

Landing Obligation Economic Impact Assessment (EIA)

Interim Report Two: Scenario Analysis





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Jennifer Russell (Anderson Solutions Ltd)
Simon Mardle (Fishor Consulting Ltd)
Hazel Curtis (Seafish)

Sea Fish Industry Authority
18 Logie Mill
Logie Green Road
Edinburgh, EH7 4HS

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1. INTRODUCTION

Seafish is undertaking an economic impact assessment of the landing obligation. The landing obligation has been introduced as part of the reform of the Common Fisheries Policy (CFP) and requires all catches of quota stocks to be landed. The purpose of the economic impact assessment is to provide information that will support decision-making and understanding at a fleet segment, home nation and national level.

The Landing Obligation Economic Impact Assessment project is being undertaken in three analytical phases. Interim Report One reported on the first phase of the project, the choke analysis. Interim Report Two reports on the findings from a scenario analysis. The third phase of the project will consider the economic impacts of the landing obligation onshore.

1.1. BACKGROUND AND PURPOSE OF THE SCENARIO ANALYSIS

Article 15 of the reformed Common Fisheries Policy (EC Reg. 1380/2013) introduces a regulatory requirement for the EU fishing fleet to land all catches subject to catch limits or quotas (the landing obligation).

The landing obligation was implemented for EU pelagic fisheries from January 2015. For demersal fisheries, the landing obligation will come into force using a phased approach beginning on January 1st 2016, with full implementation by January 1st 2019.

A significant proportion of the demersal fleet in the UK is fishing in a highly mixed fishery. This inevitably means that there are fish that a fisherman wants to catch and fish that a fisherman would rather not catch. Target stocks can vary between different fleet segments however in general fishermen want to avoid:

- undersize fish (below minimum landing size);
- fish which there is no economically viable market for; and
- fish that the vessel owner has no quota for. This may be because the quota for a particular stock has been fully used up or because the vessel has no quota for a stock, for example a demersal vessel will seek to avoid pelagic stocks.

Fishermen avoid unwanted fish through their knowledge of the behaviour of stocks, through communication between vessels or via POs on recent catches, and by using gear designed to avoid undersize fish. Many of the gear choices available to fishermen are regulated to support avoidance of undersize fish. However, regardless of these efforts, it remains inevitable that in a mixed fishery unwanted fish will be caught. When unwanted fish are caught they are commonly discarded, indeed fishermen are obliged to discard undersize fish and have to discard fish for which they cannot obtain quota.

The landing obligation is designed to stop all forms of discarding. Therefore in 2019, when all demersal quota stocks become subject to the landing obligation, all catch of quota stocks must be landed. All catch must be landed regardless of whether the catch is below the minimum conservation reference size (a replacement measure for minimum landing size), is a stock for which they cannot access quota, or is a stock for which there is no viable market. This will leave many fishermen with a significant operational challenge as they try to find new ways to avoid unwanted catch. With uncertainty around how much more can be done to avoid unwanted catch in a mixed fishery and with TACs that often lag behind changes in fish stocks there is potential for

the landing obligation to have a substantial effect on business performance in the short-term. Business performance could be affected if income per landed tonne goes down due to catch composition that includes a higher proportion of undersize fish or fish which there is little or no market for. Furthermore the fleet could choke on a stock which they cannot obtain quota for and it is assumed that in this situation the fleet would have to stop fishing and would be unable to catch the rest of its quota. This is referred to as the choke point.

It is possible that new technology and more real time information could help fishermen to make operational decisions and mitigate the impact of the landing obligation on their business. However, the potential for improvement from such actions requires further investigation. The revised CFP and in particular Article 15 recognises the potential challenges to fishermen and several provisions, exemptions and derogations are proposed that appear to be designed to lessen the operational challenges that fishermen will face. These include:

- a one-off quota uplift, sometimes referred to as quota transfer, that will recognise that TACs are now providing catch quotas rather than landings quotas;
- a de minimis exemption – the landing obligation will not apply to catches falling under the de minimis exemption. De minimis is designed to reduce the challenge caused by economically unviable catch that represent a small proportion of total catch and catch where scientific evidence indicates that selectivity is very difficult to achieve (Article 15, paragraph 5);
- an interspecies flexibility derogation that allows unused quota for one stock to be used to cover the catch of another stock (Article 15, paragraphs 4 and 8); and
- a survivability exemption that will allow fishermen to return to the sea their catch of stocks which are scientifically proven to have a high chance of survival (Article 15, paragraph 4).

The purpose of the scenario analysis presented in this report is to analyse the potential outcomes for the UK fleet from the introduction of various landing obligation policy levers. The analysis is focused on what difference quota uplift, exemptions and derogations could have on the choke point and, as a consequence, the activity and business performance of the UK fleet.

The scenario analysis uses a specially designed bioeconomic model and informed assumptions to present a quantitative analysis of the potential impact of the landing obligation and the different provisions set out in Article 15. The reader is advised not to consider the analysis as a prediction of what will actually occur in 2019 as a result of the landing obligation as how the provisions proposed in Article 15 will be implemented is not yet known; and the impact of changes initiated by the fleet could also have an impact on fleet activity and performance. Rather, the scenario analysis is best viewed as a simulation designed to identify issues of resilience, viability and vulnerability in the key segments of the UK fleet.

1.2. STRUCTURE OF REPORT

Interim Report Two is structured as follows:

- Chapter 2 sets out the approach, methodology and key assumptions used to produce the scenario analysis;
- Chapters 3 to 8 present the scenario analysis for each of the six fleet segments included in the report;

- Chapter 9 presents an analysis which considers the volume and value of quota that could be caught and the volume and value of quota that might be left in the sea;
- Chapter 10 provides a summary of the findings and conclusions from the scenario analysis;
- Appendix A contains more detail on how the bioeconomic model is constructed and the calculations contained within it; and
- Appendix B – contains the discard rates used for each fleet segment in each sea area. (to follow)

2. APPROACH AND METHODOLOGY

2.1. THE CHOKE ANALYSIS

The choke analysis was the first phase in the Landing Obligation Economic Impact Assessment and its output was presented in Interim Report One. The choke analysis provides a view of what the activity of six UK fleet segments would have been in 2013 had the proposed rules for the landing obligation in 2016 and 2019 been in place.

Information that is critical to a choke analysis is:

- landings volume by species and stock;
- observed discard rates by species in each sea area;
- advice and information on stocks provided by ICES; and
- information on the quota available.

The choke analysis used 2013 data for landings and discard rates, 2012 ICES advice in respect of 2013 and the initial quota allocation to the fleet in 2013.

The output of the choke analysis provides an indication of how many days fishing could be achieved before the primary choke stock in each sea area could have halted the activity of each fleet segment in 2013. A choke stock is a stock for which a fleet segment has insufficient quota to enable it to land its total potential catch of that stock. The choke analysis assumed that when the quota of a stock is fully used (the choke point), the fleet that catches that stock will be unable to fish in the sea area for the remainder of the year. A 'primary' choke stock is the first quota stock to have its quota fully used up and therefore it is the primary choke stock that determines the activity of the fleet.

The output of the choke analysis can be regarded as a worst-case scenario because:

- the choke analysis did not incorporate the potential benefits of exemptions and derogations specified in the landing obligation such as interspecies flexibility, survivability and de minimis;
- the choke analysis was calculated on the basis of the initial quota allocation to each home nation and therefore did not incorporate the benefits of trading in quota during the year to extend fishing opportunity;
- the choke analysis was a retrospective analysis, which imposed the landing obligation rules on actual activity in 2013 and therefore did not consider how fishermen might alter their fishing operations to avoid catching potential choke stocks; and
- the choke analysis did not consider how the landing obligation might affect the biomass of target or bycatch stocks.

However, the choke analysis had characteristics that could have limited the potential negative impact. The choke analysis excluded the potential impact of zero-TAC stocks such as cod 6A, cod 6B and whiting in Area VI. The choke analysis also assumed that quota could be allocated throughout the home nation fleet segment to where catching activity required it, i.e. the analysis did not recognise that quota is held by individual vessels and POs.

The choke analysis also assumed that the landing obligation would be implemented for the principle fisheries for a fleet segment in 2016, for example cod, haddock, whiting and saithe would be subject to the landing obligation in 2016 for the whitefish trawl/seine fleet.

2.2. PURPOSE OF THE SCENARIO ANALYSIS

Following on from the choke analysis, the purpose of the scenario analysis is to answer the following question:

What are the potential outcomes for the fleet from the introduction of various landing obligation policy levers?

The scenarios simulate the possible outcomes over the coming years and identify issues of resilience, viability and vulnerability in key segments of the UK fleet. The scenarios only focus upon:

- the possible outcomes from the introduction of the landing obligation, without any new policy levers or fleet-based solutions; and
- the potential outcomes from the introduction of various policy levers.

The scenario analysis does not consider the potential effect of fleet-based solutions. Fleet-based solutions could help the fleet to avoid choke stocks and therefore mitigate the impact of the landing obligation on the activity and performance of the fleet. Fleet-based solutions might include:

- gear and technological developments on-board vessels;
- developments in fleet management; and/or
- differences in the decision-making process on areas to fish and areas to avoid.

Modelling if, what and how fleet-based responses might occur in different fleet segments and in different sea areas around the UK was not within the scope of this project and would be very difficult to achieve.

2.3. APPROACH TO THE SCENARIO ANALYSIS

The scenario analysis has been undertaken using a bioeconomic model. The final version of the model contains over 3 million calculation steps and the model includes:

- 51 demersal quota stocks;
- 45 fleet segments. Of these 45 segments, 22 PO fleet segments which represent the majority of fishing activity in the UK are included in the six home nation fleet segments reported on in this report;
- Eleven scenarios;
- Three sea areas; and
- 10 years of analysis (2013-2022), from which 2016 and 2019 are selected to present the analysis in this report.

Furthermore, the whole analysis has been undertaken twice, once based on initial quota allocation (as was used in the choke analysis) and once based on end of year landings, which has

been taken as a proxy for quota held at year end after trading and swaps. It is the scenario analysis based on end of year landings that is presented in this report.

The reason why all analyses are not presented in this report is driven by the need to provide focused and valuable information that can be accessed and used by decision-makers to inform ongoing discussions, this has required the presentation of information to be selective.

The scenario analysis has also been designed to eliminate weaknesses inherent in the home nation choke analysis. In particular:

- The bioeconomic model created to undertake the scenario analysis uses 2013 data but enables dynamic assessment of stocks year on year as a result of changing variables, in particular catch volumes. The dynamic nature of the model means that the scenario analysis does consider how policy changes and catching activity can affect the biomass of target and bycatch stocks and TAC is adjusted year on year to reflect changing biomass. Therefore the scenario analysis does not simply impose the landing obligation on fleet activity in 2013 to determine potential future outcomes.
- The scenario analysis is undertaken at a PO fleet segment level and aggregated to present the findings at a home nation level. The PO based approach has a number of consequences because the characteristics of each PO (quota held, nature of vessels, areas fished) will affect which species create a choke for that PO and the fishing days available per vessel. The PO based structure of the scenario analysis is considered to more closely reflect reality. Implications of particular note are:
 - the choke analysis assumed that all quota held in a home nation is matched to the catching activity that requires it, regardless of who holds the quota. A PO fleet segment analysis protects the quota in the PO for use by vessels in the PO.
 - the PO fleet segment approach means that the choke stock can be different for different POs. Furthermore the number of days available before a choke stock affects activity of a PO fleet segment will depend on the quota held within the PO. Therefore in the model, vessels in one PO might be affected by a choke stock in a sea area much earlier than the vessels of another PO.

These changes in approach mean that the projected choke stocks in the scenario analysis may not match those identified in the choke analysis in Interim Report One.

