota allocations for some by-catch species are limited (as described in relation to choke species below) and there is no certainty of international swaps being available.

The key differences to the status quo are therefore:

- the change in species being landed, which may be sub-optimal and includes a proportion of fish below MLS that could not achieve the market price for human consumption;
- the increase in quota lease costs.

The greatest impacts result in scenario 2 where constant landed volumes are assumed. As with Scenario 1, Scenario 2 also assumes that quota could be leased in as and when required, but that the fishing capacity of the vessel is limiting. Previously discarded fish will be stored in the hold along with target catches and so may limit the amount of target catch that can be stored. This is a genuine concern for some vessels operating week-long trips in the North Sea as holds are currently filled with target catch and desirable by-catch before returning to port. If current discards stored on board must replace some of this, this change in landings composition could have a significant impact on fleet economic performance.

#### 5.1.1 Irish Sea *Nephrops*

For the Irish Sea *Nephrops* trawl fleet, an additional 1,000 tonnes of quota would have been required in 2012 to account for the volume of fish discarded in that year. The quota leasing market is not well developed in the Irish Sea as most quotas are exchanged in swaps. Prices are consequently comparatively lower. Around 1.5% of landed value would be required based on these current lease prices, but the fleet becomes 10% more profitable from the additional revenue generated by retained whitefish over the MLS (again a lack of data on fish sizes could result in the model over-estimating this positive impact).

The Irish Sea *Nephrops* trawl fleets is loss-making when averaged across the three years (-0.3%) if constant landed volumes are assumed. This is a consequence of the catch composition being far less valuable if some of the *Nephrops* catch is displaced by previously discarded material.

#### 5.1.2 North Sea mixed whitefish

For the North Sea fleets where the quota lease market is more developed (and lease prices have increased significantly in recent years) the impact on both the *Nephrops* and whitefish trawl fleets is reduced profitability.

The North Sea mixed whitefish trawl fleet experience a 25% reduction in profitability as quota lease costs increase to 7% of landed value (and over 5 times current levels), which can only be partially offset by the increased revenue.

If a constant landed volume is assumed, the North Sea mixed whitefish trawl becomes marginally viable at 6% operating profit. This is a consequence of the catch composition being less valuable if some of the target catch (preferred species and grades) is displaced by previously discarded material.

### 5.1.3 North Sea Nephrops

The North Sea *Nephrops* trawl fleet would see only slightly reduced profit levels compared to the status quo as a result of the increases in quota lease costs to 2.5 times current levels and amounting to 4% of landed value.

The North Sea *Nephrops* trawl fleets are loss-making (-10% averaged across the three years) when a constant landed volume is assumed. This is a consequence of the catch composition being far less valuable if some of the *Nephrops* catch is displaced by previously discarded material.

## 5.2 CHOKE SPECIES

Choke species are quota species that, once the quota is exhausted, would limit fishing from continuing within a mixed fishery context. With the constant catch composition assumed in the model, when quota for a choke species is exhausted, fishing would have to cease as it is likely that more of that choke species would be caught.

The model presents the average situation across the fleet based on fleet landings and discard rates in relation to UK quota holdings and swaps in a given year. The quota holdings for individual vessels and POs vary substantially. It is therefore expected that quota purchasing, leasing and swaps would occur between operators and between POs until UK quota is used up. Finally international swaps would take place between Member States to bring in more choke species quota in order to avoid a choke situation. There is, however no certainty that international swaps will occur in the same manner as in previous years. The following tables therefore present a theoretical situation where additional swaps are not available.

The tables below present the results based on 2012 data for the three case studies. In each a primary choke species is identified (i.e. the first to be exhausted) along with secondary choke species where, based on the total catch of the species per day, the quota would be exhausted before the fleet average days at sea per vessel is reached.

It only takes one choke species to stop a fleet operating and therefore the primary choke species is the most significant. However, if the primary choke species can be addressed e.g. through *de minimis* exemptions or quota flexibility, other choke species may become limiting.

### 5.2.1 Irish Sea Nephrops

For the Irish Sea *Nephrops* trawl fleet (**Error! Reference source not found.**) the situation in relation to Northern Ireland quota holdings and UK quota is presented. **Whiting** is the

primary choke species, with plaice being the only secondary choke species identified. For both species (whiting and plaice), the available UK quota would run out before the average days at sea per vessel would be reached.

The key choke species is shown to be whiting where current discard levels indicate that the current UK quota, 88% of which is already held by Northern Ireland vessels, would be exhausted after 15 days at sea. Plaice is also the single secondary choke species identified based on 2010 data, while no other secondary choke species found based on 2011 data.

The consequences for fleet viability are presented as scenario 3 in the tables in Appendix 1. For the Irish Sea *Nephrops* trawl fleet, the very few fishing days enabled by a comparatively meagre whiting quota would prevent the fleet from operating viably as only a few fishing days would be possible, with an insufficient basis for revenues to cover operating and investment costs/.

The potential for international swaps for more whiting quota is limited as the total EU quota for Area VIIa whiting is only around 100 tonnes. With an estimated 293 tonnes of whiting discarded by the fleet in 2012 at reported discard rates, there is a large imbalance between available quota and discard levels. This is a smaller volume of whiting discards than in 2010 and 2011, which would see UK whiting quota run out after 9 and 5 days respectively.

### 5.2.2 North Sea mixed whitefish

For the North Sea mixed whitefish trawl (TR1) fleet (Table 5), the primary choke species based on 2012 data is **hake** (UK quota being exhausted after 27 days and then 108 days following swaps against an average of 154 days fishing per year), with secondary choke species being saithe, cod and haddock. Plaice and skates & rays also feature as secondary choke species, but this is a result of quota being swapped out rather than in, and so available days at sea reduce to below the average.

For the previous years the situation differs. In 2011 UK quota for hake is again exhausted first (after 37 days), however the international swaps carried out result in saithe being the primary choke species (144 days against an average of 168) with hake becoming a secondary choke species along with haddock, whiting and plaice.

In 2010, again the primary choke species in relation to UK quota is **hake** (running out after 26 days). However, when annual swaps are included, the primary choke species is whiting (running out after 131 days against an average of 173) and numerous secondary choke species are evident (hake, cod, haddock, saithe, megrim and skates & rays).

For the North Sea mixed whitefish fleet, the impact is significant but less dramatic than the other two case study fleets, with hake reducing the amount of fishing activity by less than a third compared to the average for the TR1 fleet. Profitability is reduced in 2012, but is similar in the two earlier years when over 80% of regular fishing activity is possible before the choke prevents further fishing. However, it should be noted that the model is unable to distinguish between size grades; this is a significant factor in the prices achieved and hence the profitability of the fleet.

### 5.2.3 North Sea Nephrops

For the North Sea *Nephrops* trawl (TR2) (Table 6) fleet the primary choke in relation to UK quota is identified as **hake**. This is found to be consistent throughout 2010-2012, running

out after 28, 34 and 23 days respectively. However when swaps are considered, the choke varies:

- 2010 the choke after swaps is **whiting** (91 days) with haddock (92) and cod (93 days) close behind, along with several other secondary choke species;
- 2011 the choke after swaps is **saithe** (85 days) with haddock (92), cod (95) and whiting (97) close behind followed by several other secondary choke species; and
- 2012 the choke after swaps is **cod** (87 days) followed by hake (90 days) and haddock (96 days) along with several other secondary choke species.

For the North Sea *Nephrops* trawl fleet the impact is of a much reduced profitability (down to an average of 3% operating profit) and in 2010 the choke results in the fleet making a loss. With little more than half the fishing days available even after international swaps, the viability of the fleet in the long term is questionable.

Table 4 Irish Sea *Nephrops* 'choke' species in 2012 (av. days at sea 137)

Area VIIa	Tonnes				Scenario 3: choke species		Scenario 4: Quota uplift		
	Initial NI quota allocation	Quota change in Year	Year end NI quota	Catch per day	Fishing days before NI quota exhausted	Fishing days before UK quota exhausted	Fishing days with 25% uplift	Fishing days with 50% uplift	Fishing days with 75% uplift
sole	12.75	-0.3	12.5	0.07	171	NA			
plaice	223.67	11.7	235	3.14	75	130	159	188	217
cod	92.76	11.1	103	0.71	146	NA			
whiting	28.53	4.2	32	2.17	15	16	49	83	116
saithe	120.07	-33.7	86	0.00	22,597	NA			
anglers	333.32	-139.2	194	0.89	219	NA			
megrim	31.42	-1.1	30	0.00	11,148	NA			
haddock	498.45	-13.0	485	1.89	257	NA			
hake	680.10	-560.9	119	0.47	254	NA			
pollack	292.76	-64.0	229	0.09	2,610	NA			
Nephrops	6,646.60	596.4	7,243	51.29	141	162			
skates & rays	146.19	6.2	152.4	2.23	68	863			



<sup>st</sup>  
1 choke





<sup>nd</sup>  
2 choke

(a 2<sup>nd</sup> choke is a species where quota is exhausted before average days at sea reached)

Table 5 North Sea Mixed Whitefish Trawl 'choke' species, 2012 (av. days at sea 154)

Area IV  Species	Tonnes				Scenario 3: Choke species			Scenario 4: Quota uplift	
	Initial Quota Allocation	Quota Change In Year	Year End quota	catch per day	fishing days before UK quota exhausted	fishing days from swaps	fishing days after swaps	% quota uplift (ICES advice)	fishing days after quota uplift
haddock	26,644	1,075	27,719	185.60	144	6	149	12%	166
cod	11,276	2,045	13,320	92.38	122	22	144	30%	181
whiting	10,539	446	10,985	68.95	153	6	159	52%	238
saithe	6,318	1,821	8,139	71.04	89	26	115	20%*	132
plaice	22,542	-3,599	18,943	128.43	176	-28	147	43%	223
hake	466	1,385	1,851	17.20	27	81	108	20%*	113
anglers	8,209	-351	7,858	38.25	215	-9	205	0%	205
megrin	1,952	-16	1,936	10.81	181	-1	179	18%	211
Nephrops	21,175	-1,340	19,835	71.38	297	-19	278	4%	291
lemons	3,905	-56	3,849	10.29	379	-5	374	20%*	449
dabs	1,588	64	1,652	8.65	184	7	191	20%*	227
turbot	717	-202	515	3.10	231	-65	166	0%	166
skates & rays	989	-215	774	5.15	192	-42	150	20%*	188
sole	803	414	1,217	4.67	172	89	260	20%*	294



 1<sup>st</sup> choke



 2<sup>nd</sup> choke

(a 2<sup>nd</sup> choke is a species where quota is exhausted before average days at sea reached)