The scenario analysis is dependent, as the choke analysis is, on the quality of data used, for example catch and catching patterns are informed by observed discard rates from a sample of trips and not actual discard rates. Furthermore the scenario analysis assumes that the activity of all vessels within a PO fleet segment is the same i.e. each vessel has the same catch rates and that the quota will be shared between vessels in the PO segment.

The assumption that when the quota of a stock is fully used, the fleet that catches that stock will be unable to fish in the affected sea area is continued in the scenario analysis. For each fleet segment the first stock to have its quota fully used up under each scenario is the primary choke stock.

2.4. SCENARIO DEFINITIONS

The scenario analysis includes eleven scenarios. The scenarios have been developed by the project team and do not necessarily represent what will actually occur under each of the

exemptions and derogations. How and whether the derogations and exemptions will be utilised by fisheries managers is yet to be finalised and therefore this analysis is intended to support understanding of how the different levers could create an impact and what that impact might be. The scenarios are divided into three types:

- baseline scenarios;
- single policy lever scenarios; and
- combined policy lever scenarios.

Each type and the scenarios within them are described below.

2.4.1. BASELINE SCENARIOS

There are three baseline scenarios. Baseline scenarios are those that could exist prior to the introduction of any policy lever scenarios that incorporate de minimis, interspecies flexibility or survivability.

The baseline scenarios were originally developed in January 2015 and therefore do not incorporate proposals in the submitted regional plans to revise the transitional rules prior to 2019 by phasing in species at different times.

- **Scenario B1** – Baseline Scenario B1 presents the effect of introducing the landing obligation with no associated policy adjustments, except the transitional rules prior to 2019 set out in Article 15.
- **Scenario B2** – Baseline Scenario B2 presents the effect of scenario B1 plus a catch allowance for stocks which have no quota allocated to POs, referred to as zero TAC stocks in the remainder of this report. The catch allowance in baseline scenario B2 means that a stock for which no quota is allocated can be caught, i.e. cod 6A, cod 6B and Whiting in Area VI, but catch is restricted to no more than 1.5% of total PO fleet segment catch.
- **Scenario B3** – Scenario B3 presents the effect of scenario B2 plus the application of quota uplift, where available. Quota uplift is applied and is calculated according to ICES information from 2012 (see Table 2-3). Uplift is applied to stocks when they are subject to the landing obligation i.e. cod, haddock, whiting, saithe, nephrops, hake, plaice and sole have uplift applied at a EU TAC level in 2016, megrim and other stocks have uplift applied in 2019. As in scenario B2, a zero-TAC stock can be caught e.g. cod 6A, cod 6B and whiting in Area VI, but catch is restricted to no more than 1.5% of total PO fleet segment catch.

Baseline scenario B3 is the scenario that is most closely aligned to the output of the choke analysis in that it largely eradicates the impact of zero-TAC stocks and quota uplift is applied to eligible stocks.

The single and combined policy lever scenarios have all been applied to baseline scenario B3. Therefore in each policy lever scenario that follows the potential benefit of a catch allowance and quota uplift is included.

2.4.2. SINGLE POLICY LEVER SCENARIOS

Scenarios 1A to 3 estimate the potential impact of the exemptions and derogations referred to as de minimis, interspecies flexibility and survivability. These exemptions and derogations are all

introduced in Article 15 and the term used for them in the report is 'policy levers'. There are five single policy lever scenarios under which each exemption and derogation operates in isolation.

De minimis is the exemption which has the broadest potential scope as a question remains over what the 5%, referenced in Article 15, is a percentage of. Therefore three different de minimis scenarios are presented to demonstrate its potential scope. Article 15 allows for a transitional increase in de minimis and therefore in the model in 2016 the percentage of catch that can be discarded is 7%, in 2017 the percentage is 6% and in 2018 the percentage becomes and then remains 5%. The analysis presented references de minimis as an exemption of 5% but in all cases the analysis has incorporated the transitional approach as described.

The bioeconomic model allocates the de minimis allowance to every fleet segment in the UK, including those segments not included in the report such as non-sector vessels. The allocation is undertaken using an incremental increase of one day to every fleet segment. The increase of one day to each PO fleet segment continues until the UK fleet segments cannot receive another full day as the remaining de minimis allowance is insufficient to support another one full day of fishing across the UK.

- **Scenario 1A – De Minimis Lax** presents the outcome if the landing obligation is introduced as per scenario B3 plus a de minimis exemption that means 5% of the total catch of demersal quota stocks by a PO fleet segment can be discarded. Scenario 1A is calculated on the catch of the PO fleet segment, not the quota or catch of a specific stock.
- **Scenario 1B – De Minimis Mid** presents the outcome if the landing obligation is introduced as per baseline scenario B3 plus a de minimis exemption that means 5% of the total catch of a stock can be discarded as long as total discards of that stock in the UK do not exceed 5% of the EU TAC for the stock. Although all stocks are included in this derogation, in reality it is only applied to choke stocks.
- **Scenario 1C – De Minimis Strict** presents the outcome if the landing obligation is introduced as per baseline scenario B3 plus a de minimis exemption that means 5% of the total catch of a stock can be discarded as long as total discards in the UK do not exceed 5% of the UK TAC for the stock. Although all stocks are included in this derogation, in reality it is only applied to choke stocks.
- **Scenario 2 – Interspecies flexibility** presents the outcome if the landing obligation is introduced as per baseline scenario B3 plus a derogation that means the catch of a stock that exceeds the quota held by a PO fleet segment AND is a stock that is considered to be within safe biological limits (as informed by ICES and shown in Table 2-3) can be covered by quota from another stock (up to a maximum of 9% per stock) from the same, or a different, sea area. Quota in future years will reflect stock biomass impacts. Although all stocks within safe biological limits can 'receive' a transfer of quota, in reality interspecies flexibility is only applied to choke stocks and only until a choke stock that is not within safe biological limits becomes the primary choke stock. For example in the model cod quota from Area IV can be 'transferred' to delay a choke point created by saithe in Area VI. This can be achieved because saithe is considered to be within safe biological limits. In this example, the additional catch of saithe, in excess of quota allocated, would be taken into account in biomass calculations and future TAC adjustments.

- **Scenario 3 – Survivability** presents the outcome if the landing obligation is introduced as per baseline scenario B3 plus an exemption that means all catch in excess of quota holdings for stocks that are considered to have a good chance of survival can be discarded. Scenario 3 assumes that skates and rays, plaice, sole, lemon sole, dabs and turbot survive and can therefore be discarded.

2.4.3. COMBINED POLICY LEVER SCENARIOS

If introduced, the policy levers described in scenarios 1A to 3 are expected to operate in combination, rather than in isolation. Therefore the analysis has combined each of the three de minimis scenarios with the interspecies flexibility scenario and the survivability scenario to create three combined policy lever scenarios.

- **Scenario 4a** – De minimis LAX, interspecies flexibility and survivability (scenarios 1A, 2 and 3) are all applied to baseline scenario B3 to estimate the combined impact of the different policy levers.
- **Scenario 4b** – De minimis MID, interspecies flexibility and survivability (scenarios 1B, 2 and 3) are all applied to baseline scenario B3 to estimate the combined impact of the different policy levers.
- **Scenario 4c** – De minimis STRICT, interspecies flexibility and survivability (scenarios 1C, 2 and 3) are all applied to baseline scenario B3 to estimate the combined impact of the different policy levers.

2.5. SIX HOME NATION FLEET SEGMENTS

The PO fleet segments included in the scenario analysis are identified in Table 2-1. These combine to form six home nation fleet segments which form the basis of the presentation of the scenario analysis findings in the rest of the report. The segments principally define the three fisheries for: Norway lobster (nephrops), common sole and plaice, and cod, haddock, whiting and saithe.

	Whitefish trawl / seine	Nephrops trawl	Beam trawl
England and Wales	Anglo-Scottish FPO, Cornish FPO, Eastern England FPO and South Western FPO	Anglo-Scottish FPO and Eastern England FPO	Cornish FPO, North Sea Fishermen’s Organisation, South Western FPO, Wales and West Coast FPO ¹
Northern Ireland		Anglo-North Irish FPO and Northern Ireland FPO	
Scotland	Aberdeen FPO, North East of Scottish Fishermen’s Organisation, Scottish Fishermen’s Organisation and Shetland FPO	North East of Scotland Fishermen’s Organisation, Northern Producers Organisation, Scottish Fishermen’s Organisation, The Fife FPO and West of Scotland FPO	

Table 2-1. Fleet segments included in the scenario analysis

¹The WWCFPO fleet segment was moved to the beam trawl fleet segment from the demersal trawl/seine segment for the purpose of the scenario analysis as the primary catch of the fleet is plaice.

The aggregated results for each of the six home nation fleet segments are created from the combination of PO and main gear based fleet segments under each segment (see Table 2-1). The

PO fleet segments included in the scenario analysis are estimated to account for approximately 92% of the UK landings of the 2013 UK TAC of cod, haddock, whiting and saithe, 60% of nephrops and 40% of sole and plaice. The PO fleet segments have been allocated to home nations. It is known that POs are not necessarily wholly aligned to home nations, in particular that vessels in a PO could potentially be Scottish or English. However, the analysis shown in Table 2-2 shows that for the majority of vessels the registered home nation is also the nation that the PO is aligned to. For example 131 of 153 vessels registered in England and Wales are members of a PO aligned to England and Wales.

Registered country	PO member vessels by location of PO		
	England and Wales	Northern Ireland	Scotland
England and Wales	131		22
Northern Ireland	9	100	9
Scotland	5		265

Table 2-2. Number of vessels included in the EIA that are registered in each country in 2013

In terms of revenue, three of the six home nation fleet segments earned 78% of the total revenue of all six segments. The three largest fleet segments in the UK are:

- the Scotland whitefish trawl/seine fleet, which earned 40% of the total revenue of all six fleet segments in 2013;
- the England beam trawl fleet, which earned 19% of the total revenue of all six fleet segments in 2013; and
- the Scotland nephrops trawl fleet, which earned 19% of the total revenue of all six fleet segments in 2013 (Figure 2-1).

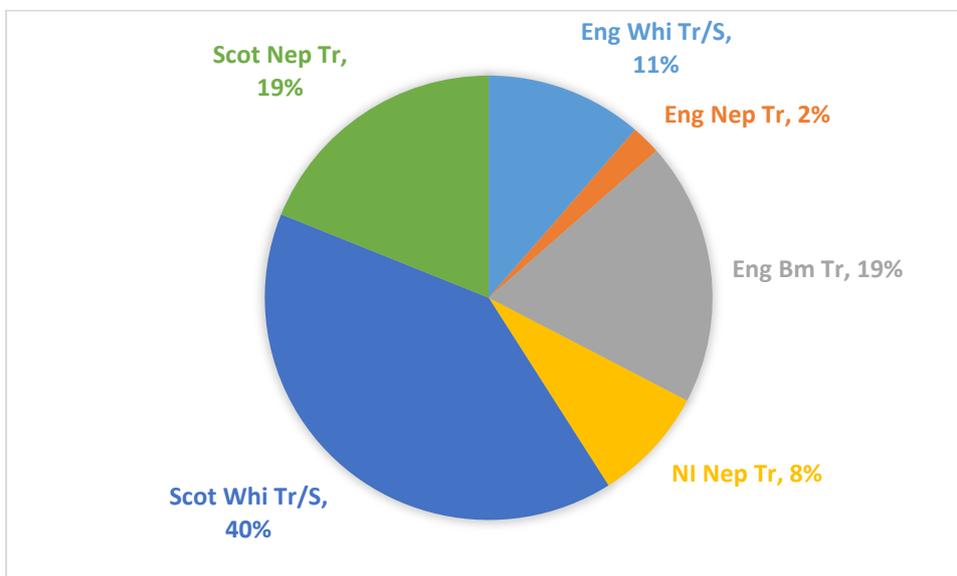


Figure 2-1: Revenue of each Home Nation Fleet Segment in 2013 as a percentage of Total Revenue in 2013

Note: The revenue estimates in this analysis include revenue from activities in addition to landings of demersal quota stocks

2.6. KEY ASSUMPTIONS

The following sections summarise the key assumptions used in the bioeconomic model. For further information on how the model operates please see Appendix A.

2.6.1. COMPLIANCE

One of the basic assumptions of the model is full compliance with the rules so if a fleet segment does not have sufficient quota for everything under the landing obligation they are likely to catch, then they need to tie up.

2.6.2. FISHERIES

Fishing areas are divided in the model into Area IV, Area VI and Area VII and activity of fleet segments evaluated at this level. Therefore Area VII is analysed as a single area and averages are used.

The landing obligation is implemented for the principle fisheries per fleet. That is the landing obligation will apply in 2016 to fisheries targeting in each of the focus areas, North Sea (area IV), West of Scotland (area VI) and South-West (area VII)

- cod, haddock, whiting and saithe;
- nephrops; and
- sole and plaice.

In the analysis it is assumed that:

- demersal trawl/seine fleets target haddock, cod, whiting and saithe;
- nephrops trawl fleets target nephrops; and
- beam trawl fleets target sole and plaice.

An adjustment was made to the fleet segments during the analysis phase and one PO fleet segment from the England demersal trawl/seine fleet was moved to be included in the analysis of the England beam trawl fleet. The adjustment was made because the primary catch of the PO fleet segment was plaice in 2013.

2.6.3. DISCARD RATES

The ICES advice and discard rates used in the model relate to 2013. Discard rates are based on survey data from Marine Scotland, Centre for Fisheries and Aquatic Science (CEFAS) and Agri-food and Biosciences Institute (AFBI). The discard rates used in the model for each home nation fleet segment are presented in Appendix B.

Discards in 2013, as a result of minimum landing sizes, are included in the discard rate assumption.

Observed discard rates are critical to the calculation of catch. However recorded discard rates are based on a sample of trips. This does introduce some uncertainty and may not always reflect what fishermen are experiencing. For example hake is recognised to be a growing problem in the North Sea because there is a very small UK TAC, 348 tonnes in 2013, but a substantial and growing biomass that makes it increasingly difficult for fishermen to avoid the stock. However, in the scenario analysis it rarely appears as a primary choke stock under baseline or policy lever scenarios in the North Sea. The discard rate used in the scenario analysis for hake for the

Scotland whitefish PO fleet segments in the North Sea (Area IV) is 36%, as observed in 2013. However, a study undertaken of vessels in the Shetland fleet in 2013/14 suggests that the discard rate could be as high as 90% in parts of the North Sea.

2.6.4. QUOTA UPLIFT

Uplift multipliers are collated from ICES documents and assumed to be 100% of catch estimates for stocks assessed. Uplift multipliers used in the EIA are presented in Table 2-3. For stocks not assessed or for stocks where catch estimates are not provided then an assumption of zero uplift on 2013 TAC is made.

Uplift is applied to EU TAC when a stock becomes subject to the landing obligation. For example an uplift multiplier of 1.25 is applied to the EU TAC for nephrops in Area IV in 2016. The uplift is then distributed in 2016 to all fleet segments with a quota holding for nephrops in Area IV, regardless of whether or not the nephrops catch of the fleet segment is subject to the landing obligation in 2016. The distribution is based on end of year landings as a proxy for quota held at year end.

2.6.5. INTERSPECIES FLEXIBILITY

An indication of stock status (i.e. within safe biological limits) is provided in Table 2-3. Only stocks considered to be within safe biological limits can 'receive' a transfer of quota under the interspecies flexibility derogation. The transfer of quota from one stock to another stock is assumed to happen on a tonne for tonne basis.

2.6.6. EFFORT

The bioeconomic model assumes that for each PO fleet segment the total number of days at sea recorded by its member vessels in 2013 is the maximum number of days that the PO fleet segment can be at sea in the future.

2.6.7. CATCH COMPOSITION

Catch volumes in 2013 (landings plus discards) drive the catch compositions of the fleet segments modelled.

2.6.8. SEASONALITY

Seasonal differences are not taken into consideration as average catch of stocks per trip is a key assumption in the model under the catchability input data.

2.6.9. FINANCIAL ANALYSIS

Business performance data is collated from the Seafish annual cost and earnings survey. Data input into the model is estimated at a vessel level based on activity of each vessel in a given year and then aggregated up to a fleet segment level.

The landings price achieved for each stock has been held constant at 2013 average prices.

The calculation of operating profit assumes that the same number of vessels that were in the fleet in 2013 remain in the fleet.

The revenue estimates for each fleet segment are based on the landings of quota and non-quota stocks and earnings from other activities. This is informed by the revenue earned by vessels in 2013.

2.6.10. BIOMASS

The fleet segments modelled are assumed to operate together. That is in each year simulated, all fleets fish on the stocks available and all of their combined catches contribute to changing stock biomass. Therefore, if total catches increase (including discards) beyond the estimated growth of the stocks through recruitment and natural mortality then the stock will decrease. If the opposite occurs then a stock's biomass will increase.

However, for the quota stocks not assessed by ICES it is not possible to track the impacts on biomass.

2.6.11. LEASING AND SWAPS OF QUOTA

The scenario analysis is developed from information on end of year landings in 2013 and therefore incorporates the benefits of in-year quota trading in the UK and internationally. However, quota needs can be expected to change under the landing obligation, additional or alternative quota trading that would meet emerging needs is not incorporated in to the scenario analysis as the extent of change is not known, and cannot be reasonably estimated.

Area	Stock	EU TAC 2013	UK TAC 2013	Quota Uplift	In Safe Biological Limits
Area IV	Anglerfish	8703	7082	1.00	No
Area IV	Cod	26475	10311	1.26	No
Area IV	Dabs	18434	1588	1.00	No
Area IV	Haddock	45040	29194	1.13	Yes
Area IV	Hake	1935	348	1.05	Yes
Area IV	Lemon sole	6931	3905	1.00	No
Area IV	Ling	2428	1869	1.00	No
Area IV	Megrim	1937	1864	1.18	Yes
Area IV	Nephrops	17350	15027	1.25	No
Area IV	Plaice	97070	25964	1.56	Yes
Area IV	Saithe	91220	7273	1.00	Yes
Area IV	Skate	1256	814	1.00	No
Area IV	Sole	14000	599	1.00	Yes
Area IV	Turbot	4642	717	1.00	No
Area IV	Tusk	235	96	1.00	No
Area IV	Whiting	18932	11402	1.65	No
Area VI	Anglerfish	4924	1515	1.00	No
Area VI	Boarfish	82000	5211	1.00	No
Area VI	Cod 6A	0	0	1.00	No
Area VI	Cod 6B	74	45	1.00	No
Area VI	Haddock 6A	4211	3278	1.64	Yes
Area VI	Haddock 6B	990	798	1.64	Yes
Area VI	Hake	30900	5553	1.05	Yes
Area VI	Ling	14164	2716	1.00	No
Area VI	Megrim	3387	1062	1.18	Yes
Area VI	Nephrops	16690	16295	1.23	No
Area VI	Plaice	658	388	1.00	No
Area VI	Pollack	397	145	1.00	No
Area VI	Saithe	9464	3254	1.00	Yes
Area VI	Sole	57	11	1.00	No
Area VI	Whiting	292	167	1.00	No
Area VII	Anglerfish	29144	5241	1.00	No
Area VII	Cod 7A	285	82	1.00	No
Area VII	Cod VIIB-K	5000	804	1.12	Yes
Area VII	Haddock 7A	1189	569	1.00	No
Area VII	Haddock 7B-K	14148	1415	1.28	Yes
Area VII	Megrim	17385	2492	1.24	No
Area VII	Nephrops	23065	7566	1.25	No
Area VII	Plaice 7A	1627	491	1.00	No
Area VII	Plaice 7DE	6400	1862	1.00	No
Area VII	Plaice FG	369	43	1.00	No
Area VII	Plaice 7HJK	141	18	1.00	No
Area VII	Pollack	13495	2353	1.00	No
Area VII	Saithe	3176	434	1.00	No
Area VII	Sole 7A	140	35	1.00	No
Area VII	Sole 7D	5900	1135	1.00	Yes
Area VII	Sole FG	1100	309	1.00	Yes
Area VII	Sole 7HJK	402	67	1.00	Yes
Area VII	Sole 7E	894	525	1.00	Yes
Area VII	Whiting 7A	84	32	1.00	No
Area VII	Whiting 7B-K	24500	2629	1.30	Yes

Table 2-3. Stocks modelled with EU TAC & UK TAC in 2013 plus quota uplift and eligibility for interspecies flexibility

Note: Quota uplift and whether or not the stock is in safe biological limits, and therefore eligible for interspecies flexibility, are informed by ICES advice from 2012, relating to 2013.

3. ENGLAND WHITEFISH TRAWL AND SEINE SCENARIO ANALYSIS

The over 10m England whitefish trawl/seine fleet segment consisted of 93 vessels in 2013 mostly fishing in Area VII (11,745 days, 77% of days) and Area IV, North Sea, (3,548 days, 23% of total days)¹. There was a small amount of activity recorded in Area VI in 2013 (23 days in total).

The scenario analysis presented in this report incorporates PO fleet segments with five or more vessels. The vessels not included may be either non-sector or belong to POs with fewer than five vessels in the segment analysed. The PO fleet segments included in the scenario analysis represent 76 vessels or 82% of the national fleet included in the choke analysis.

The England whitefish trawl/seine fleet in the scenario analysis has been reduced largely because some vessels categorised as England whitefish trawl/seine vessels in the choke analysis have been moved to the England beam trawl fleet segment. The vessels have been moved because they target the same stocks as the beam trawl fleet and therefore for the purpose of the scenario analysis are best allocated to the beam trawl segment.

The producer organisations which have vessels included in the scenario analysis for the England whitefish trawl and seine fleet segment are:

- Anglo-Scottish Fishermen's Producer Organisation (ASFPO);
- Cornish Fishermen's Producer Organisation (CFPO);
- Eastern England Fish Producers Organisation (EEFPO); and
- South Western Fishermen's Producer Organisation (SWFPO).

The findings for each whitefish trawl/seine PO fleet segment are aggregated to provide an overall analysis of the relative impact of different scenarios on the activity and performance of the England whitefish trawl/seine fleet segment. It is the aggregated analysis that is presented in this chapter.

The analysis does not consider what positive impact could be achieved from fleet-based responses that could help the fleet to avoid choke stocks. The extent to which technological, strategic or operational changes can be implemented to avoid choke stocks and reduce the impact of the landing obligation is not known and cannot be reasonably estimated across the whole of the UK fleet at this time.

The findings of the scenario analysis for the England whitefish trawl and seine fleet segment are presented in two halves in chapter 3:

- Sections 3.1 and 3.2 report on the potential impact of the eleven scenarios on the performance of the England whitefish trawl and seine fleet segment as a whole². The focus of the analysis is on the impact of all scenarios on the revenue of the fleet segment. However, the impact of the three combined scenarios on landings, effort, operating profit and number of vessels is also reported.
- The second half of the chapter, Sections 3.3 to 3.5, reports on the impact of the scenarios in the different sea areas where the England whitefish trawl and seine fleet is active. The

¹ Source: Landing Obligation Economic Impact Assessment Interim Report One: Choke Analysis

² It is advisable to have read chapter 2 before reviewing the results in the remainder of this Chapter.

analysis provides explanations for why the scenarios have the impact that is reported in the first half of the Chapter.