**Table 6 North Sea *Nephrops* Trawl 'choke' species, 2012 (average days at sea 143)**

Area IV	Tonnes				Scenario 3: Choke species		Scenario 4: Quota uplift	
	Initial Quota Allocation	Quota change in Year	year end quota	catch per fishing day (tonnes)	fishing days before UK quota exhausted	fishing days after swaps	% quota uplift (ICES advice)	fishing days with catch quota based on ICES
haddock	26,644.00	1,075	27,719	288.25	92	96	12%	106
cod	11,275.56	2,045	13,320	152.82	74	87	30%	109
whiting	10,539.00	446	10,985	101.80	104	108	52%	161
saithe	6,318.00	1,821	8,139	64.00	99	127	20%*	147
plaice	22,542.00	-3,599	18,943	157.30	143	120	43%	182
hake	466.01	1,385	1,851	20.65	23	90	20%*	94
anglers	8,209.00	-351	7,858	45.49	180	173	0%	173
megrin	1,952.00	-16	1,936	12.86	152	151	18%	177
Nephrops	21,175.06	-1,340	19,835	76.87	275	258	4%	270
lemons	3,905.00	-56	3,849	12.64	309	304	20%*	366
dabs	1,588.00	64	1,652	7.93	200	208	20%*	248
turbot	717.00	-202	515	4.41	162	117	0%	117
skates & rays	989.00	-215	774	6.12	162	126	20%*	158
sole	803.02	414	1,217	4.26	188	285	20%*	323

 1<sup>st</sup> choke

 2<sup>nd</sup> choke

(a 2<sup>nd</sup> choke is a species where quota is exhausted before average days at sea reached)

### 5.3 QUOTA UPLIFT

See Table 4 to Table 6 for results. The level of quota uplift (the amount of additional quota permitted to take into account the discard ban resulting in catch quota rather than a landings quota) is currently unknown and will vary by species. However scenario 4 applies expected uplift levels (where known), or averages of expected uplifts, to determine the impacts of this quota uplift.

ICES provided advice on total catches for 2014 in the North Sea for a number of species. These are presented in the table below, along with the average uplift applied to all other quota species in the model.

**Table 7 Assumed uplift under scenarios 4, 7 & 10 for North Sea TR1 & TR2 case studies**

Species	Assumed uplift
haddock	12%
cod	30%
whiting	52%
saithe	20%*
plaice	43%
hake	20%*
anglers	0%
megrim	18%
<i>Nephrops</i>	4%
lemons	20%*
dabs	20%*
turbot	0%
skates & rays	20%*
sole	20%*

\*20% is the average uplift rate used for species without ICES total catch advice

For the Irish Sea where these estimates are not available, the model examines the impacts of possible increases in quota being provided to account for current discards, with scenarios for different amounts of quota being provided (75% of discards, 50% of discards, and 25% of discards). In all cases quota provided for discards is in addition to the existing quota provision.

In effect, the model scenario assuming quota for 100% of discards represents a situation in which no choke species would apply and in which vessels would land all fish caught (scenario 1). However for the other scenarios, the model estimates the number of fishing days possible based on the additional quota for discards provided, and the catch per day.

Catch quota trials have often allocated 75% of current discards levels as this is hoped to provide a workable amount of additional quota along with an incentive to reduce discarding from the previous level. The 75% uplift level is presented in Table 9 when operating profit is presented, which shows reduced profitability. However, the allocation of 75% of discard levels is unlikely for a species with such limited quota available and lower uplift levels of even 50% are still a considerable constraint on the fishery resulting in the fleet being loss-making.



The uplift as advised by ICES and assumed to be applied to the fleet lessens the impact of choke species, but does not entirely remove the impact of choke species on operating profit.

### 5.3.1 Irish Sea Nephrops

For whiting in the Irish Sea where 75% of discard levels is assumed, the resulting 116 days fishing compared to the current 137 average means that profits are reduced to a point where the fleet is only just breaking even.

### 5.3.2 North Sea whitefish

For the North Sea whitefish fleet, the level of uplift (estimated as the 20% average for the choke species hake and saithe) actually results in increased profitability (as more quota is being provided for target species) IF this uplift is also applied to swaps and these continue to be available to the UK fleet. Should current swaps not be available, based on UK quota holdings only the amount of days fishing would be highly inadequate to enable a profitable operation.

### 5.3.3 North Sea Nephrops

For the North Sea Nephrops fleet, the level of uplift (estimated as the 20% average for the choke species hake and saithe) actually results in increased profitability (as more quota is being provided for what is mostly marketable bycatch) IF this uplift is also applied to swaps and these continue to be available to the UK fleet. Should current swaps not be available, based on UK quota holdings only, the amount of days would be highly inadequate to enable a profitable operation.

## 5.4 QUOTA FLEXIBILITY

There is a proposed flexibility to use 9% of target quota (*Nephrops* in the case of Irish Sea and North Sea *Nephrops* trawl fleets) for unwanted by-catch.

### 5.4.1 Irish Sea Nephrops

By optimising the flexibility allowance to use *Nephrops* quota for by-catch where quota is exhausted (whiting, plaice and skates & rays), the *Nephrops* quota would run out after 130 days fishing for 2012 data. This is slightly below the current average fishing days (137), equating to a 5% reduction in fishing opportunities. Overall therefore while some restriction still occurs, the fleet could continue to function profitably.

For 2010 data (with higher fish landings and therefore higher discards), this optimisation of *Nephrops* quota for by-catch would result in the 9% assumed maximum *Nephrops* allocation being used up after 104 days fishing, i.e. fishing would have to stop after 76% of average fleet fishing time with the resulting reduction in revenue.

Based on 2012 landings and the assumed average discard rates, assuming there is an ability to manage the quota optimally (i.e. vessels in need within the fleet are able to access the available quota) around 646 tonnes of *Nephrops* quota (8.9% of the Northern Ireland's total quota) would be used for by-catch of whiting (299 tonnes), plaice (204 tonnes) and skates & rays (143 tonnes) before the *Nephrops* quota was used up.

If this flexibility were permissible, there would be the additional negative economic consequences for the fleet (landing by-catch at an assumed value of £150 per tonne rather than *Nephrops* at around £3,000 per tonne), but it would create a potential allowance for whiting, plaice and skates & rays by-catch for the fleet to continue fishing to 130 days.

The result is a reduced operating profit for the Irish Sea *Nephrops* fleet to 10% average across the 3 years, but viability is maintained.

However, given the requirement for the recipient stock to be within biological limits, it is not evident that this flexibility would be permitted. For the Irish Sea *Nephrops* trawl fleet this detail regarding the flexibility rules will be critical to the viability of the fleet following the implementation of the discard ban.

#### **5.4.2 North Sea whitefish**

For the North Sea mixed whitefish trawl fleet, what constitutes the target species is more debatable and the model has assumed an under-used stock (plaice in this instance) to account for the choke species. Quota flexibility may be permitted for hake with the positive 2014 advice for Northern hake stock, but for saithe (where the stock is not at Bmsy, but is expected to be above Blim) it is less certain that quota flexibility would be permitted.

As most fish caught by the North Sea mixed whitefish trawl fleet is above MLS, the impact is a slight increase in operating profits as potentially un-used quota is used for whitefish species that may achieve a reasonable market price.

#### **5.4.3 North Sea Nephrops**

The above is true to a lesser extent for the North Sea *Nephrops* trawl fleet if any un-used quota could be used, however if *Nephrops* quota must be used, the fleet would experience a similar impact to the Irish Sea *Nephrops* trawl fleet.

### **5.5 DE MINIMIS**

A category of exemption from the discard ban is “catches under *de minimis* exemptions”, where i) scientific evidence shows that selectivity is difficult or ii) there are disproportionate costs for certain fishing gears.

The 5% *de minimis* proposals (7% in years one and two, 6% in years three and four) have the effect of reducing the amount of by-catch which must be allocated quota, making quota last longer as illustrated in table below. It has recently been suggested that the 5% relates to TAC of the species in question rather than the total catch of quota species by a fleet/vessel/Member State. The consequences of each interpretation are provided in the table below for the three case studies.

#### **5.5.1 Irish Sea Nephrops**

For the Irish Sea, with the small Area VIIa TAC for whiting, even 5% of the TAC would only allow around 7 tonnes of *Nephrops* to be used against whiting by-catch (just three additional fishing days at current discard levels).

For Irish Sea whiting it has been stated by industry that it will be difficult to identify and separate juvenile whiting on board and while selectivity of small whiting may be possible,

this may result in high losses of the target species, *Nephrops*, and significant additional fishing costs. There may therefore be grounds for applying an exemption to whiting, however more detail would be required on the gear adaptations required to select out small whiting.

### **5.5.2 North Sea Whitefish**

For North Sea mixed whitefish trawl gear there is a slight reduction in operating profits if 5% of total catch is permitted as *de minimis*. As per scenario 2, increased lease costs impact profits. However, should only 5% of the TAC be permitted, the *de minimis* allowance amounts to only 80% of days for mixed whitefish trawl.

### **5.5.3 North Sea Nephrops**

For North Sea *Nephrops* trawl gear there is also a slight reduction in operating profits if 5% of total catch is permitted as *de minimis*. As per scenario 2, increased lease costs impact profits. However, should only 5% of the TAC be permitted, the *de minimis* allowance amounts to less than half the fishing days being available for *Nephrops* trawl gear (47%).

Table 8 Implication of 5% *de minimis* exemptions on choke species

	Irish Sea <i>Nephrops</i> Trawl				North Sea Mixed Whitefish Trawl				North Sea <i>Nephrops</i> Trawl			
	2010	2011	2012	average	2010	2011	2012	average	2010	2011	2012	average
<b>5% of total quota catch (tonnes)</b>	540	410	432	461	3534	3248	3,622	3468	1646	1427	1072	1382
<b>total fishing days for choke (de minimis + choke)</b>	94	132	214	147	191	189	319	233	111	97	142	117
<b>as % of status quo fishing days</b>	61%	95%	156%	104%	110%	113%	207%	143%	75%	65%	99%	80%
<b>5% of MS TAC (tonnes)</b>	2.85	1.85	1.6	2.1	375	367	23	255	375	367	23.3	255
<b>total fishing days for choke (de minimis + choke)</b>	9.3	5.6	15.7	10	137	149	109	132	95	88	24	69
<b>as % of status quo fishing days</b>	6%	4%	12%	7%	79%	89%	71%	80%	64%	59%	17%	47%
<b>choke species</b>	whiting	whiting	whiting		whiting	saithe	hake		whiting	saithe	cod	

## 5.6 SCENARIO RESULTS

The table below summarises the results of the model (presented in more detail in Appendix 1) in relation to operating profit. Operating profit margin is the best indicator of the impact of the various scenarios on the viability of the fleet.

It should be noted, that net profits (applying depreciation, interest charges and repayments etc.) can be significantly lower than operating profits, but these will depend on how indebted the business is and so is highly variable between vessels.

As a guide, an operating profit margin averaging below 10% could be viewed as being unsustainable if persistent over the long-term as there are insufficient returns to enable re-investment in the fleet. This is found to be the case for the North Sea *Nephrops* trawl fleet where high fuel costs in 2010 reduced profits that was only partly offset by improved *Nephrops* prices in 2012.