If choke stocks exist in a sea area for the England whitefish trawl/seine fleet, it is the primary choke stock, the stock which the fleet segment runs out of quota for first, that will limit the activity of the fleet. The primary choke stock and the number of days fishing that is possible until the choke occurs – the choke point – can be affected by the design of each scenario. The analysis in the second half of the chapter explores how the scenarios impact upon the primary choke stock and choke point for the segment as a whole.

Once the quota of a stock has been fully used by a PO fleet segment the analysis assumes that fishing by that PO fleet segment in the sea area affected will stop. Because the analysis for the England whitefish trawl/seine fleet is an aggregated calculation of the impacts on four PO fleet segments it is possible that each PO fleet segment will be affected by different choke stocks and in different time frames.

The analysis presented is developed from information on end of year landings and therefore incorporates the benefits of in-year quota trading in the UK and internationally.

3.1. IMPACT OF EACH SCENARIO ON THE REVENUE OF THE ENGLAND WHITEFISH TRAWL/SEINE FLEET

An overview of the impact of all 11 scenarios on the revenue of the fleet segment is presented in Figure 3-1. The estimated revenue that could be achieved by the fleet segment under each scenario is presented as a percentage of the revenue achieved by the fleet segment in 2013. This allows comparison of the potential impact of the landing obligation in 2016 and 2019 to actual total segment revenue in 2013. Revenue in 2013 is represented by a horizontal blue line in Figure 3-1. The estimated revenue includes landings of quota species, non-quota species and other earnings expected by the fleet. Revenue estimates also assume that the average price achieved per species in 2013 will be the average price achieved in each year analysed.

3.1.1. IMPACT OF BASELINE SCENARIOS ON REVENUE

The baseline scenarios represent the introduction of the landing obligation without the potential benefits of de minimis, interspecies flexibility and survivability. They are therefore considered to be worst-case scenarios. Table 3-1 presents the percentages used in the graph.

- Baseline scenario B1 does not provide a catch allowance for zero-TAC stocks and does not incorporate quota uplift. This is the worst-case scenario in the analysis. It is estimated that under baseline scenario B1 fleet revenue would be 80% of 2013 revenue in 2016 and 37% of 2013 revenue in 2019.
- Baseline scenario B2 estimates fleet segment revenue would be 82% of 2013 revenue in 2016 and 38% of 2013 revenue in 2019. Therefore the inclusion of a 1.5% catch allowance for zero-TAC stocks would have a small benefit compared to the worst-case scenario of B1.
- Baseline scenario B3 incorporates the catch allowance included in baseline scenario B2 plus quota uplift for some stocks. This improves the revenue of the segment in 2016 to 84% of 2013 levels, an increase of 2 percentage points compared to baseline scenario B2. However, in 2019 the revenue of the fleet would not be improved in 2019 through the introduction of quota uplift and revenue remains the same as under baseline scenario B2 (38%) (Table 3-1).

3.1.2. IMPACT OF SINGLE AND COMBINED POLICY LEVER SCENARIOS ON REVENUE

Each policy lever scenario is applied to baseline scenario B3. This means that the policy levers of de minimis, interspecies flexibility and survivability are applied to a baseline that already incorporates:

- a catch allowance for zero-TAC stocks; and
- quota uplift for stocks deemed eligible for an uplift.

The impacts of the five policy lever scenarios on the revenue of the fleet segment are shown in Figure 3-1 and detailed in Table 3-1.

The impact of each policy lever should be judged by comparing it to the percentage shown for baseline scenario B3.

Observations on the impact of the single and combined policy levers are:

- Although effort is held at a maximum of the days fished in 2013, revenue could still exceed 2013 levels as seen under scenarios 1A, 1B, 4A, 4B and 4C in 2016. This occurs when there is no choke stock and quota uplift means that the fleet segment can land and sell fish that might previously have been discarded due to being over quota.
- In all scenarios, revenue would be lower in 2019 than in 2016. This is because all demersal quota stocks become subject to the landing obligation and stocks which might previously have been considered an unwanted bycatch, such as skate and dabs, would have to be landed in 2019 and counted against limited quota. This would create a choke on fleet activity much earlier than in the transitional phase of the landing obligation.
- The biggest improvement on baseline scenario B3 under a single policy lever, in both 2016 and 2019, would be under de minimis LAX (scenario 1A) as the revenue of the fleet would be 112% (2016) and 96% (2019) of 2013 revenues. This scenario would generate an improvement on baseline scenario B3 of 28 percentage points (2016) and 58 percentage points (2019). However, de minimis LAX may be unacceptable to some as the derogation is simply a percentage of the total catch of the PO fleet segment and is not stock specific.
- Of the two stock based de minimis scenarios, de minimis MID, where the 5% is taken as a percentage of EU TAC, would achieve the same revenues in 2016 as de minimis LAX (111% of 2013 revenues). The benefit would also be relatively good in 2019 with revenues equivalent to 72% of 2013 revenues, and 34 percentage points above the baseline scenario B3 position.
- Interspecies flexibility (scenario 2) would have some benefit in 2016 as it supports revenue equivalent to 92% of 2013 revenue, which would be 8 percentage points higher than under baseline B3. However in 2019, interspecies flexibility in isolation would only support an improvement of one percentage point on scenario B3.
- Survivability (scenario 3) would have no benefit in 2016 as none of the stocks subject to the landing obligation during the transitional period for this fleet segment would be eligible for the exemption. In 2019 under the survivability scenario, revenue would increase from 38% under baseline scenario B3 to 78% of 2013 levels.

- The combined scenarios can enable the policy levers to work together to lessen the impact of choke stocks and delay the choke point. The synergistic effect of the policy levers can result in revenue estimates higher than the value of any single policy lever and there is evidence of this in the analysis for the England whitefish trawl/seine fleet segment. In 2019 all three combined scenarios would produce revenue in excess of the single policy lever scenarios incorporated into each combined scenario.
 - In 2019, the benefit of combining the policy lever scenarios for this fleet segment would be greater than the impact of the policy levers in isolation. Scenario 4A which incorporates the most favourable single policy lever of de minimis LAX (1A) would result in revenues of 103% of 2013 levels this is a substantial increase of 65 percentage points on baseline scenario B3 and an improvement of 7 percentage points on the de minimis LAX policy lever in isolation.
 - In 2019, the combined scenarios which incorporate the stock specific de minimis scenarios, 4B and 4C, would support revenue of 101% and 92% of 2013 levels respectively. Therefore, even under the strictest definition of de minimis the benefit of combining the policy levers could support revenues that are within reach of the revenue achieved by the fleet segment in 2013 and substantially higher than could be achieved under baseline scenario B3 (Figure 3-1 and Table 3-1).

The findings indicate how valuable the different policy levers could be to this fleet segment, particularly in combination, once all demersal quota stocks are subject to the landing obligation in 2019.

The reasons why the impact of each scenario occurs and why the impact can vary over time are explored in detail on a sea area by sea area basis in Section 3.3.

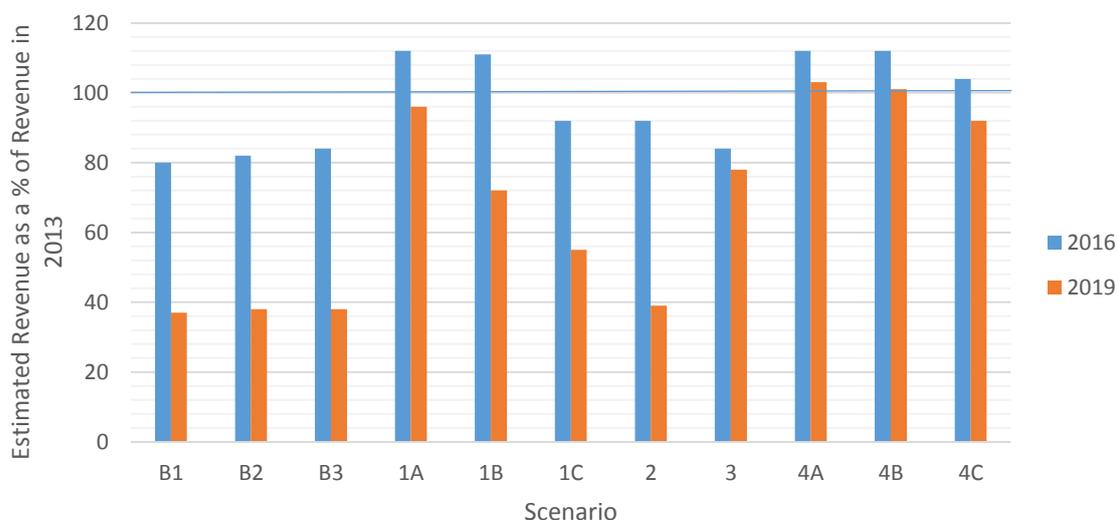


Figure 3-1: England Whitefish Trawl/Seine Fleet Revenue under each scenario as a percentage of actual revenue in 2013

	Scenario Label	Scenario Description	Estimated revenue in 2016 as a % of revenue in 2013	Estimated revenue in 2019 as a % of revenue in 2013
Baseline Scenarios	B1	Implementation of landing obligation with only transitional rules in place	80	37
	B2	B1 plus a catch allowance for zero-TAC stocks	82	38
	B3	B2 plus quota uplift, where applicable	84	38
Policy Lever Scenarios	1A	De Minimis Lax (5% of PO segment catch)	112	96
	1B	De Minimis Mid (5% of EU TAC)	111	72
	1C	De Minimis Strict (5% of UK TAC)	92	55
	2	Interspecies flexibility (for stocks considered to be within safe biological limits)	92	39
	3	Survivability (majority of flatfish stocks)	84	78
Combined Scenarios	4A	Combination of Scenarios 1A, 2 and 3	112	103
	4B	Combination of Scenarios 1B, 2 and 3	112	101
	4C	Combination of Scenarios 1C, 2 and 3	104	92

Table 3-1: Estimated revenue for the England whitefish trawl/seine fleet segment under each scenario as a % of revenue in 2013

3.2. THE IMPACT OF COMBINED POLICY LEVER SCENARIOS ON OTHER PERFORMANCE MEASURES

In Table 3-2, alongside the impact on revenue, the estimated impact of the combined scenarios on the following measures of fleet activity and performance is also shown:

- Landings (tonnes);
- Effort (fishing days);
- Operating Profit (revenue minus operating costs, before deducting cost of capital); and
- Number of vessels. The number of vessels that can operate successfully under each scenario in each year is difficult to measure as the definition of 'operating successfully' will vary from vessel owner to vessel owner. The analysis has assumed that under the benefits created by the combined policy levers the number of vessels that can operate will be the number of vessels that can continue to maintain the average number of fishing days used per vessel in the fleet segment in 2013.

The revenue under each scenario in Table 3-2, is the same as the revenue presented in Table 3-1. The figures in brackets represent the finding as a percentage of activity in 2013.

Observations on the impact of baseline scenario B3 and combined policy lever scenarios on activity and business performance are:

- In 2016, all combined scenarios result in landed volumes higher than the volume landed in 2013. This is because of the quota uplift applied to all stocks subject to the landing obligation during the transitional period.
- In 2019, all combined scenarios result in landed volumes above or broadly equivalent to 2013 volumes. Scenario 4A is the most favourable scenario, and is also the only scenario which is not stock specific. In 2019, scenario 4A would support landings volumes equivalent to 108% of 2013 volumes.
- In 2019 effort (fishing days) under all three combined scenarios would be less than the effort used by the fleet segment in 2013. This highlights that under each scenario in each year a choke stock would halt fishing activity. The best scenario for the fleet in 2019 (4A) suggests the fleet could fish for 93% of the days used in 2013 and the worst combined scenario in 2019 (4C) suggests that the fleet could fish for 81% of the days used in 2013
- All three combined scenarios indicate that the fleet segment will achieve higher operating profits in 2019 than were achieved in 2013.
- If each vessel in the fleet segment was to be at sea for the average number of days each vessel in the fleet was at sea in 2013, the findings suggest that under the three combined policy lever scenario in 2019 the fleet could reduce from 76 vessels to between 60 and 70 vessels.
- As indicated in the revenue analysis in Section 3.1 there would not be a substantial difference between the three combined scenarios on any measure of fleet activity and performance in 2016 or 2019. The only other fleet segment of the six analysed that has similarly small differences between the three combined scenarios is the England beam trawl fleet segment.

	Year	Baseline B3	Combined policy lever scenarios (percent of 2013 figures)		
			4a	4b	4c
Revenue (£'000s) (2013=£29,113)	2016	24,544 (84%)	32,571 (112%)	32,584 (112%)	30,266 (104%)
	2019	11,176 (38%)	30,121 (103%)	29,446 (101%)	26,886 (92%)
Landings (t) (2013=11,163 tonnes)	2016	9,200 (82%)	13,427 (120%)	13,445 (120%)	12,594 (113%)
	2019	2,182 (20%)	12,063 (108%)	11,589 (104%)	10,714 (96%)
Effort (days) (2013=11,490 days)	2016	8,931 (78%)	11,490 (100%)	11,487 (100%)	10,430 (91%)
	2019	4,837 (42%)	10,710 (93%)	10,672 (93%)	9,326 (81%)
Operating Profit (£'000s) (2013=£4,449)	2016	4,400	7,061	7,076	6,453
	2019	-737	6,692	6,537	5,764
Number of Vessels (#same effort) (2013=76 vessels)	2016	59 (78%)	76 (100%)	75 (99%)	68 (89%)
	2019	31 (41%)	70 (92%)	68 (89%)	60 (79%)

Table 3-2: Summary of Impact of Baseline Scenario B3 and Combined Policy Lever Scenarios on Performance Measures of the England whitefish trawl/seine fleet segment in 2016 and 2019

Note: The number in brackets is the finding as a percentage of performance in 2013, which is shown in brackets in the first column

The model produced a substantial volume of detailed findings in addition to those presented in the activity and performance analysis above. We draw on these findings in the second part of the Chapter to further explain why the scenarios have the impact that they do for the England whitefish trawl/seine fleet segment.

3.3. CHOKE STOCK AND CHOKE POINT BY SEA AREA UNDER EACH SCENARIO

The impact of the landing obligation is driven by the extent to which the fleet can continue to fish in each sea area, and this is determined by the presence, or not, of a choke stock. The potential benefit of each scenario is entirely dependent on the extent to which a policy lever can impact upon the primary choke stock. However, the primary choke stock will vary by sea area, and can be expected to vary between different POs.

The analysis which follows finds the stock which provides the fewest fishing days to the combined England whitefish trawl/seine fleet as a whole. An individual PO may have a different primary choke stock to the segment as a whole. Thus, the sum of fishing days for the segment primary choke stock may be different from the sum of days until each individual PO would choke on its own primary choke stock. (n.b. The performance and activity analysis in the first half of this chapter is based on the sum of days until each PO reaches its own individual choke point.)

The following tables contain the primary choke stock and estimated choke point for the England whitefish trawl/seine fleet under each of the eleven scenarios in:

- the North Sea (Area IV) in 2016 (Table 3-3)Table 3-4;
- the North Sea (Area IV) in 2019 (Table 3-4);
- Area VII in 2016 (Table 3-5); and
- Area VII in 2019 (Table 3-6).

Commentary on the impact of each scenario is included in each table.

A summary graph provided in Section 3.4 uses the information from Table 3-4 and Table 3-6 to produce an overview of the choke point by sea area under each scenario in 2019.

England whitefish trawl/Seine fleet days sea in Area IV (North Sea) in 2013 = 2,864 days						
	Scenario Label	Description	Primary Choke Stock(s) in 2016	Days until choke point in Area IV	Days until choke point as % of 2013 days	Comment
Baseline Scenarios	B1	Implementation of landing obligation with only transitional rules in place	Whiting	1,690	59%	Baseline scenario B1 is the worst-case scenario.
	B2	B1 plus a catch allowance for zero-TAC stocks	Whiting	1,690	59%	There are no zero-TAC stocks in the North Sea.
	B3	B2 plus quota uplift, where applicable	Saithe	1,754	61%	Quota uplift would have sufficient impact to remove whiting as the primary choke stock but saithe would become the primary choke stock and uplift was not available in the North Sea for this stock.
Policy Lever Scenarios	1A	De Minimis Lax (5% of PO segment catch)	No choke	-	100%	De minimis LAX would remove all potential choke stocks in 2016.
	1B	De Minimis Mid (5% of EU TAC)	No choke	-	100%	De minimis MID would remove all potential choke stocks in 2016.
	1C	De Minimis Strict (5% of UK TAC)	Saithe	1,954	68%	De minimis STRICT would not change the primary choke stock but it would delay the choke point, compared to scenario B3.
	2	Interspecies flexibility (for stocks considered to be within safe biological limits)	Saithe	2,100	73%	Interspecies flexibility could enable quota to be transferred to saithe as although no quota uplift was applied, the stock is considered to be within safe biological limits. Therefore under scenario 2 the choke point would be delayed despite saithe continuing as the primary choke stock.
	3	Survivability (majority of flatfish stocks)	Saithe	1,754	61%	Survivability would have no effect on the primary choke stock.
Combined Scenarios	4A	Combination of Scenarios 1A, 2 and 3	No choke	-	100%	The combination of policy levers under scenario 4A would remove all potential choke stocks.
	4B	Combination of Scenarios 1B, 2 and 3	No choke	-	100%	The combination of policy levers under scenario 4B would remove all potential choke stocks.
	4C	Combination of Scenarios 1C, 2 and 3	Saithe	2,513	88%	The combination of de minimis STRICT and interspecies flexibility would not change the primary choke stock but would substantially delay the choke point, compared to scenario B3.

Table 3-3: England whitefish trawl/Seine fleet: Primary Choke Stock and Choke Point under each Scenario in Area IV (North Sea) in 2016

England whitefish trawl/seine fleet days at sea in Area IV (North Sea) in 2013 = 2,864 days						
	Scenario Label	Description	Primary Choke Stock(s) in 2019	Days until choke point in Area IV	Days until choke point as % of 2013 days	Comment
Baseline Scenarios	B1	Implementation of landing obligation with only transitional rules in place	Dabs	143	5%	Baseline scenario B1 is the worst-case scenario.
	B2	B1 plus a catch allowance for zero-TAC stocks	Dabs	143	5%	There are no zero-TAC stocks in the North Sea.
	B3	B2 plus quota uplift, where applicable	Dabs	143	5%	Quota uplift would have no effect on the primary choke stock.
Policy Lever Scenarios	1A	De Minimis Lax (5% of PO segment catch)	Dabs	2,184	76%	De minimis LAX would not change the primary choke stock but would significantly delay the choke point, compared to scenario B3.
	1B	De Minimis Mid (5% of EU TAC)	Dabs	1,126	39%	De minimis MID would not change the primary choke stock but would significantly delay the choke point, compared to scenario B3.
	1C	De Minimis Strict (5% of UK TAC)	Dabs	643	22%	De minimis STRICT would not change the primary choke stock but would delay the choke point, compared to scenario B3.
	2	Interspecies flexibility (for stocks considered to be within safe biological limits)	Dabs	143	5%	Interspecies flexibility could not have an impact on dabs as the stock is not considered to be in safe biological limits.
	3	Survivability (majority of flatfish stocks)	Saithe	1,319	46%	Survivability would remove dabs as a potential choke stock and saithe would become the primary choke stock and significantly delay the choke point, compared to scenario B3.
Combined Scenarios	4A	Combination of Scenarios 1A, 2 and 3	Hake, ling, saithe and whiting	2,239	74%	Under survivability dabs would be removed as a potential choke stock. Interspecies flexibility becomes more effective and along with de minimis LAX changes the primary choke stock to a combination of hake, ling, saithe and whiting and substantially delay the choke point.
	4B	Combination of Scenarios 1B, 2 and 3	Hake	2,092	69%	Under survivability dabs would be removed as a potential choke stock. This allows interspecies flexibility to become more effective and along with de minimis MID could change the primary choke stock to hake and substantially delay the choke point, compared to scenario B3.
	4C	Combination of Scenarios 1C, 2 and 3	Ling	1,987	69%	Under survivability dabs would be removed as a potential choke stock. This allows interspecies flexibility to become more effective and along with de minimis STRICT could change the primary choke stock to ling and substantially delay the choke point, compared to scenario B3.

Table 3-4: England whitefish trawl/seine fleet: Primary Choke Stock and Choke Point under each Scenario in Area IV (North Sea) in 2019

England whitefish trawl/seine fleet days at sea in Area VII in 2013 = 8,503 days						
	Scenario Label	Description	Primary Choke Stock(s) in 2016	Days until choke point in Area VII	Days until choke point as % of 2013 days	Comment
Baseline Scenarios	B1	Implementation of landing obligation with only transitional rules in place	Haddock 7B-K	6,831	80%	Baseline scenario B1 is the worst-case scenario.
	B2	B1 plus a catch allowance for zero-TAC stocks	Haddock 7B-K	6,831	80%	There are no zero-TAC stocks in Area VII.
	B3	B2 plus quota uplift, where applicable	Whiting 7B-K	7,087	83%	Quota uplift would remove all potential primary choke stocks for the fleet in 2016.
Policy Lever Scenarios	1A	De Minimis Lax (5% of PO segment catch)	No choke	-	100%	De minimis LAX would remove all potential choke stocks.
	1B	De Minimis Mid (5% of EU TAC)	No choke	-	100%	De minimis MID would remove all potential choke stocks.
	1C	De Minimis Strict (5% of UK TAC)	Whiting 7B-K	7,793	92%	De minimis STRICT would not change the primary choke stock but would delay the choke point, compared to scenario B3.
	2	Interspecies flexibility (for stocks considered to be within safe biological limits)	Whiting 7B-K	7,093	83%	Interspecies flexibility would have no effect on the primary choke stock.
	3	Survivability (majority of flatfish stocks)	Whiting 7B-K	7,087	83%	Survivability have no effect on the primary choke stock.
Combined Scenarios	4A	Combination of Scenarios 1A, 2 and 3	No choke	-	100%	The combination of policy levers under scenario 4A would remove all potential choke stocks.
	4B	Combination of Scenarios 1B, 2 and 3	No choke	-	100%	The combination of policy levers under scenario 4B would remove all potential choke stocks.
	4C	Combination of Scenarios 1C, 2 and 3	Whiting 7B-K	7,793	92%	De minimis STRICT and interspecies flexibility are combined but do not exceed the choke point identified under de minimis STRICT.