The results summarised in Table 9 illustrate that the fleets would remain profitable if quota can be leased in for all by-catch. However, even at current quota lease prices the substantial costs of this additional leasing means that profitability of the fleet is slightly reduced.

If hold capacity is limiting, having to land a mix of target catch and unwanted by-catch makes both *Nephrops* fleets unviable. The whitefish fleet is found to be marginally profitable, but it should be remembered that the model does not take into account size grades, which can be critical to profitability in a mixed demersal fishery.

With choke species, the Irish Sea *Nephrops* fleet can only fish for a few days and is not viable. The potential for international swaps of whiting is limited as the total whiting TAC for the Irish Sea is so small. The North Sea fleets would be in a similar loss-making position based on UK quota only, but do remain viable if current international swaps are maintained (North Sea *Nephrops* only marginally so).

With 75% of discards added to quotas, the Irish Sea *Nephrops* fleet is only marginally viable. In the North Sea the expected uplift levels result in improved profitability compared to the status quo and the 'no choke' scenario where quota lease costs impact on profits. A point of caution, however, is that the uplift that might be expected for the key choke species of hake and saithe. ICES has not provided total catch advice for these species and therefore a 20% uplift is assumed based on the average applied to other species.

Using the 9% quota flexibility allowance, all three case study fleets exhibit operating profits. For the Irish Sea *Nephrops* fleet profits are reduced compared to the status quo because not all whiting discards can be covered by 9% of *Nephrops* and so fishing days are still reduced and because *Nephrops* quota is used for by-catch of small whiting at £150/tonne instead of for a valuable target catch. The North Sea whitefish fleet sees improved profitability as it is assumed that un-used plaice quota could be used for landing whitefish by-catch rather than leasing in additional quota for that species.

The *de minimis* presented is based on 5% of total MS catch of quota species and shows reduced profitability for Irish Sea *Nephrops* and North Sea mixed whitefish, but improved profitability for North Sea *Nephrops*, again because additional landings can be made using *de minimis* exemption without the need for additional quota lease costs.

Table 9 Operating profit (as % of turnover) for case study fleets under 6 scenarios

Scenario	0	1	2	3	4	5	6
	Status Quo	No choke - all landed	No choke - constant vol landed	Choke species	Quota uplift*	9% flex	de minimis (5% of total catch)
<b>Irish Sea Nephrops</b>							
2010	10%	-3%	-29%	-221%	-8%	-13%	-14%
2011	7%	16%	10%	-270%	0%	14%	18%
2012	23%	25%	18%	-63%	9%	23%	25%
<b>average</b>	13%	13%	-0.30%	-185%	0.30%	8%	10%
Change from Status Quo		0%	-13%	-198%	-13%	-5%	-3%
<b>North Sea Mixed Whitefish Trawl (TR1)</b>							
2010	8%	6%	4%	10%	19%	12%	6%
2011	19%	18%	14%	26%	27%	21%	18%
2012	15%	12%	1%	5%	23%	20%	13%
<b>average</b>	14%	12%	6%	14%	23%	18%	12%
Change from Status Quo		-2%	-8%	0%	9%	4%	-2%
<b>North Sea <i>Nephrops</i> Trawl (TR2)</b>							
2010	6%	5%	-8%	-3.40%	14%	0.40%	10%
2011	10%	8%	-21%	5%	20%	11%	20%
2012	12%	11%	0%	8%	20%	15%	11%
<b>average</b>	9%	8%	-10%	3%	18%	9%	14%
Change from Status Quo		-1%	-19%	-6%	9%	0%	5%

\*North Sea relates to ICES total catch advice, Irish Sea relates to 75% of current discard levels.

## 5.7 COMBINATIONS

Scenarios 7 to 10 consider various combinations of the three main allowances and exemptions (quota uplift, flexibility and *de minimis*). These assume the most logical order in which to apply these options, i.e. uplift > *de minimis* > flexibility. *De minimis* would have to be justified and is likely to be sought after quota uplift. Quota flexibility may also not be possible for the necessary by-catch species if these are not within biological limits and its use could mean target quota is used for landings with minimal value, so quota flexibility would be the last to be applied of the three.

**Scenario 7: Quota uplift + quota flexibility**

For the Irish Sea quota uplift is unknown as there is no ICES advice. While 75% uplift maintains fleet profitability, albeit at marginal levels, in reality a 75% uplift may be unlikely given current TAC levels and the uncertainties over stock status. This uncertainty is also likely to rule out the application of quota flexibility, which would result in relatively profitable operations similar to the status quo if *Nephrops* quota can be exchanged for whiting quota. Overall therefore, while this combination does enable continued operation at levels similar to the status quo, quota flexibility may be unrealistic for the Irish Sea *Nephrops* trawl fleet.

As illustrated in scenario 4 (quota uplift), both the North Sea fleets can operate based on assumed uplift levels IF current swaps are maintained. Without the swaps, the 20% estimated uplift (average of ICES advice for stocks with total catch calculated) on UK quota for key choke species such as hake would not be sufficient. However the application of quota flexibility would address this shortfall. The opportunity to apply quota flexibility appears likely for hake which is a stock described as being in good biological status and substantial TAC increases are planned for 2014.

For the North Sea mixed whitefish fleet, hake and saithe are potential choke species following uplift (in 2012 reaching 73% and 85% of average fishing days respectively). As scenario 4 shows, profitability is above the status quo as quota lease costs are reduced. If there is a desire to maintain status quo effort levels (i.e. 100% of the current days at sea), some flexibility must be applied. Hake and saithe are above biomass limits (Blim) and therefore could be expected to be eligible for quota flexibility. Using this allowance the fleet achieves a profitability that remains above the status quo.

Whiting is identified as a secondary choke species using 2010 data and may not be deemed eligible for quota flexibility as reference points for that stock are not defined, but again fishing to the quota uplift constraint still results in a profitable fleet.

For the North Sea *Nephrops* fleet, after quota uplift hake is the primary choke species at 94 days followed by 106 days for haddock, and 109 days for cod. Quota flexibility could be used for hake and haddock but cod is yet to recover to above Blim and it is therefore unlikely to be eligible for quota flexibility. Cod would therefore represent the primary choke, but there are enough fishing days for continued profitability (above status quo levels as per scenario 4).

**Scenario 8: *De minimis* + quota flexibility**

On average, when the *de minimis* allowance is applied to choke species based on 5% of *total fleet catch*, this would enable the Irish Sea *Nephrops* trawl fleet and the North Sea mixed whitefish trawl fleet to achieve a similar number of days at sea to the status quo, maintaining profitability. The North Sea *Nephrops* trawl fleet, can achieve 80% of average fishing days and this would also enable profitable operations. Applying quota flexibility to make up any shortfall would further improve profitability to or above status quo levels.

If *de minimis* is applied to choke species based on 5% of the TAC of that stock, the situation is very different. For the Irish Sea, with such a small whiting TAC in area VIIa, only a couple of additional fishing days would be possible per vessel. As stated above, applying quota

flexibility would enable viable fleet operations, albeit at a reduced level of profit. However, as already explained, it appears unlikely that flexibility on whiting would be available to the fleet.

The key issue is therefore how the *de minimis* is interpreted: 5% of total fleet catch of quota species, or 5% of TAC. There are also several other interpretations possible for where this 5% exemption is applied (e.g. total catch of quota species at individual vessel, fleet or MS level; or 5% of MS or EU TAC).

### **Scenario 9: Quota uplift + *De minimis***

For the Irish Sea, the quota uplift is expected to be insufficient to cover recently recorded discard levels as the model outputs suggest that 75% uplift is needed to achieve a viable level of profitability for the current fleet. The critical issue is therefore how the *de minimis* is applied. If interpreted as 5% of total fleet catch of quota species, the *de minimis* exemption enables a viable operation at the current fleet size. If *de minimis* is interpreted as 5% of the TAC for whiting, only a couple of additional days at sea would be gained and the fleet would not be viable.

With quota uplift and *de minimis* it is again critical for the North Sea fleets that current swaps are maintained. With uplift in this situation, the fleet can operate viably. With uplift only being applied to UK quota, profitability would be much reduced and the fleets' long-term viability would be marginal. If *de minimis* applied on top of uplift, the situation would be improved for North Sea fleets and the fleet could achieve profitability similar to the status quo. The need for a *de minimis* exemption must be proved and as most target stocks are above MLS for the North Sea mixed whitefish fleet, this may be more difficult to argue for that fleet, compared to the Irish Sea and North Sea *Nephrops* trawl fleets, where identifying and sorting small fish on top of the on-board labour may be considered a disproportionate cost.

### **Scenario 10: Quota uplift + *De minimis* + quota flexibility**

In the Irish Sea the *Nephrops* trawl fleet can operate profitably if the rules surrounding the allowances and exemptions are interpreted favourably. If however the strictest interpretations of the rules are applied, these options would not achieve a viable fleet as quota uplift would be limited, *de minimis* would only give 7% of fishing days on average, and quota flexibility may not be available for VIIa whiting.

Applying all three allowances and exemptions to the North Sea fleets would enable continued operations even if these are interpreted with the most constraining conditions. In general the expected quota uplift alone enables viable operations albeit at reduced levels of profitability. Introducing *de minimis* and quota flexibility more than compensates for that potential reduction. The result is profitability for North Sea fleets at or above status quo levels (again the lack of considerations of fish size within the model may over-estimate the benefits of landing previously discarded fish against increasing lease costs).



## 6 WIDER IMPLICATIONS OF THE LANDINGS OBLIGATION

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The model is used to consider the impacts on fishing operations (vessels) only in certain case study fleets. Industry stakeholders highlighted a number of issues with the implementation of a discard ban (as currently designed) that are significant but are not currently incorporated into the model. These are discussed below.

### 6.1 QUOTA MANAGEMENT

- The phased introduction of the landing obligation could cause difficulties for quota managers. For example, the TR2 fleet may only initially be required to land the target species, Nephrops, and would only receive additional quota for that species whereas the TR1 fleet will be required to land the species that define their fishery (e.g. cod, haddock, whiting and saithe) and would receive additional quota for these species. Quota managers are concerned that the current quota allocation system is not equipped to manage this as an FQA of cod could be caught by either a TR1 vessel or a TR2 vessel.
- The reaction of the quota market to a discard ban is unknown. As more by-catch species will be required, it is highly likely that purchase and lease prices will increase above current levels.
- Some quota traders are concerned that the quota market will initially ‘freeze up’, with quota owners less willing to trade quota in case they have a need for the quota later in the year.
- The same is true of international swaps, which are based on reaching agreement on a mutually beneficial exchange of predominantly target species. The need for quota for all by-catch species may affect the willingness of Member States to continue with historic swap deals.
- How a producer organisation (POs) functions (individual or pooled quota) may also affect operators’ reaction to a discard ban. A pool may provide more flexibility in some respects or limit some operators due to the actions of others. POs hold different quota amounts, some strategically trading out by-catch allocations to build up target species allocations.
- The likelihood of swaps will depend on different choke species in different fisheries. For example, whiting is the choke for the Irish Sea Nephrops fishery, while other nations may be limited by quota for megrim, angler or saithe where sufficient UK Irish Sea quota is available. In these instances the potential for international swaps is evident.
- Overall however, the total EU quota available will limit a fishery. In the case of Irish Sea whiting, the UK holds 32 tonnes of a total EU quota of just 84 tonnes. Swapping in all available whiting quota will only provide another 24 fishing days at current discard levels. Quota leasing will therefore not be the main solution to the challenges faced by the Irish Sea *Nephrops* trawl fleet following the introduction of the discards ban.