Table 3-5: England whitefish trawl/seine fleet: Primary Choke Stock and Choke Point under each Scenario in Area VII in 2016

England whitefish trawl/Seine fleet days at sea in Area VII in 2013 = 8,503 days						
	Scenario Label	Description	Primary Choke Stock(s) in 2019	Days until choke point in Area VII	Days until choke point as % of 2013 days	Comment
Baseline Scenarios	B1	Implementation of landing obligation with only transitional rules in place	Plaice FG and plaice 7DE	4,640	55%	Baseline scenario B1 is the worst-case scenario.
	B2	B1 plus a catch allowance for zero-TAC stocks	Plaice FG and plaice 7DE	4,640	55%	There are no zero-TAC stocks in Area VII.
	B3	B2 plus quota uplift, where applicable	Plaice FG and plaice 7DE	4,640	55%	Quota uplift would have no effect on the primary choke stocks identified in Area VII as neither are considered to be eligible for uplift.
Policy Lever Scenarios	1A	De Minimis Lax (5% of PO segment catch)	Plaice FG and plaice 7DE	6,762	80%	De minimis LAX would not change the primary choke stocks but would substantially delay the choke point compared to scenario B3.
	1B	De Minimis Mid (5% of EU TAC)	Plaice FG and plaice 7DE	7,040	83%	De minimis MID would not change the primary choke stocks but would substantially delay the choke point compared to scenario B3.
	1C	De Minimis Strict (5% of UK TAC)	Plaice FG and plaice 7DE	5,540	65%	De minimis STRICT would not change the primary choke stocks but would delay the choke point compared to scenario B3.
	2	Interspecies flexibility (for stocks considered to be within safe biological limits)	Plaice FG and plaice 7DE	4,640	55%	Interspecies flexibility would have no effect on the primary choke stocks.
	3	Survivability (majority of flatfish stocks)	Pollack	7,087	83%	Survivability would remove plaice FG and plaice 7DE as potential choke stocks. Pollack would become the primary choke stock under scenario 3 and the choke point would be substantially delayed compared to scenario B3.
Combined Scenarios	4A	Combination of Scenarios 1A, 2 and 3	Whiting 7B-K	8,348	99%	Survivability removes all plaice stocks as potential choke stocks and interspecies flexibility and de minimis LAX would increase the volume of whiting that could be caught. Combined scenario 4A would be very close to supporting fishing effort at 2013 levels.
	4B	Combination of Scenarios 1B, 2 and 3	No choke	-	100%	The combination of policy levers under scenario 4B would remove all potential choke stocks.
	4C	Combination of Scenarios 1C, 2 and 3	Pollack	7,393	87%	Survivability removes all plaice stocks as potential choke stocks and interspecies flexibility and de minimis STRICT would increase the volume of pollack that could be caught.

Table 3-6: England whitefish trawl/Seine fleet: Primary Choke Stock and Choke Point under each Scenario in Area VII in 2019

3.4. SUMMARY OF THE CHOKE POINT BY SEA AREA UNDER EACH SCENARIO IN 2019

Figure 3-2 provides a summary of the impact of the landing obligation in 2019 under the baseline scenarios (B1-B3), the single policy lever scenarios (1A-3) and the combined policy lever scenarios (4A-4C). The summary reflects the choke points shown in the previous tables for Area IV and Area VII in 2019. Observations on Figure 3-2 include:

- The baseline scenarios all indicate how significant the impact of the landing obligation could be for the England whitefish trawl/seine fleet segment in 2019, particularly in Area IV.
- All three de minimis scenarios could be beneficial in both sea areas.
- In Area VII, it would be scenario 3, survivability, that could have the most substantial impact in 2019 and this removes the need for de minimis.
- All three combined scenarios have a notable impact in Area IV compared to baseline scenario B3.

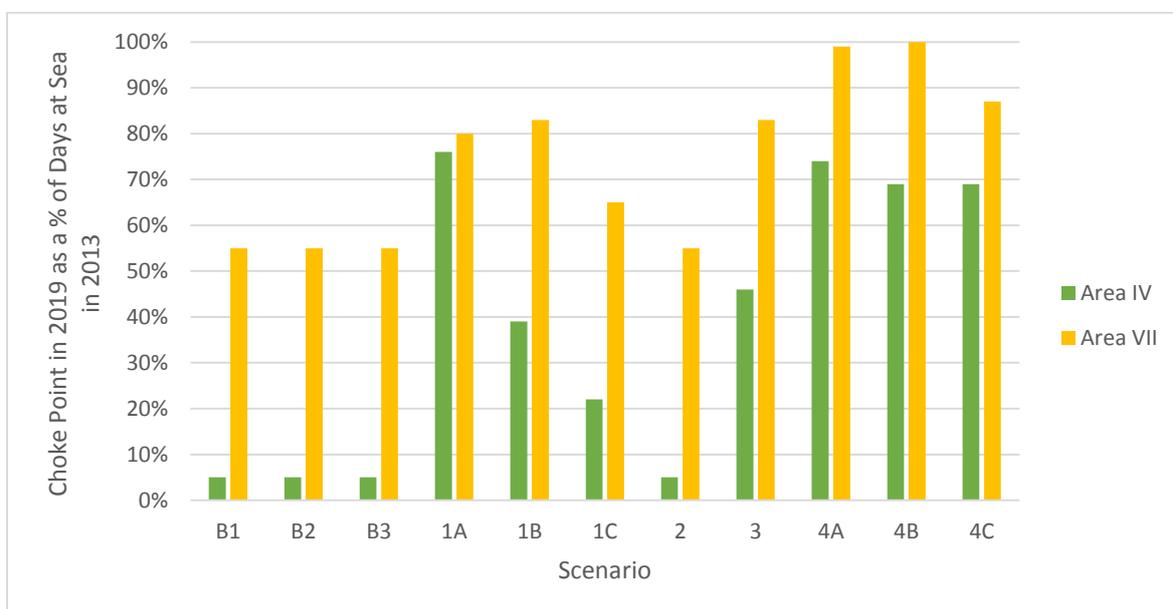


Figure 3-2: England whitefish trawl/seine fleet - Impact of each scenario on the effort of the fleet (days at sea) in 2019, shown as a percentage of actual effort in 2013

3.5. TOP FIVE CHOKE STOCKS AND THEIR CHOKE POINT UNDER THE COMBINED POLICY LEVER SCENARIOS

The scenario analysis and the choke analysis (reported in Interim Report One) are dependent on the quantitative information available on the catching activity of different fleet segments in different sea areas. The quantitative information used in the scenario analysis is the best available. However, estimates of discard volumes, and therefore estimates of total catch, are determined from a sample of vessels and whilst the estimate can reasonably be expected to be representative, there is nevertheless a risk that discard estimates may not be accurate. The relative impact of policy levers may be different if discard rates are materially different from those used in modelling.

The purpose of the top five choke analysis presented in Table 3-7 is to identify what other stocks might create a choke problem for the England whitefish trawl/seine fleet segment:

- if the identified primary choke stock turns out not to be the primary choke stock because reality varies from the recorded information available;
- if the fleet can avoid the primary choke stock; or
- if another way is found to address the primary choke stock.

Table 3-7 presents the top five choke stocks under baseline scenario B3 and the three combined policy lever scenarios. Area VI (West of Scotland) is included for the first time in the analysis for completeness but activity in this area was very limited in 2013.

Scenario	Area IV (2013 days at sea = 2,864 days)				Area VI (2013 days at sea = 119 days)				Area VII (2013 days at sea = 8,503 days)			
	2016		2019		2016		2019		2016		2019	
	Choke Stock	Choke Point (days)	Choke Stock	Choke Point (days)	Choke Stock	Choke Point (days)	Choke Stock	Choke Point (days)	Choke Stock	Choke Point (days)	Choke Stock	Choke Point (days)
Baseline scenario B3	Saithe	1,754	Dabs	143	Saithe	88	Hake	55	Whiting 7B-K	7,087	Plaice FG	4,640
	Whiting	2,790	Skate	1,128	-	-	Megrim	56	-	-	Plaice 7DE	4,640
	-	-	Saithe	1,319	-	-	Plaice	82	-	-	Plaice 7HJK	6,235
	-	-	Hake	1,941	-	-	Saithe	88	-	-	Whiting 7B-K	7,087
	-	-	Ling	1,987	-	-	Ling	89	-	-	Pollack	8,306
Combined policy lever scenario 4A	Whiting	2,808	Hake	2,239	No choke	-	No choke	-	No choke	-	Whiting 7B-K	8,348
	Saithe	2,810	Ling	2,239	-	-	-	-	-	-	Pollack	8,422
	-	-	Saithe	2,239	-	-	-	-	-	-	-	-
	-	-	Whiting	2,239	-	-	-	-	-	-	-	-
	-	-	Tusk	2,379	-	-	-	-	-	-	-	-
Combined policy lever scenario 4B	Whiting	2,808	Hake	2,092	No choke	-	Ling	89	No choke	-	No choke	-
	Saithe	2,810	Ling	2,117	-	-	Megrim	95	-	-	-	-
	-	-	Saithe	2,162	-	-	Saithe	107	-	-	-	-
	-	-	Whiting	2,183	-	-	Anglerfish	117	-	-	-	-
	-	-	Tusk	2,262	-	-	-	-	-	-	-	-
Combined policy lever scenario 4C	Whiting	2,513	Ling	1,987	No choke	-	Ling	89	Whiting 7B-K	7,793	Whiting	7,393
	Saithe	2,790	Whiting	2,087	-	-	Saithe	92	-	-	Pollack	8,306
	-	-	Hake	2,133	-	-	Megrim	95	-	-	-	-
	-	-	Saithe	2,150	-	-	Anglerfish	117	-	-	-	-
	-	-	Tusk	2,154	-	-	-	-	-	-	-	-

Table 3-7: England whitefish trawl/seine fleet segment – top five choke stocks in Area IV, Area VI and Area VII in 2016 and 2019 under baseline scenario B3 and all three combined policy lever scenarios

4. ENGLAND NEPHROPS TRAWL SCENARIO ANALYSIS

The over 10m England nephrops trawl fleet segment consisted of 35 vessels in 2013 mostly fishing in the Area IV, North Sea (2,811 days, 72% of total days), with the remainder of their days split between Area VII (587 days, 15% of total days) and Area VI, West of Scotland (486 days, 13% of total days)³.

The scenario analysis presented in this report incorporates PO fleet segments with five or more vessels. The vessels not included may be either non-sector or belong to POs with fewer than five vessels in the segment analysed. The PO fleet segments included in the scenario analysis represent 30 vessels or 86% of the national fleet included in the choke analysis. The 30 vessels included in the analysis were not active in Area VII in 2013 and therefore the results do not contain analysis for Area VII.

The producer organisations which have vessels included in the scenario analysis for the England nephrops trawl fleet segment are:

- Anglo-Scottish Fish Producers' Organisation (ASFPO); and
- Eastern England Fish Producers' Organisation (EEFPO).

The findings for each nephrops trawl PO fleet segment are aggregated to provide an overall analysis of the relative impact of different scenarios on the activity and performance of the England nephrops trawl fleet segment. It is the aggregated analysis that is presented in this chapter.

The analysis does not consider what positive impact could be achieved from fleet-based responses that could help the fleet to avoid choke stocks. The extent to which technological, strategic or operational changes can be implemented to avoid choke stocks and reduce the impact of the landing obligation is not known and cannot be reasonably estimated across the whole of the UK fleet at this time.

The findings of the scenario analysis for the England nephrops trawl fleet segment are presented in two halves in chapter 4:

- Sections 4.1 and 4.2 report on the impact of the eleven scenarios on the performance of the England nephrops trawl fleet segment as a whole⁴. The focus of the analysis is on the impact of all scenarios on the revenue of the fleet segment. However, the impact of the three combined scenarios on landings, effort, operating profit and number of vessels is also reported.
- The second half of the chapter, Sections 4.3 to 4.5, reports on the impact of the scenarios in the different sea areas where the England nephrops trawl fleet is active. The analysis provides explanations for why the scenarios have the impact that is reported in the first half of the Chapter.

³ Source: Landing Obligation Economic Impact Assessment Interim Report One: Choke Analysis

⁴ It is advisable to have read chapter 2 before reviewing the results in the remainder of this Chapter.

If choke stocks exist in a sea area for the England nephrops trawl fleet, it is the primary choke stock, the stock which the fleet segment runs out of quota for first, that will limit the activity of the fleet. The primary choke stock and the number of days fishing that would be possible until the choke occurs – the choke point – can be affected by the design of each scenario. The analysis in the second half of the chapter explores how the scenarios impact upon the primary choke stock and choke point for the segment as a whole.