## 6.2 GEAR SELECTIVITY

- Highly-selective gear is now a requirement for all vessels in the fleet with a number of gear options identified. However efforts to date have focused on cod. The remit must now be extended to all other by-catch species, prioritised by those identified as choke species.
- For TR1 gears there is a sense that additional selectivity in this mixed fishery can only go so far. A variety of whitefish species are targeted so the avoidance of certain species is not possible and further selectivity may result in important components of the catch, such as small haddock, being lost.
- Most TR2 selectivity devices seek to select out whitefish larger than the target species (*Nephrops*). The minimum landing size for *Nephrops* is small compared to the whitefish by-catch. The reaction of fish to trawls varies by species and size, but in general large fish swim up and small fish swim down. The result is that most panels encouraging fish up and out will reduce the catch of marketable-size fish, but not all juveniles.
- Avoiding the key choke species identified in the Irish Sea *Nephrops* fishery, whiting, is a major challenge as discard data indicate 96% are below the minimum landing size. Larger mesh sizes to enable smaller whiting to escape will similarly reduce the target *Nephrops* catch.
- The warps and the trawl doors create a sediment plume that herds the fish into the net. *Nephrops* do not actively swim with the net and so those caught are directly in the path of the mouth of the net. A partial solution to minimise fish by-catch overall would therefore be to reduce the herding effect of the gear. The use of semi-pelagic trawl doors may contribute to this.

## 6.3 CATCH MANAGEMENT

- A main by-catch consisting of undersized whitefish would cause further challenges in sorting and identifying the catch under a discard ban.
- Catch handling aboard a *Nephrops* trawler is already a laborious, time-consuming process. If deck hands are required to sort all species into separate boxes the task would be greatly increased suggesting that more crew may be needed at significant costs to the vessel operator.
- Differentiating juvenile whitefish by species has proven too difficult for fisheries scientists during sampling in the past, let alone deck hands sorting the whole catch.
- Skates & rays (a secondary choke species for the Irish Sea *Nephrops* trawl fleet) could be deemed to be a high survival species (and therefore exempt from the discard ban).
- There are also implications for shore-based operations as significant volumes of low value species would enter the market under a discard ban, as well as volumes of undersized fish that must be segregated and stored for onward processing.

#### 6.4 COMPLIANCE

- Regulation is most likely to be complied with if operators view it as fair and proportionate. While many details are still to be determined, the industry has not been afforded the implementation timeframe or flexibility in approach as detailed in industry submissions relating to the discard ban.
- The ease of enforcement of options will vary. With VMS required on all vessels over 12 metres in length, managing closed areas can be relatively straightforward. Experience in the North Sea has shown that there is a cost and communication challenge in establishing a system of real time closures (RTCs), but it has proven to be workable.
- Fitting by-catch reduction devices is easily checked in port, but checking they are being used in an effective manner is less straightforward and something that must be inspected at sea.
- Enforcement of the discard ban will be supported with fully documented fisheries (FDF). For most this suggests the introduction of CCTV. The trials to date highlight the high capital costs of the equipment and disruption to fishing trips with malfunctions. Who bears this cost is still to be determined, and costs to vessel operators have not been included in the model.
- The introduction of FDF will change the nature of enforcement operations with a greater reliance on remote observation. This should ultimately result in some cost savings for compliance authorities if less at sea inspection is required. It could also be expected to change the dynamics between enforcement officers and the industry.
- With the segregation of catch, including undersized fish, the need for port and market-based inspections will remain. At sea, this may become more onerous with the need to identify and weigh the whole catch.

#### 6.5 ADMINISTRATIVE BURDEN

- The documentation and more active management of all quota (rather than a focus on target species) will result in additional administrative burden for both the POs and the vessel operators themselves.
- Additional administrative costs are also expected for management authorities as whole catch reporting adds a further burden of proof that must be checked. It is also likely that quota uptake will be higher, suggesting the need to consider real-time reporting of quota uptake rather than monthly checks.

## 7 CONCLUSIONS

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### 7.1 THE MODEL

- The details and interpretation of provisions for a landing obligation as outlined in the current draft regulation may not be clarified or tested before the implementation of discard management plans. The model therefore makes various assumptions as a result of these continued uncertainties, which should be kept in mind when interpreting the model results.
- The model is retrospective: it considers the implications of the discard ban for specific fleets in terms of recent average economic performance. It identifies likely 'choke' species and estimates how these and the various allowances and exemptions being proposed may affect fleet economic performance.
- The model is not predictive: it does not explore changes in behaviour that may occur with the introduction of the landing obligation (changes to selectivity, fishing patterns, etc.). Catch quota trials being conducted by MMO and Marine Scotland investigate these aspects further.
- The model considers 'average fleet performance' to identify potential choke points for the fleet as a whole. Consequently it is assumed that the full UK quota is available to that fleet segment being considered. While this may remain a weakness of the model, not considering the fleet in isolation risks the assumption that more quota would be available when in fact other fleet segments would retain these.
- In reality the coping strategies employed by individual vessels will be dependent on their specific quota holdings, which vary enormously within a fleet.
- The size grade of fish determines price, and thus profitability. The change in landed size grades may be critical to mixed whiting fisheries and this aspect could be incorporated into future iterations of the model.
- The implications of seasonality are also not explored in the current model (where constant catch rate is assumed). If seasonal variation in catch composition is well understood, this could also be factored into future model revisions.
- The model can be applied to other fleets if the necessary data on landings, discard levels and cost & earnings are available. This would be useful to identify the priority areas of focus for the fleet concerned in dealing with the landing obligation.

### 7.2 IRISH SEA NEPHROPS TRAWL FLEET

- The key 'choke' species for the Irish Sea, i.e. where available quota is not sufficient to cover discards, is **whiting**, allowing only around 10 fishing days at estimated average discard rates before all UK quota is used up.
- Quota swaps and quota uplift/increases (increasing current quota levels to include discards) would not provide a complete solution. This is primarily due to the very low whiting TAC compared to other species being targeted. Quota would need to be provided for more than 75% of current discards if the fleet is to remain viable.

- The provision for a *de minimis* element to the discards ban is important for the Irish Sea *Nephrops* fleet where juvenile whitefish are still retained in 'highly selective' gear. The sorting to species level to enable allocation of quota would result in additional crew being required, which could be deemed a disproportionate cost.
- However if *de minimis* is interpreted as 5% of TAC, as the overall EU VIIa whiting quota is 84 tonnes only 2 additional fishing days are permitted, creating an unviable situation for the existing fleet.
- The 'flexibility' allowance enabling up to 9% of target quota to be used for unwanted catch would enable the current Irish Sea *Nephrops* trawl fleet to remain viable and continue to fish for 130 days (i.e. 95% of the 2012 average 137 days) with 552 tonnes of *Nephrops* quota being caught as whiting (and some secondary choke species).
- Quota flexibility is dependent upon the non-target stock being within safe biological limits. Whiting is assessed as a data limited stock with ICES advising lowest possible catch for 2014 (ICES, 2013). The likelihood of *Nephrops* being able to be used for whiting by-catch therefore appears highly unlikely.
- Developing and implementing gear with the selectivity characteristics to avoid the main choke species (whiting), while maintaining current selectivity (cod-avoidance), should be a priority for the Irish Sea *Nephrops* trawl fleet.

### 7.3 NORTH SEA MIXED WHITEFISH FLEETS

- To date improved gear selectivity has focused on cod, however the discard ban will require both the North Sea mixed whitefish to consider numerous other whitefish as potential choke species: hake & saithe in particular. A balance is required as further gear selectivity risks the loss of target species such as haddock; an important catch component.
- The continuation of current swaps for choke species such as hake is critical for the viability of the North Sea whitefish trawl fleets under a landing obligation as UK hake quota is exhausted after an average of 29 days.
- The expected levels of uplift as proposed by ICES advice would enable continued viable fleet operations. However no advice is currently given for the identified choke species of as hake and saithe, making assumptions on extent of uplifts even more uncertain.
- A substantial increase in quota requirements (and so lease costs) is expected as a result of the landing obligation (increasing by 5 times for mixed whitefish trawl fleet). The overall cost increase could be even greater as the lease price may be expected to increase with greater demand.
- With the various exemptions and flexibilities that can be applied, and with current swaps, the North Sea whitefish fleet would be able to continue operating profitably, however the model does not include consideration of size grades, which can be critical in the mixed North Sea fisheries.

#### 7.4 NORTH SEA NEPHROPS FLEET

- To date improved gear selectivity has focused on cod, however the discard ban will require the Nephrops trawl fleet to consider numerous other whitefish as potential choke species: hake, saithe, haddock and whiting.
- The expected levels of uplift as proposed by ICES advice would enable continued viable fleet operations. However no advice is currently given for the identified choke species of hake and saithe, making assumptions on extent of uplifts even more uncertain.
- The continuation of current swaps for choke species such as hake is critical for the viability of the North Sea Nephrops trawl fleets under a landing obligation as UK hake quota is exhausted after an average of 28 days.
- A substantial increase in quota requirements (and so lease costs) is expected as a result of the landing obligation (increasing by 2.5 times for the Nephrops trawl fleet). The overall cost increase could be even greater as the lease price may be expected to increase with greater demand.
- The interpretation of the 5% *de minimis* is critical; if 5% of total catch, fishing activity could continue with 80% of current fishing days; if 5% of MS TAC, only 47% of current fishing days would be possible.
- With the various exemptions and flexibilities that can be applied, and with current swaps, the North Sea Nephrops fleet would be able to continue operating albeit with reduced profitability.

#### 7.5 GENERAL

- Accessing additional quota is critical to the implementation of the discards ban. Under a discards ban there is no certainty that the quota lease market or international swap arrangements will operate in the same manner. Mechanisms should be explored to ensure the trade in quota and international swaps continue.
- Vessels that currently operate trips over several days and return with a full hold of fish could be significantly constrained by hold capacity.
- The results are based on reported discard rates between 2010 and 2012. Outcomes would be substantially improved with lower discard levels. Gear development focused on identified choke species should be a priority to reduce their impact.
- Research on survival and the evidence base required to apply *de minimis* (catch differentiation and disproportionate cost) should be a priority.
- The model is useful for identifying priority issues for specific fisheries and can be applied to other fleets if the necessary data on landings, discard levels and cost & earnings are available.