Once the quota of a stock has been fully used by a PO fleet segment the analysis assumes that fishing by that PO fleet segment in the sea area affected will stop. Because the analysis for the England nephrops trawl fleet is an aggregated calculation of the impacts on two PO fleet segments it is possible that each PO fleet segment will be affected by different choke stocks and in different time frames.

The analysis presented is developed from information on end of year landings and therefore incorporates the benefits of in-year quota trading in the UK and internationally.

4.1. IMPACT OF EACH SCENARIO ON THE REVENUE OF THE ENGLAND NEPHROPS TRAWL FLEET

An overview of the impact of all 11 scenarios on the revenue of the fleet segment is presented in Figure 4-1. The estimated revenue that could be achieved by the fleet segment under each scenario is presented as a percentage of the revenue achieved by the fleet segment in 2013. This allows comparison of the potential impact of the landing obligation in 2016 and 2019 to actual total segment revenue in 2013. Revenue in 2013 is represented by a horizontal blue line in Figure 4-1. The estimated revenue includes landings of quota species, non-quota species and other earnings expected by the fleet. Revenue estimates also assume that the average price achieved per species in 2013 will be the average price achieved in each year analysed.

4.1.1. IMPACT OF BASELINE SCENARIOS ON REVENUE

The baseline scenarios represent the introduction of the landing obligation without the potential benefits of de minimis, interspecies flexibility and survivability. They are therefore considered to be worst-case scenarios. Table 4-1 presents the percentages used in Figure 4-1.

- Baseline scenario B1 does not provide a catch allowance for zero-TAC stocks and does not incorporate quota uplift. This is the worst-case scenario in the analysis. It is estimated that under baseline scenario B1 fleet revenue would be 101% of 2013 revenue in 2016 and 23% of 2013 revenue in 2019.
- Baseline scenario B2 would have no effect on this fleet segment and revenue estimates remain as per baseline scenario B1. The reason why this baseline scenario has no effect in 2016 or 2019 would be because the fleet segment is not affected by zero-TAC stocks.
- Baseline scenario B3 incorporates the catch allowance included in baseline scenario B2 plus quota uplift. This improves the revenue of the segment in 2016 to 104% of 2013 levels, an increase of 3 percentage points compared to baseline scenarios B1 and B2. However, revenue of the fleet would not be improved in 2019 through the introduction of quota uplift and revenue remains the same as under baseline scenario B2 (23%). This is because all of the primary choke stocks that affect this fleet are not eligible for quota uplift (Figure 4-1 and Table 4-1).

4.1.2. IMPACT OF SINGLE AND COMBINED POLICY LEVER SCENARIOS ON REVENUE

Each policy lever scenario is applied to baseline scenario B3. This means that the policy levers of de minimis, interspecies flexibility and survivability are applied to a baseline that already incorporates:

- a catch allowance for zero-TAC stocks; and
- quota uplift for stocks deemed eligible for an uplift.

The impact of the single and combined policy lever scenarios on the revenue of the fleet segment are indicated in Figure 4-1 and detailed in Table 4-1.

The impact of each policy lever should be judged by comparing it to the percentage shown for baseline scenario B3. However, for the England nephrops fleet an improvement on baseline scenario B3 only occurs in a small number of cases.

Observations on the impact of the single and combined policy levers are:

- In 2016, once quota uplift is applied to nephrops (baseline scenario B3) the revenue of the fleet would exceed revenue earned in 2013. This occurs because there would be no choke stock and the allocation of quota uplift to the fleet means that the fleet segment can land and sell fish that might previously have been discarded due to being over quota.
- In 2016, the policy levers are not required as under baseline scenario B3 there are no choke stocks for the England nephrops fleet segment in any sea area.
- In all scenarios revenue would be substantially lower in 2019 than in 2016. This is because all demersal quota stocks become subject to the landing obligation and stocks which might previously have been considered an unwanted bycatch, and for which the fleet segment holds limited quota, would have to be landed in 2019 and counted against quota. For the England nephrops trawl fleet segment this would create a choke on fleet activity much earlier than in the transitional phase of the landing obligation.
- In 2019, the biggest improvement on baseline scenario B3 for a single policy lever would be under de minimis LAX (scenario 1A) as the revenue of the fleet would be 62% of 2013 levels. This scenario generates an improvement on baseline scenario B3 of 39 percentage points in 2019. However, de minimis LAX is simply a percentage of the total catch of the PO fleet segment and is not stock specific.
- In 2019, the two stock specific de minimis scenarios provide a benefit. De minimis MID, where the 5% is taken as a percentage of EU TAC, and de minimis STRICT, where the 5% is taken as a percentage of UK TAC, would increase the revenue of the fleet by 7% compared to baseline scenario B3, which would lead to revenue for the fleet equal to 30% of total revenue in 2013.
- In 2019, interspecies flexibility (scenario 2) would have no effect.
- In 2019, survivability (scenario 3) would have a modest benefit of 2 percentage points, compared to baseline scenario B3, and this would lead to revenue equal to 25% of total revenue in 2013 (Figure 4-1 and Table 4-1).

- The combined scenarios can enable the policy levers to work together to lessen the impact of choke stocks and delay the choke point. The synergistic effect of the policy levers can result in revenue estimates higher than the value of any single policy lever and there is evidence of this in the analysis for the England nephrops fleet segment as all three combined scenarios would produce revenue in excess of the single policy lever scenarios incorporated into each combined scenario.
 - In 2019, the benefit of combining the policy lever scenarios for this fleet segment would be notably better than the impact of the policy levers in isolation. Scenario 4A which incorporates the most favourable single policy lever of de minimis LAX (1A) results in revenues of 80% of 2013 levels, this would be a substantial increase of 57 percentage points on baseline scenario B3.
 - In 2019, the combined scenarios which incorporate the stock specific de minimis scenarios (4B and 4C) support revenues of 54% of 2013 levels. Therefore, even under the strictest definition of de minimis the benefit of combining the policy levers can support revenues 31 percentage points higher than under baseline scenario B3 and 24 percentage points higher than the de minimis scenarios 1B and 1C in isolation.

These findings indicate the potential value of the different policy levers however it is unlikely that the findings will be considered positive for the fleet segment as a whole. The findings do suggest that there is a clear need for fleet-based solutions in the England nephrops trawl fleet to fully address the challenge of the landing obligation as the benefit of policy levers, even under the most generous interpretation of de minimis, can only provide so much mitigation from 2019.

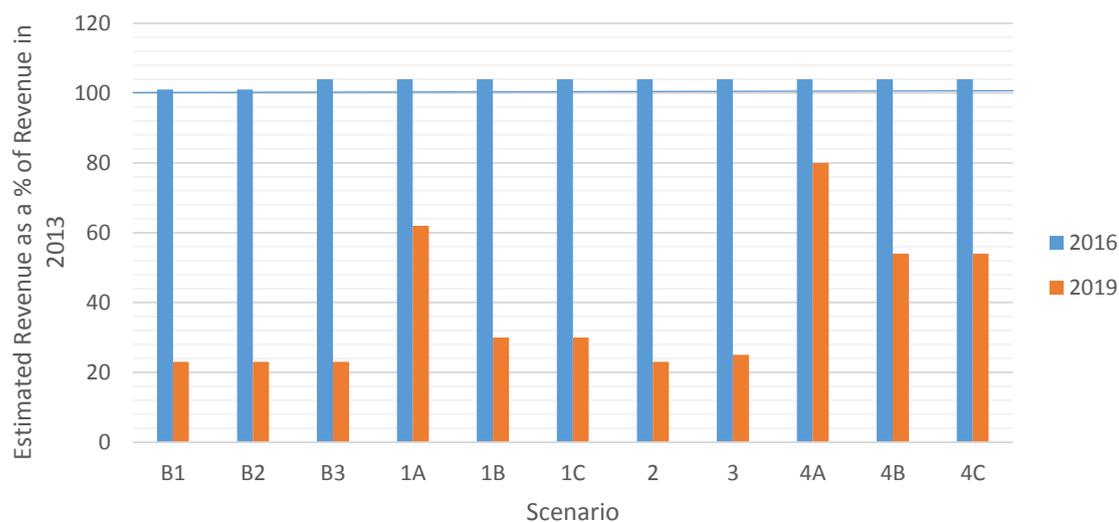


Figure 4-1: England Nephrops Trawl Fleet Revenue in 2016 and 2019 under each scenario, as a percentage of actual revenue in 2013

	Scenario Label	Scenario Description	Estimated revenue in 2016 as a % of revenue in 2013	Estimated revenue in 2019 as a % of revenue in 2013
Baseline Scenarios	B1	Implementation of landing obligation with only transitional rules in place	101	23
	B2	B1 plus a catch allowance for zero-TAC stocks	101	23
	B3	B2 plus quota uplift, where applicable	104	23
Policy Lever Scenarios	1A	De Minimis Lax (5% of PO segment catch)	104	62
	1B	De Minimis Mid (5% of EU TAC)	104	30
	1C	De Minimis Strict (5% of UK TAC)	104	30
	2	Interspecies flexibility (for stocks considered to be within safe biological limits)	104	23
	3	Survivability (majority of flatfish stocks)	104	25
Combined Scenarios	4A	Combination of Scenarios 1A, 2 and 3	104	80
	4B	Combination of Scenarios 1B, 2 and 3	104	54
	4C	Combination of Scenarios 1C, 2 and 3	104	54

Table 4-1: Estimated revenue for the England Nephrops Trawl fleet segment under each scenario as a % of revenue in 2013

The reasons why the impact of each scenario would be limited are explored in detail on a sea area by sea area basis in the second part of the chapter.

4.2. THE IMPACT OF COMBINED POLICY LEVER SCENARIOS ON OTHER PERFORMANCE MEASURES

In Table 4-2, alongside the impact on revenue, the estimated impact of the combined scenarios on the following measures of fleet activity and performance is also shown:

- Landings (tonnes);
- Effort (fishing days);
- Operating Profit (revenue minus operating costs, before deducting cost of capital); and
- Number of vessels. The number of vessels that can operate successfully under each scenario in each year is difficult to measure as the definition of 'operating successfully' will vary from vessel owner to vessel owner. The analysis has assumed that under the benefits created by the combined policy levers the number of vessels that can operate will be the number of vessels that can continue to maintain the average number of fishing days used per vessel in the fleet segment in 2013.

The revenue under each scenario in Table 4-2, is the same as the revenue presented in Table 4-1. The figures in brackets represent the finding as a percentage of activity in 2013.

Observations on the impact of the combined policy lever scenarios on activity and business performance are:

- In 2016 all business performance and activity measures under baseline scenario B3 are higher or equal to performance and activity in 2013. This would be a result of quota uplift and the absence of any choke stock. Therefore, the combined policy lever scenarios cannot improve upon baseline scenario B3.
- In 2019 all combined scenario result in estimated landed volumes below 2013 volumes. Scenario 4A would be the most favourable scenario, and would be also the only scenario which is not stock specific. Scenario 4A would support landings volumes equivalent to 88% of 2013 volumes and an improvement of 74% on baseline scenario B3 (14%).
- In 2019 the effort (fishing days) under all three combined scenarios would be less than the effort used by the fleet segment in 2013. This indicates that under each scenario in each year a choke stock would halt fishing activity in at least one sea area for at least one PO. The best scenario in 2019 (4A) suggests the fleet could fish for 71% of the days used in 2013 and the worst combined scenario in 2019 (4C) suggests that the fleet could fish for 44% of the days used in 2013. However these scenarios offer substantial benefit over and above the baseline position when the fleet would only have 16% of the days fished in 2013.
- All three combined scenarios indicate that the fleet segment in 2019 will achieve lower operating profits than were achieved in 2013. However, this is the only nephrops fleet segment where the analysis suggests an operating profit could be achieved in 2019 under all three combined scenarios.
- If each vessel in the fleet segment was to be at sea for the average number of days each vessel in the fleet was at sea in 2013 this would suggest that under the three combined policy lever scenarios the fleet could reduce from 30 vessels to between 13 and 21 vessels (Table 4-2).