## **APPENDIX 1: IMPACT OF DISCARD BAN ON KEY VARIABLES**

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As outlined in section 4, for each scenario the model produces estimates of changes in key variables such as the number of fishing days and the operational costs, which can be expected to change under the different scenarios. These estimated changes in key variables and their scope, which in turn impact on vessel/fleet profitability, are based on discussions with industry (wherever possible supported by empirical evidence) and presented in Table 10 with further explanation below.

**Volume of landings:** For most scenarios the volume of landings per fishing day is assumed to remain the same, either because the fishing pattern is not altered or because less days are fished before quota is exhausted. For most scenarios therefore, the volume of landings compared to the status quo changes in proportion to fishing days. For scenario 1, however, the volume landed increases as vessels are assumed to be capable of storing and landing all their catch. In contrast scenario 2 presents a situation where there is not sufficient additional hold capacity to store more catch.

**Quota lease costs:** The introduction of a discard ban results in the need to lease in more quota from elsewhere. The additional amount for the fleet is estimated based on the discard rate and average quota lease costs (based on current costs). Scenario 1 results in the status quo quota lease costs plus additional quota required for previously discarded species. For all other scenarios quota lease costs are assumed to be the quota lease costs for scenario 1 proportional to the number of fishing days.

**'Other' fishing expenses:** Other fishing expenses such as harbour dues, subs and levies, crew travel, other fishing expenses (Boat Expenses, Carriage, Crew subsistence, fees and licences, food, life raft, motor expenses, protective clothing, rent – stores, travel expenses, wheelhouse) are all assumed to vary in proportion to fishing days.

**Table 10 Assumed impacts of policy options on key operational costs and earnings**Example given is North Sea *Nephrops* Trawl, 2012

Scenario number	CHOKE/NO CHOKE			Allowances & Exemptions		
	1	2	3	4a	5	6
Policy	No choke - all landed	No choke - constant vol of landings	Choke species	Quota uplift based on ICES total catch	Choke species(hake) 9% flex	de minimis (5% of total catch)
<b>Change for fleet</b>						
fuel use	100%	100%	61%	66%	73%	99%
vol of landings	124%	100%	61%	82%	73%	124%
fishing days	100%	100%	61%	66%	73%	99%
quota lease costs	£1,587,812	£1,587,812		66%	£-	99%
change in value of landings		-			100%	



**APPENDIX 2: MODEL CASE STUDY RESULTS****Table 11 Irish Sea choke species and potential uplift, 2010, average days at sea 153**

Area VIIa	Tonnes				Scenario 3: choke species		Scenario 4: Quota uplift		
Species	Initial NI quota allocation	Quota change in Year	Year end NI quota	Catch per day	Fishing days before NI quota exhausted	Fishing days before UK quota exhausted	Fishing days with 25% uplift	Fishing days with 50% uplift	Fishing days with 75% uplift
sole	13.30	-	13.30	0.07	192	NA			
plaice	209.56	(5.70)	203.86	3.59	57	105	164	205	234
cod	167.13	159.70	326.83	1.86	176	NA			
whiting	55.27	2.10	57.37	6.36	9	9	46	84	122
saithe	115.56	(8.60)	106.96	0.06	1,798	NA			
anglers	380.02	(230.00)	150.02	0.49	305	NA			
megrin	36.79	(12.49)	24.31	0.03	811	NA			
haddock	555.15	127.90	683.05	2.55	268	NA			
hake	677.50	(471.23)	206.27	0.28	747	NA			
pollack	298.02	(152.90)	145.12	0.12	1,175	NA			
Nephrops	6,708.28	1,529.40	8,237.68	55.65	148	167			
skates & rays	167.40	(3.20)	164.20	0.24	679	7953			

**Table 12 Irish Sea choke species and potential uplift, 2011. Average fishing days 140**

Area VIIa	Tonnes				Scenario 3: choke species		Scenario 4: Quota uplift		
	Initial NI quota allocation	Quota change in Year	Year end NI quota	Catch per day	Fishing days before NI quota exhausted	Fishing days before UK quota exhausted	Fishing days with 25% uplift	Fishing days with 50% uplift	Fishing days with 75% uplift
sole	11.90	3.60	15.50	0.09	179	NA			
plaice	201.30	5.40	206.70	0.02	11,676	NA			
cod	130.52	28.80	159.32	0.95	168	NA			
whiting	44.20	(26.70)	17.50	3.23	5	5	46	81	119
saithe	116.38	(8.80)	107.58	0.00	36,362	NA			
anglers	357.83	(231.59)	126.24	0.02	6,010	NA			
megrim	32.83	(15.70)	17.13	0.00	11,686	NA			
haddock	451.83	71.90	523.73	0.03	16,141	NA			
hake	675.76	(563.99)	111.77	0.20	545	NA			
pollack	289.20	(158.20)	131.00	0.13	1,033	NA			
Nephrops	6,641.04	655.60	7,296.64	52.62	139	159			
skates & rays	158.42	(10.20)	148.22	2.01	74	1,031			

**Table 13 North Sea MIXED WHITEFISH TRAWL choke species and potential uplift, 2010. Average days at sea 173**

Species	Initial Quota	Quota change in Year	year end quota	catch per fishing day (tonnes)	fishing days before UK quota exhausted	fishing days from swaps	fishing days after swaps	% quota uplift (ICES advice)	fishing days quota uplift (from ICES)
haddock	23,124	2,233	25,368	164.21	141	14	154	12%	171
cod	13,133	1,214	14,281	97.49	135	12	147	30%	188
whiting	7,490	292	7,782	59.19	127	5	131	52%	197
saithe	8,455	3,639	12,094	77.48	109	47	156	20%*	178
plaice	16,864	-1,986	14,763	92.78	182	-21	160	43%	238
hake	355	1,634	1,989	13.71	26	119	145	20%*	150
anglers	10,160	-400	9,763	42.00	242	-10	232	0%	232
megrin	1,685	-7	1,678	9.75	173	-1	172	18%	203
Nephrops	23,147	-312	22,835	113.21	204	-3	202	4%	211
lemons	3,983	-	3,983	7.89	505	-	505	20%*	605
dabs	1,620	-225	1,395	5.53	293	-41	252	20%*	310
turbot	732	-122	610	2.93	250	-42	208	0%	208
skates & rays	926	-197	677	4.47	207	-44	163	20%*	204
sole	629	578	1,207	6.39	98	90	189	20%*	208

Table 14 North Sea MIXED WHITEFISH TRAWL choke species and potential uplift, 2011. Average days at sea 168

Area IV  Species	Tonnes				Scenario 3: Choke species			Scenario 4: Quota uplift	
	Initial Quota Allocation	Quota Change In Year	Year End quota	catch per day	fishing days before UK quota exhausted	fishing days from swaps	fishing days after swaps	% quota uplift (ICES advice)	fishing days after quota uplift
haddock	22,652	1,677	24,347	159.37	142	11	153	12%	169
cod	11,645	2,029	12,484	81.31	143	25	168	30%	211
whiting	8,917	233	9,150	59.29	150	4	154	52%	232
saithe	7,333	3,118	10,451	72.37	101	43	144	20%*	164
plaice	19,599	-3,603	15,996	98.23	200	-37	163	43%	249
hake	441	1,491	1,932	11.79	37	126	164	20%*	171
anglers	7,846	-309	7,537	43.64	180	-		0%	180
megrim	1,775	-7	1,768	9.31	191	-		18%	224
Nephrops	22,599	-762	21,828	83.01	272	-		4%	284
lemons	3,905	-100	3,805	10.06	388	-		20%*	465
dabs	1,588	45	1,633	6.65	239	-		20%*	286
turbot	717	-31	686	2.98	241	-		0%	241
skates & rays	945	-75	870	5.17	183	-		20%*	219
sole	723	559	1,082	5.26	137	-		20%*	165

Table 15 North Sea NEPHROPS TRAWL choke species and potential uplift, 2010

Area IV	Tonnes				Scenario 3: Choke species			Scenario 4: Quota uplift	
	Initial Quota Allocation	Quota Change In Year	Year End quota	catch per day	fishing days before UK quota exhausted	fishing days from swaps	fishing days after swaps	% quota uplift (ICES advice)	fishing days after quota uplift
haddock	23,124	2,233	25,358	275.64	84	8	92	12%	102
cod	13,133	1,214	14,281	154.47	85	8	93	30%	119
whiting	7,490	292.00	7,782	85.68	87	3	91	52%	136
saithe	8,455	3,639	12,094	106.61	79	34	113	20%*	129
plaice	16,864	-1,986	14,763	120.06	140	-17	124	43%	184
hake	355	1,634	1,989	12.81	28	128	155	20%*	161
anglers	10,160	-400	9,763	52.36	194	-8	186	0%	186
megrim	1,685	-7	1,678	12.15	139	-1	138	18%	163
Nephrops	23,147	-312	22,835	125.99	184	-2	181	4%	189
lemons	3,983	-	3,983	10.25	388	-	388	20%*	465
dabs	1,620	-225	1,395	9.49	171	-24	147	20%*	181
turbot	732	-122	610	4.29	170	-28	142	0%	142
sole	629	578	1,207	6.43	98	90	188	20%*	207

Table 16 North Sea NEPHROPS TRAWL choke species and potential uplift, 2011, average days at sea 150

Area IV  Species	Tonnes				Scenario 3: Choke species			Scenario 4: Quota uplift	
	Initial Quota Allocation	Quota Change In Year	Year End quota	catch per day	fishing days before UK quota exhausted	fishing days from swaps	fishing days after swaps	% quota uplift ( ICES advice)	fishing days after quota uplift
haddock	22,652	1,677	24,329	263.87	86	6	92	12%	102
cod	11,645.00	2,029	13,674	143.82	81	14	95	30%	119
whiting	8,916.87	233	9,150	94.66	94	2	97	52%	145
saithe	7,333.00	3,118	10,451	122.80	60	25	85	20%*	97
plaice	19,599.00	-3,603	15,996	145.84	134	-25	110	43%	167
hake	441.00	1,491	1,932	12.82	34	116	151	20%*	158
anglers	7,846.00	-309	7,537	59.30	132	-5	127	0%	127
megrin	1,775.00	-7	1,768	12.65	140	-1	140	18%	165
Nephrops	22,599.00	-762	21,828	92.97	243	-8	235	4%	246
lemons	3,905.00	-100	3,805	11.76	332	-9	324	20%*	389
dabs	1,588.00	45	1,633	8.06	197	6	203	20%*	242
turbot	717.00	-31	686	4.55	158	-7	151	0%	151
sole	723.00	559	1,082	5.29	137	106	243	20%*	270

### APPENDIX 3 FLEET PERFORMANCE FOR SCENARIOS 0-6

**Table 17 Irish Sea Nephrops Fleet performance in 2010 for scenarios 0-6**

Option number	0		1		2		3		4b quota for 75% discards		5		6	
Status Quo	No choke - all landed		No choke - constant volume		Choke species)		NO 9% flex		quota for 75% of current disc		9% flex		de minimis (5% of total catch)	
Fishing days	153	153	153	153	9	122	106	94						
	£	% of turnover	£	% of turnover	£	% of turnover	£	% of turnover	£	% of turnover	£	% of turnover	£	% of turnover
Value of landings	£12,632,400		£15,571,859		£10,223,044		£9,181,613		£12,104,666		£9,990,055		£9,567,025	
Non-fishing income	£5,600		£5,600		£5,600		£5,600		£5,600		£5,600		£5,600	
Quota lease cost	£225,000		£225,000		£225,000		£225,000		£225,000		£225,000		£225,000	
<b>Total Turnover</b>	<b>£12,766,200</b>		<b>£15,802,459</b>		<b>£10,453,644</b>		<b>£1,149,213</b>		<b>£12,335,266</b>		<b>£10,220,655</b>		<b>£9,797,625</b>	
Total fishing expenditure	£8,002,400	62.7%	£13,408,186	84.8%	£10,517,313	100.6%	£760,919	66.2%	£10,402,162	65.8%	£8,663,976	84.8%	£8,237,709	84.1%
Total Vessel expenditure	£2,924,769	20.5%	£2,924,769	18.5%	£2,924,769	28.0%	£2,924,769	254.5%	£2,924,769	23.7%	£2,924,769	28.6%	£2,924,769	29.9%
Total Expenditure	£10,927,169	86%	£16,332,955	103%	£13,442,082	129%	£3,685,688	320.7%	£13,326,931	108.0%	£11,588,745	113.4%	£11,162,478	113.9%
<b>Operating profit / Earnings Before Interest and Tax</b>	<b>£1,301,036</b>	<b>10%</b>	<b>-£530,496</b>	<b>-3%</b>	<b>-£2,988,439</b>	<b>-29%</b>	<b>-£2,536,476</b>	<b>-220.7%</b>	<b>-£991,665</b>	<b>-8%</b>	<b>-£1,368,090</b>	<b>-13.4%</b>	<b>-£1,364,853</b>	<b>-13.9%</b>
<b>Net profit / Earnings Before Interest and Tax</b>	<b>£2,029,911</b>	<b>16%</b>	<b>-£2,833,996</b>	<b>-18%</b>	<b>-£5,291,939</b>	<b>-51%</b>	<b>-£4,839,976</b>	<b>-421.2%</b>	<b>-£3,295,915</b>	<b>-27%</b>	<b>-£3,671,590</b>	<b>-35.9%</b>	<b>-£2,833,996</b>	<b>-28.9%</b>
Gross value added	£76,979		£71,178		£17,393		-£23,636		£48,893		£34,244		£32,186	
Gross value added	£6,928,136		£6,405,986		£1,565,414		-£2,127,280		£4,400,356		£3,081,978		£2,896,776	
Change in GVA (fleet)			-£522,149		-£5,362,721		-£9,055,415		-£2,527,779		-£3,846,156		-£4,031,359	
Change in GVA (%)			-8%		-77%		-131%		-36%		-56%		-58%	
Profit as % of turnover	15.9%		-17.9%		-50.6%		-421.2%		-26.7%		-35.9%		-28.9%	
No. of vessels	89		0		0		0		0		0		0	

Table 18 Irish Sea Nephrops Fleet performance in 2011 for scenarios 0-6

Scenario number	0	1	2	3	4b quota for 75% discards	5	6
	Status Quo	Discard ban. No choke -	Discard ban. No choke -	discard ban (whiting as ch	discard ban and quota for 7	discard ban (whiting as de minimis (5% of total cat	
Fishing days	140	140	140	5	119	140	132
	£	% of turn £	% of turn £	% of turn £	% of turnover £	% of turnover £	% of turn £
Value of landings	£17,400,400	£18,891,029	£16,263,951	£733,832	£12,629,963	£17,598,166	£16,464,895
Non-fishing income	£5,700	£5,700	£5,700	£5,700	£5,700	£5,700	£5,700
Quota lease out	£225,000	£225,000	£225,000	£225,000	£225,000	£225,000	£225,000
Total Turnover	£17,601,900	£19,121,729	£16,494,651	£964,532	£12,860,663	£17,828,866	£16,695,595
Total fishing expenses	£10,894,500	61.9% £13,195,200	69.0% £11,945,876	72.4% £499,277	51.8% £9,953,656	52.1% £12,447,922	69.8% £11,650,705
Total Vessel expenses	£3,067,700	20.5% £2,924,769	15.3% £2,924,769	17.7% £3,067,700	318.1% £2,924,769	22.7% £2,924,769	16.4% £2,924,769
Total Expenditure	£13,962,200	79% £16,119,970	84% £14,870,645	90% £3,566,977	369.8% £12,878,426	100.1% £15,372,691	86.2% £16,119,970
Operating profit	£1,301,036	7% £3,001,760	16% £1,624,006	10% -£2,602,445	-269.8% -£17,762	0% £2,456,175	13.8% £3,001,760
Net profit / EBIT (bef	£3,209,311	18% £2,684,160	14% £1,306,406	8% -£2,920,044	-302.7% -£336,112	-3% £2,138,575	12.0% £2,684,160
Gross value added (vi	£76,979	£101,232	£76,484	-£26,279	£45,185	£90,525	£92,515
Gross value added (fl	£6,928,136	£9,110,913	£6,883,591	-£2,365,132	£4,066,630	£8,147,230	£8,326,327
Change in GVA (fleet)		£2,182,778	-£44,544	-£9,293,266	-£2,861,504	£1,219,095	£1,398,193
Change in GVA (%)		32%	-1%	-134%	-41%	18%	20%
Profit as % of turnover	18.2%	14.0%	7.9%	-302.7%	-2.6%	12.0%	16.1%
No. of vessels to main	89	74	36	0	0	59	74



Table 19 Irish Sea Nephrops Fleet performance in 2012 for scenarios 0-6

Scenario num	0		1		2		3		4b quota for 75% discards		5		6	
	Status Quo		Discard ban. No choke - all		Discard ban. No choke -		discard ban (whiting as		discard ban and quota for		discard ban (whiting as		de minimis (5% of total	
Fishing days	137		137		137		15		116		130		137	
	£	% of turnover	£	% of turnover	£	% of turnover	£	% of turnover	£	% of turnover	£	% of turnover	£	% of turnover
Value of landing	£19,635,100		£21,264,946		£17,546,591		£2,348,448		£13,749,411		£18,952,742		£21,264,946	
Non-fishing inc	£5,600		£5,600		£5,600		£5,600		£5,600		£5,600		£5,600	
Quota lease out	£225,000		£225,000		£225,000		£225,000		£225,000		£225,000		£225,000	
<b>Total Turnover</b>	<b>£19,865,700</b>		<b>£21,495,546</b>		<b>£17,777,191</b>		<b>£2,579,048</b>		<b>£13,980,011</b>		<b>£19,183,342</b>		<b>£21,495,546</b>	
<b>Total fishing cost</b>	<b>£12,292,500</b>	<b>61.9%</b>	<b>£13,209,586</b>	<b>61.5%</b>	<b>£11,646,791</b>	<b>65.5%</b>	<b>£1,416,109</b>	<b>54.9%</b>	<b>£9,730,248</b>	<b>45.3%</b>	<b>£11,880,510</b>	<b>61.9%</b>	<b>£13,209,586</b>	<b>61.5%</b>
<b>Total Vessel effort</b>	<b>£2,924,769</b>	<b>20.5%</b>	<b>£2,924,769</b>	<b>13.6%</b>	<b>£2,924,769</b>	<b>16.5%</b>	<b>£2,924,769</b>	<b>113.4%</b>	<b>£2,924,769</b>	<b>20.9%</b>	<b>£2,924,769</b>	<b>15.2%</b>	<b>£2,924,769</b>	<b>13.6%</b>
<b>Total Expenditure</b>	<b>£15,217,269</b>	<b>77%</b>	<b>£16,134,356</b>	<b>75%</b>	<b>£14,571,560</b>	<b>82%</b>	<b>£4,340,878</b>	<b>168.3%</b>	<b>£12,655,017</b>	<b>90.5%</b>	<b>£14,805,279</b>	<b>77.2%</b>	<b>£16,134,356</b>	<b>75.1%</b>
<b>Operating profit</b>	<b>£4,648,431</b>	<b>23%</b>	<b>£5,361,190</b>	<b>25%</b>	<b>£3,205,631</b>	<b>18%</b>	<b>£-1,761,830</b>	<b>-68.3%</b>	<b>£1,324,994</b>	<b>9%</b>	<b>£4,378,064</b>	<b>22.8%</b>	<b>£5,361,190</b>	<b>24.9%</b>
Depreciation	£383,100	2%	£383,100	2%	£383,100	2%	£383,100	14.9%	£383,850	3%	£383,100	2.0%	£383,100	1.8%
<b>Net profit / EBIT (before interest/finance charges and tax)</b>	<b>£4,265,331</b>	<b>21%</b>	<b>£4,978,090</b>	<b>23%</b>	<b>£2,822,531</b>	<b>16%</b>	<b>£-2,144,930</b>	<b>-83.2%</b>	<b>£941,144</b>	<b>7%</b>	<b>£3,994,964</b>	<b>20.8%</b>	<b>£4,978,090</b>	<b>23.2%</b>
Gross value added	£114,173		£127,282		£91,491		£-12,098		£58,504		£108,996		£127,282	
Gross value added (fleet)	£10,275,531		£11,455,377		£8,234,199		£-1,088,803		£5,265,351		£9,809,611		£11,455,377	
Change in GVA (%)	11%		11%		-20%		-111%		-49%		-5%		11%	
Profit as % of GVA	21.5%		23.2%		15.9%		-83.2%		6.7%		20.8%		23.2%	
No. of vessels	99		116		66		0		22		93		116	

**Table 20 North Sea MIXED WHITEFISH TRAWL Fleet performance in 2010 for scenarios 0-6**

Scenario number	0		1		2		3		4a		5		6	
	Status Quo		No choke - all landed		No choke - constant vol of Choke species		Quota uplift based on ICES tChoke species		9% fl: de minimis		5% of total catch			
Fishing days	173		173		173		156		150		155		173	
	£	% of turnover	£	% of turnover	£	% of turnover	£	% of turnover	£	% of turnover	£	% of turnover	£	% of turnover
Value of landings	£96,927,940		£104,143,970		£88,279,386		£81,504,451		£107,240,999		£93,308,182		£104,143,970	
Non-fishing income	£1,938,559		£1,938,559		£1,938,559		£1,938,559		£1,938,559		£1,938,559		£1,938,559	
Quota lease out	£1,050,000		£1,050,000		£1,050,000		£1,050,000		£1,050,000		£1,050,000		£1,050,000	
Total Turnover	£99,916,499		£107,132,529		£91,267,945		£84,493,010		£110,229,558		£96,296,740		£107,132,529	
Total Vessel expenditure	£18,244,125	20.5%	£18,244,125	16.6%	£18,244,125	20.0%	£18,244,125	21.6%	£18,244,125	16.6%	£18,244,125	18.9%	£18,244,125	17.0%
Total Expenditure	£91,710,523	92%	£100,781,368	94%	£87,256,770	96%	£76,262,187	90.3%	£89,120,989	81%	£84,401,894	87.6%	£100,472,740	93.8%
Operating profit	£8,205,976	8%	£6,351,161	6%	£4,011,175	4%	£8,230,823	9.7%	£21,108,568	19%	£11,894,847	12.4%	£6,659,789	6.2%
Net profit / EBIT (before tax)	£6,307,562	6%	£4,452,748	4%	£2,112,762	2%	£6,332,410	7.5%	£19,210,155	17%	£9,996,433	10.4%	£4,761,375	4.4%
Gross value added (before depreciation)	£243,833		£243,306		£195,845		£215,114		£360,909		£264,995		£245,644	
Gross value added (including depreciation)	£32,185,936		£32,116,366		£25,851,484		£28,395,014		£47,639,977		£34,979,279		£32,424,994	
Change in GVA (fleet)			£-69,569		£-6,334,451		£-3,790,921		£15,454,043		£2,793,344		£239,059	
Change in GVA (%)			0%		-20%		-12%		48%		9%		1%	
Profit as % of turnover	6.3%		4.2%		2.3%		7.5%		17.4%		10.4%		4.4%	
No. of vessels to maintain	132		93		44		133		402		209		100	

**Table 21 North Sea MIXED WHITEFISH TRAWL Fleet performance in 2011 for scenarios 0-6**

Scenario numb	0		1		2		3		4a		5		6	
	Status Quo		No choke - all landed		No choke - constant vol of land		Choke species		Quota uplift based on ICES		Choke species(hake) 9% flex de minimis (5% of total catch)			
Fishing days	168		168		168		144		168		155		168	
	£	% of turnc	£	% of turnover	£	% of turnover	£	% of turnover	£	% of turnover	£	% of turnover	£	% of turnover
Value of landin	£102,583,263		£107,666,041		£95,697,957		£105,046,182		£122,202,948		£99,334,740		£107,666,041	
Non-fishing inc	£17,095,801		£17,095,801		£17,095,801		£17,095,801		£17,095,801		£17,095,801		£17,095,801	
Quota lease ot	£1,114,767		£1,114,767		£1,114,767		£1,114,767		£1,114,767		£1,114,767		£1,114,767	
Total Turnover	£120,793,830		£125,876,608		£113,908,524		£123,256,750		£140,413,516		£117,545,308		£125,876,608	
Total fishing ex	£75,225,392	62.3%	£80,904,488	57.6%	£75,734,364	66.5%	£68,880,876	55.9%	£80,456,646	57.3%	£70,400,559	59.9%	£80,855,370	64.2%
Total Vessel ex	£22,056,194	20.5%	£22,056,194	15.7%	£22,056,194	19.4%	£22,056,194	17.9%	£22,056,194	15.7%	£22,056,194	18.8%	£22,056,194	17.5%
Total Expenditt	£97,281,587	81%	£102,960,682	82%	£97,790,559	86%	£90,937,070	73.8%	£102,512,840	73%	£92,456,753	78.7%	£102,911,565	81.8%
<b>Operating pro</b>	<b>£23,512,244</b>	<b>19%</b>	<b>£22,915,927</b>	<b>18%</b>	<b>£16,117,965</b>	<b>14%</b>	<b>£32,319,679</b>	<b>26.2%</b>	<b>£37,900,676</b>	<b>27%</b>	<b>£25,088,555</b>	<b>21.3%</b>	<b>£22,965,044</b>	<b>18.2%</b>
<b>Net profit / EB</b>	<b>£21,238,341</b>	<b>18%</b>	<b>£20,642,024</b>	<b>16%</b>	<b>£13,844,063</b>	<b>12%</b>	<b>£30,045,777</b>	<b>24.4%</b>	<b>£35,626,773</b>	<b>25%</b>	<b>£22,814,652</b>	<b>19.4%</b>	<b>£20,691,142</b>	<b>16.4%</b>
Gross value ad	£400,647		£406,061		£326,083		£477,831		£558,352		£406,983		£406,464	
Gross value ad	£48,878,948		£49,539,496		£39,782,077		£58,295,412		£68,118,919		£49,651,967		£49,588,614	
Change in GVA (fleet)			£660,549		£-9,096,870		£9,416,465		£19,239,972		£773,020		£709,666	
Change in GVA (%)			1%		-19%		19%		39%		2%		1%	
Profit as % of t	17.6%		16.4%		12.2%		24.4%		25.4%		19.4%		16.4%	
No. of vessels	122		119		80		173		205		131		119	

Table 22 North Sea MIXED WHITEFISH TRAWL Fleet performance in 2012 for scenarios 0-6

scenario numb	0		1		2		3		4a		5		6	
	Status Quo		No choke - all landed		No choke - constant vol o		Choke species		Quota uplift based on ICES		Choke species(hake) 9% flrde minimis (5% of total catch			
<b>Fishing days</b>	<b>154</b>		<b>154</b>		<b>154</b>		<b>108</b>		<b>113</b>		<b>134</b>		<b>154</b>	
	£	% of turnover	£	% of turno	£	% of turno	£	% of turnover	£	% of turnover	£	% of turnover	£	% of turnover
Value of landin	£93,870,231		£100,079,396		£82,533,907		£62,074,619		£88,830,529		£87,082,072		£100,079,396	
Non-fishing inc	£3,130,381		£3,130,381		£3,130,381		£3,130,381		£3,130,381		£3,130,381		£3,130,381	
Quota lease ou	£1,000,505		£1,000,505		£1,000,505		£1,000,505		£1,000,505		£1,000,505		£1,000,505	
Total Turnover	£98,001,117		£104,210,282		£86,664,792		£66,205,504		£92,961,414		£91,212,958		£104,210,282	
Total fishing ex	£65,826,285	67.2%	£74,079,564	79.7%	£67,888,116	78.3%	£44,980,021	67.9%	£53,565,519	57.6%	£55,096,674	60.4%	£73,233,514	70.3%
Total Vessel ex	£17,894,388	20.5%	£17,894,388	19.2%	£17,894,388	20.6%	£17,894,388	27.0%	£17,894,388	19.2%	£17,894,388	19.6%	£17,894,388	17.2%
Total Expendit	£83,720,673	85%	£91,973,952	88%	£85,782,504	99%	£62,874,409	95.0%	£71,459,907	77%	£72,991,062	80.0%	£91,127,902	87.4%
<b>Operating pro</b>	<b>£14,280,444</b>	<b>15%</b>	<b>£12,236,330</b>	<b>12%</b>	<b>£882,288</b>	<b>1%</b>	<b>£3,331,095</b>	<b>5.0%</b>	<b>£21,501,508</b>	<b>23%</b>	<b>£18,221,895</b>	<b>20.0%</b>	<b>£13,082,380</b>	<b>12.6%</b>
<b>Net profit / EB</b>	<b>£12,239,613</b>	<b>12%</b>	<b>£10,195,499</b>	<b>10%</b>	<b>£-1,158,542</b>	<b>-1%</b>	<b>£1,290,264</b>	<b>1.9%</b>	<b>£19,460,677</b>	<b>21%</b>	<b>£16,181,065</b>	<b>17.7%</b>	<b>£11,041,549</b>	<b>10.6%</b>
Gross value ac	£288,718		£282,488		£154,922		£139,125		£340,910		£309,994		£289,658	
Gross value ac	£34,068,762		£33,333,572		£18,280,852		£16,416,738		£40,227,431		£36,579,236		£34,179,622	
Change in GVA (fleet)			£-735,189		£-15,787,909		£-17,652,023		£6,158,670		£2,510,475		£110,861	
Change in GVA (%)			-2%		-46%		-52%		18%		7%		0%	
Profit as % of t	12.5%		9.8%		-1.3%		1.9%		20.9%		17.7%		10.6%	
No. of vessels	118		98		0		12		188		156		106	

Table 23 North Sea NEPHROPS TRAWL Fleet performance in 2010 for scenarios 0-6

Scenario number	0		1		2		3		4		5		6	
	Status Quo		No choke - all landed		No choke - constant vol of landings		Choke species		Quota uplift based on ICES total catch		Choke species(hake) 9% flex		5% minimum (5% of total catch)	
Fishing days	148		148		148		93		129		95		125	
	£	% turnover	£	% turnover	£	% turnover	£	% turnover	£	% turnover	£	% turnover	£	% turnover
Value of landings	£56,215,063		£58,629,071		£47,495,707		£35,279,079		£61,488,984		£37,633,525		£58,629,071	
Non-fishing income	£1,522,185		£1,522,185		£1,522,185		£1,522,185		£1,522,185		£1,522,185		£1,522,185	
Quota lease out	£1,213,920		£1,213,920		£1,213,920		£1,213,920		£1,213,920		£1,213,920		£1,213,920	
<b>Total Turnover</b>	<b>£58,951,168</b>		<b>£61,365,176</b>		<b>£50,231,812</b>		<b>£38,015,184</b>		<b>£64,225,089</b>		<b>£40,369,630</b>		<b>£61,365,176</b>	
Fuel and oil	£15,319,828	26.0%	£15,319,828	23.9%	£15,319,828	30.5%	£9,614,316	25.3%	£13,367,500	20.8%	£9,833,673	24.4%	£12,984,619	32.2%
Quota leasing	£702,652	1.2%	£2,981,904	5.1%	£2,279,252	4.5%	£440,965	1.2%	£613,107.15	1.0%	£451,026.38	1.1%	£2,527,371	6.3%
Crew wages	£14,270,419	24%	£14,883,225	23.2%	£12,056,976	24.0%	£8,540,073	22.5%	£15,609,225	24.3%	£9,553,421	23.7%	£14,883,225	36.9%
Other fishing expenses	£6,163,058	10.5%	£6,163,058	9.6%	£6,163,058	12.3%	£3,867,771	10.2%	£5,377,650	8.4%	£3,451,870	8.6%	£6,163,058	15.3%
<b>Total fishing expenses</b>	<b>£41,561,047</b>	<b>70.5%</b>	<b>£44,740,581</b>	<b>69.7%</b>	<b>£40,431,476</b>	<b>80.5%</b>	<b>£25,593,087</b>	<b>67.3%</b>	<b>£40,117,215</b>	<b>62.5%</b>	<b>£26,516,602</b>	<b>65.7%</b>	<b>£41,740,318</b>	<b>68.0%</b>
<b>Total Vessel expenses</b>	<b>£13,711,671</b>	<b>23.3%</b>	<b>£13,711,671</b>	<b>21.3%</b>	<b>£13,711,671</b>	<b>27.3%</b>	<b>£13,711,671</b>	<b>36.1%</b>	<b>£13,711,671</b>	<b>21.3%</b>	<b>£13,711,671</b>	<b>34.0%</b>	<b>£13,711,671</b>	<b>22.3%</b>
<b>Total Expenditure</b>	<b>£55,272,718</b>	<b>94%</b>	<b>£58,452,252</b>	<b>95%</b>	<b>£54,143,147</b>	<b>108%</b>	<b>£39,304,759</b>	<b>103.4%</b>	<b>£53,828,886</b>	<b>84%</b>	<b>£40,228,273</b>	<b>99.6%</b>	<b>£55,451,989</b>	<b>90.4%</b>
<b>Operating profit</b>	<b>£3,678,450</b>	<b>6%</b>	<b>£2,912,923</b>	<b>5%</b>	<b>-£3,911,336</b>	<b>-8%</b>	<b>-£1,289,575</b>	<b>-3.4%</b>	<b>£10,396,203</b>	<b>16%</b>	<b>£141,357</b>	<b>0.4%</b>	<b>£5,913,186</b>	<b>9.6%</b>
<b>Net profit (EBIT)</b>	<b>£2,558,378</b>	<b>4%</b>	<b>£1,792,851</b>	<b>3%</b>	<b>-£5,031,408</b>	<b>-10%</b>	<b>-£2,409,647</b>	<b>-6.3%</b>	<b>£9,276,131</b>	<b>14%</b>	<b>-£978,715</b>	<b>-2.4%</b>	<b>£4,793,114</b>	<b>7.8%</b>
<b>Gross value added (fleet)</b>	<b>£17,948,870</b>		<b>£17,796,148</b>		<b>£8,145,640</b>		<b>£7,250,498</b>		<b>£26,005,428</b>		<b>£9,694,778</b>		<b>£20,796,411</b>	
<b>Change in GVA (fleet)</b>			<b>-£152,721</b>		<b>-£9,803,229</b>		<b>-£10,698,371</b>		<b>£8,056,559</b>		<b>-£8,254,090</b>		<b>£2,847,542</b>	
<b>Change in GVA (%)</b>			<b>-1%</b>		<b>-55%</b>		<b>-60%</b>		<b>45%</b>		<b>-46%</b>		<b>16%</b>	
<b>Profit as % of turnover</b>	<b>4.3%</b>		<b>2.9%</b>		<b>-10.0%</b>		<b>-6.3%</b>		<b>14.4%</b>		<b>-2.4%</b>		<b>7.8%</b>	
<b>No. of vessels to maintain</b>	<b>202</b>		<b>142</b>		<b>0</b>		<b>0</b>		<b>732</b>		<b>0</b>		<b>378</b>	

Table 24 North Sea NEPHROPS TRAWL Fleet performance in 2011 for scenarios 0-6

Scenario numb	0		1		2		Option number	3		4		5		6		
	Status Quo		No choke - all landed		No choke - constant vol of landings		Choke species			Quota uplift based on ICES Choke species(hake)		9% flt de minimis		(5% of total catc		
Fishing days	150		150		150		Fishing days	85	Saithe	97		95		97		
	£	% of tur	£	% of turnover	£	% of turnover	£	% of turnover	£	% of turnover	£	% of turnover	£	% of turnover	£	% of turnover
Value of landin	£60,438,761		£62,903,792		£38,909,510		Value of landin	£34,290,175		£54,576,890		£39,839,068		£62,903,792		
Non-fishing inc	£4,873,028		£4,873,028		£4,873,028		Non-fishing inc	£4,873,028		£4,873,028		£4,873,028		£4,873,028		
Quota lease ou	£1,410,161		£1,410,161		£1,410,161		Quota lease ou	£1,410,161		£1,410,161		£1,410,161		£1,410,161		
Total Turnover	£66,721,951		£69,186,981		£45,192,700		Total Turnover	£40,573,364		£60,860,079		£46,122,258		£69,186,981		
Total fishing ex	£48,200,094	72.2%	£51,309,042	84.3%	£42,363,693	93.7%	Total fishing ex	£26,298,022	64.8%	£36,251,513	59.6%	£28,838,151	62.5%	£43,420,430	62.8%	
Total Vessel ex	£12,183,009	20.5%	£12,183,009	20.0%	£12,183,009	27.0%	Total Vessel ex	£12,183,009	30.0%	£12,183,009	20.0%	£12,183,009	26.4%	£12,183,009	17.6%	
Total Expenditu	£60,383,103	90%	£63,492,051	92%	£54,546,702	121%	Total Expenditu	£38,481,031	94.8%	£48,434,522	80%	£41,021,160	88.9%	£55,603,439	80.4%	
<b>Operating pro</b>	<b>£6,338,848</b>	<b>10%</b>	<b>£5,694,930</b>	<b>8%</b>	<b>-£9,354,003</b>	<b>-21%</b>	<b>Operating pro</b>	<b>£2,092,333</b>	<b>5.2%</b>	<b>£12,425,557</b>	<b>20%</b>	<b>£5,101,098</b>	<b>11.1%</b>	<b>£13,583,542</b>	<b>19.6%</b>	
<b>Net profit / EB</b>	<b>£5,071,131</b>	<b>8%</b>	<b>£4,427,213</b>	<b>6%</b>	<b>-£10,621,720</b>	<b>-24%</b>	<b>Net profit / EB</b>	<b>£824,616</b>	<b>2.0%</b>	<b>£11,157,840</b>	<b>18%</b>	<b>£3,833,381</b>	<b>8.3%</b>	<b>£12,315,825</b>	<b>17.8%</b>	
Gross value ad	£133,548		£133,808		£8,764		Gross value ad	£61,936		£159,109		£93,333		£179,145		
Gross value ad	£23,237,297		£23,282,593		£1,524,949		Gross value ad	£10,776,892		£27,685,049		£16,239,950		£31,171,205		
Change in GVA (fleet)			£45,297		-£21,712,347		Change in GVA	-£12,460,404		£4,447,753		-£6,997,346		£7,933,909		
Change in GVA (%)			0%		-93%		Change in GVA	-54%		19%		-30%		34%		
Profit as % of t	7.6%		6.4%		-23.5%		Profit as % of t	2.0%		18.3%		8.3%		17.8%		
No. of vessels	174		152		0		No. of vessels	28		383		132		423		

Table 25 North Sea NEPHROPS TRAWL Fleet performance in 2012 for scenarios 0-6

Scenario num	0		1		2		3		4		5		6	
	Status Quo		No choke - all landed		No choke - constant vol of landings		Choke species		Quota uplift based on ICES total catch		Choke species(hake) 9% flex		de minimis (5% of total catch)	
Fishing days	143		143		143		87		94		104		142	
	£	% of turnover	£	% of turnover	£	% of turnover	£	% of turnover	£	% of turnover	£	% of turnover	£	% of turnover
Value of landings	£46,041,600		£47,909,290		£39,038,651		£28,063,685		£39,089,980		£34,843,120		£47,909,290	
Non-fishing income	£4,125,380		£4,125,380		£4,125,380		£4,125,380		£4,125,380		£4,125,380		£4,125,380	
Quota lease obligations	£524,022		£524,022		£524,022		£524,022		£524,022		£524,022		£524,022	
<b>Total Turnover</b>	<b>£50,691,002</b>		<b>£52,558,693</b>		<b>£43,688,054</b>		<b>£32,713,087</b>		<b>£43,739,382</b>		<b>£39,492,523</b>		<b>£52,558,693</b>	
<b>Total fishing effort</b>	<b>£35,476,748</b>	<b>70.0%</b>	<b>£37,633,883</b>	<b>86.0%</b>	<b>£34,272,809</b>	<b>78.4%</b>	<b>£20,903,795</b>	<b>63.9%</b>	<b>£25,808,427</b>	<b>59.0%</b>	<b>£24,287,792</b>	<b>61.5%</b>	<b>£37,465,617</b>	<b>71.3%</b>
<b>Total Vessel effort</b>	<b>£9,255,858</b>	<b>20.5%</b>	<b>£9,255,858</b>	<b>21.2%</b>	<b>£9,255,858</b>	<b>21.2%</b>	<b>£9,255,858</b>	<b>28.3%</b>	<b>£9,255,858</b>	<b>21.2%</b>	<b>£9,255,858</b>	<b>23.4%</b>	<b>£9,255,858</b>	<b>17.6%</b>
<b>Total Expenditure</b>	<b>£44,732,606</b>	<b>88%</b>	<b>£46,889,742</b>	<b>89%</b>	<b>£43,528,668</b>	<b>100%</b>	<b>£30,159,653</b>	<b>92.2%</b>	<b>£35,064,286</b>	<b>80%</b>	<b>£33,543,650</b>	<b>84.9%</b>	<b>£46,721,476</b>	<b>88.9%</b>
<b>Operating profit</b>	<b>£5,958,396</b>	<b>12%</b>	<b>£5,668,951</b>	<b>11%</b>	<b>£159,386</b>	<b>0%</b>	<b>£2,553,434</b>	<b>7.8%</b>	<b>£8,675,096</b>	<b>20%</b>	<b>£5,948,873</b>	<b>15.1%</b>	<b>£5,837,217</b>	<b>11.1%</b>
<b>Net profit / EBIT</b>	<b>£4,889,496</b>	<b>10%</b>	<b>£4,600,051</b>	<b>9%</b>	<b>-£909,514</b>	<b>-2%</b>	<b>£1,484,534</b>	<b>4.5%</b>	<b>£7,606,196</b>	<b>17%</b>	<b>£4,879,973</b>	<b>12.4%</b>	<b>£4,768,317</b>	<b>9.1%</b>
<b>Gross value added</b>	<b>£103,493</b>		<b>£104,412</b>		<b>£57,549</b>		<b>£52,696</b>		<b>£110,190</b>		<b>£87,208</b>		<b>£105,451</b>	
<b>Gross value added (fleet)</b>	<b>£16,765,843</b>		<b>£16,914,805</b>		<b>£9,323,015</b>		<b>£8,536,681</b>		<b>£17,850,774</b>		<b>£14,127,675</b>		<b>£17,083,071</b>	
<b>Change in GVA</b>			<b>£148,963</b>		<b>-£7,442,827</b>		<b>-£8,229,161</b>		<b>£1,084,932</b>		<b>-£2,638,166</b>		<b>£317,229</b>	
<b>Change in GVA (%)</b>			<b>1%</b>		<b>-44%</b>		<b>-49%</b>		<b>6%</b>		<b>-16%</b>		<b>2%</b>	
<b>Profit as % of turnover</b>	<b>9.6%</b>		<b>8.8%</b>		<b>-2.1%</b>		<b>4.5%</b>		<b>17.4%</b>		<b>12.4%</b>		<b>9.1%</b>	
<b>No. of vessels</b>	<b>162</b>		<b>152</b>		<b>0</b>		<b>49</b>		<b>252</b>		<b>162</b>		<b>158</b>	