	Year	Baseline B3	Combined policy lever scenarios (percent of 2013 figures)		
			4a	4b	4c
Revenue (£'000s) (2013=£5,499)	2016	5,743 (104%)	5,743 (104%)	5,743 (104%)	5,743 (104%)
	2019	1,272 (23%)	4,381 (80%)	2,960 (54%)	2,968 (54%)
Landings (t) (2013=2,337 tonnes)	2016	2,675 (114%)	2,675 (114%)	2,675 (114%)	2,675 (114%)
	2019	318 (14%)	2,055 (88%)	1,304 (56%)	1,310 (56%)
Effort (days) (2013=3,675 days)	2016	3,675 (100%)	3,675 (100%)	3,675 (100%)	3,675 (100%)
	2019	571 (16%)	2,622 (71%)	1,625 (44%)	1,625 (44%)
Operating Profit (£'000s) (2013=£579)	2016	766	766	766	766
	2019	-427	499	136	143
Number of Vessels (#same effort) (2013=30 vessels)	2016	30 (100%)	30 (100%)	30 (100%)	30 (100%)
	2019	6 (20%)	21 (70%)	13 (43%)	13 (43%)

Table 4-2: Summary of Impact of Baseline Scenario B3 and Combined Policy Lever Scenarios on Performance Measures of the England nephrops trawl fleet segment in 2016 and 2019

Note: The number in brackets is the finding as a percentage of performance in 2013, which is shown in brackets in the first column

The model produced a substantial volume of detailed findings in addition to those presented in the revenue analysis above. We draw on these findings in the second part of the Chapter to further explain why the scenarios have the impact that they do for the England nephrops trawl fleet segment.

4.3. CHOKE STOCK AND CHOKE POINT BY SEA AREA UNDER EACH SCENARIO

The impact of the landing obligation is driven by the extent to which the fleet can continue to fish in each sea area, and this is determined by the presence, or not, of a choke stock. The potential benefit of each scenario is entirely dependent on the extent to which a policy lever can impact upon the primary choke stock. However, the primary choke stock will vary by sea area, and can be expected to vary between different POs.

The analysis which follows finds the stock which provides the fewest fishing days to the combined England nephrops trawl fleet as a whole. An individual PO may have a different primary choke stock to the segment as a whole. Thus, the sum of fishing days for the segment primary choke stock may be different from the sum of days until each individual PO would choke on its own primary choke stock. (n.b. The performance and activity analysis in the first half of this chapter is based on the sum of days until each PO reaches its own individual choke point.)

The following tables contain the primary choke stock and estimated choke point for the England nephrops trawl fleet under each of the eleven scenarios in:

- the North Sea (Area IV) in 2016 (Table 4-3);
- the North Sea (Area IV) in 2019 (Table 4-4);
- the West of Scotland (Area VI) in 2016 (Table 4-5); and
- the West of Scotland (Area VI) in 2019 (Table 4-6).

Commentary on the impact of each scenario is included in each table.

A summary graph provided in Section 4.4 uses the information from Table 4-4 and Table 4-6 to produce an overview of the choke point by sea area under each scenario in 2019.

England Nephrops Trawl Fleet days at sea in Area IV (North Sea) in 2013 = 3,018 days						
	Scenario Label	Description	Primary Choke Stock(s) in 2016	Days until choke point in Area IV	Days until choke point as % of 2013 days	Comment
Baseline Scenarios	B1	Implementation of landing obligation with only transitional rules in place	Nephrops	3,016	99.93%	Baseline scenario B1 is the worst-case scenario. However in 2016 the extent of the choke caused by landing all nephrops catch would only occur 2 days earlier than the number of days fished in 2013.
	B2	B1 plus a catch allowance for zero-TAC stocks	Nephrops	3,016	99.93%	There are no zero-TAC stocks in the North Sea.
	B3	B2 plus quota uplift, where applicable	No choke	-	-	Quota uplift would apply to nephrops in Area IV. Therefore under baseline scenario B3, once quota uplift is applied to the TAC for nephrops, nephrops is removed as a potential choke stock in 2016.
Policy Lever Scenarios	1A	De Minimis Lax (5% of PO segment catch)				The England nephrops trawl fleet would have no requirement for any policy levers in Area IV (North Sea) in 2016 as no choke stocks have been identified under baseline scenario B3.
	1B	De Minimis Mid (5% of EU TAC)				
	1C	De Minimis Strict (5% of UK TAC)				
	2	Interspecies flexibility (for stocks considered to be within safe biological limits)				
	3	Survivability (majority of flatfish stocks)				
Combined Scenarios	4A	Combination of Scenarios 1A, 2 and 3				The England nephrops trawl fleet would have no requirement for combined policy levers in Area IV (North Sea) in 2016 as no choke stocks have been identified under baseline scenario B3.
	4B	Combination of Scenarios 1B, 2 and 3				
	4C	Combination of Scenarios 1C, 2 and 3				

Table 4-3: England Nephrops Trawl Fleet: Primary Choke Stock and Choke Point under each Scenario in Area IV (North Sea) in 2016

England Nephrops Trawl Fleet days at sea in Area IV (North Sea) in 2013 = 3,018 days						
	Scenario Label	Description	Primary Choke Stock(s) in 2019	Days until choke point in Area IV	Days until choke point as % of 2013 days	Comment
Baseline Scenarios	B1	Implementation of landing obligation with only transitional rules in place	Dabs and skate	470	16%	Baseline scenario B1 is the worst-case scenario.
	B2	B1 plus a catch allowance for zero-TAC stocks	Dabs and skate	470	16%	There are no zero-TAC stocks in the North Sea.
	B3	B2 plus quota uplift, where applicable	Dabs and skate	470	16%	Quota uplift would have no effect on the primary choke stocks identified under baseline scenario B2.
Policy Lever Scenarios	1A	De Minimis Lax (5% of PO segment catch)	Cod	1,357	45%	De minimis LAX would change the primary choke stock to cod and substantially delay the choke point, compared to scenario B3.
	1B	De Minimis Mid (5% of EU TAC)	Dabs, skate and hake	570	19%	De minimis MID would delay the choke point compared to scenario B3 but dabs and skate would remain primary choke stocks and hake would become a primary choke stock.
	1C	De Minimis Strict (5% of UK TAC)	Dabs, skate and hake	570	19%	De minimis STRICT would delay the choke point compared to scenario B3 but dabs and skate would remain primary choke stocks and hake would become a primary choke stock.
	2	Interspecies flexibility (for stocks considered to be within safe biological limits)	Dabs and skate	470	16%	Interspecies flexibility could not have an impact on the primary choke stocks identified under baseline scenario B3, dabs or skate, as the stocks are not considered to be in safe biological limits.
	3	Survivability (majority of flatfish stocks)	Hake	516	17%	Survivability would remove dabs and skate as potential choke stocks but hake would become the primary choke stock and create a choke after 516 days.
Combined Scenarios	4A	Combination of Scenarios 1A, 2 and 3	Cod	2,003	66%	Under survivability skate and dabs are removed as potential choke stocks. This allows interspecies flexibility to become more effective and along with de minimis LAX could change the primary choke stock to cod and substantially delay the choke point, compared to scenario B3.
	4B	Combination of Scenarios 1B, 2 and 3	Cod	1,306	43%	Under survivability skate and dabs are removed as potential choke stocks. This allows interspecies flexibility to become more effective and along with de minimis MID could change the primary choke stock to cod and substantially delay the choke point, compared to scenario B3.
	4C	Combination of Scenarios 1C, 2 and 3	Cod	1,306	43%	Under survivability skate and dabs are removed as potential choke stocks. This allows interspecies flexibility to become more effective and along with de minimis STRICT could change the primary choke stock to cod and substantially delay the choke point, compared to scenario B3.

Table 4-4: England Nephrops Trawl Fleet: Primary Choke Stock and Choke Point under each Scenario in Area IV (North Sea) in 2019

England Nephrops Trawl Fleet days at sea in Area VI (West of Scotland) in 2013 = 656 days						
	Scenario Label	Description	Primary Choke Stock(s) in 2016	Days until choke point in Area VI	Days until choke point as % of 2013 days	Comment
Baseline Scenarios	B1	Implementation of landing obligation with only transitional rules in place	No choke	-	-	Baseline scenario B1 is the worst-case scenario. However in 2016 there would be no choke stock for the England nephrops trawl fleet in Area VI (West of Scotland).
	B2	B1 plus a catch allowance for zero-TAC stocks	No choke	-	-	Catch allowance would have no effect in Area VI (West of Scotland) as there would be no choke stocks in 2016.
	B3	B2 plus quota uplift, where applicable	No choke	-	-	Quota uplift would not be required for the England nephrops trawl fleet in Area VI in 2016.
Policy Lever Scenarios	1A	De Minimis Lax (5% of PO segment catch)				The England nephrops trawl fleet would have no requirement for any policy levers in Area VI (West of Scotland) in 2016 as no choke stocks have been identified under any of the baseline scenarios.
	1B	De Minimis Mid (5% of EU TAC)				
	1C	De Minimis Strict (5% of UK TAC)				
	2	Interspecies flexibility (for stocks considered to be within safe biological limits)				
	3	Survivability (majority of flatfish stocks)				
Combined Scenarios	4A	Combination of Scenarios 1A, 2 and 3				The England nephrops trawl fleet would have no requirement for combined policy levers in Area VI (West of Scotland) in 2016 as no choke stocks have been identified under any of the baseline scenarios.
	4B	Combination of Scenarios 1B, 2 and 3				
	4C	Combination of Scenarios 1C, 2 and 3				

Table 4-5: England Nephrops Trawl Fleet: Primary Choke Stock and Choke Point under each Scenario in Area VI (West of Scotland) in 2016

England Nephrops Trawl Fleet days at sea in Area VI (West of Scotland) in 2013 = 656 days						
	Scenario Label	Description	Primary Choke Stock(s) in 2019	Days until choke point in Area VI	Days until choke point as % of 2013 days	Comment
Baseline Scenarios	B1	Implementation of landing obligation with only transitional rules in place	Cod 6A	300	46%	Baseline scenario B1 is the worst-case scenario.
	B2	B1 plus a catch allowance for zero-TAC stocks	Saithe, plaice and ling	318	49%	Catch allowance would mean cod 6A would no longer be the primary choke stock. With cod 6A removed there are three stocks that would create a choke at the same time and in a slightly longer time frame.
	B3	B2 plus quota uplift, where applicable	Saithe, plaice and ling	318	49%	Quota uplift would have no effect on the primary choke stocks identified in the West of Scotland as none are considered to be eligible for uplift.
Policy Lever Scenarios	1A	De Minimis Lax (5% of PO segment catch)	Saithe, plaice, ling, megrim and hake	618	94%	De minimis LAX would delay the choke point substantially, compared to scenario B3. The primary choke stocks identified under B3 would remain but hake and megrim would also become primary choke stocks..
	1B	De Minimis Mid (5% of EU TAC)	Saithe, plaice and ling	318	49%	De minimis MID would not change the primary choke stocks or delay the choke point, compared to scenario B3.
	1C	De Minimis Strict (5% of UK TAC)	Saithe, plaice and ling	318	49%	De minimis STRICT would not change the primary choke stocks or delay the choke point, compared to scenario B3.
	2	Interspecies flexibility (for stocks considered to be within safe biological limits)	Plaice and ling	318	49%	Interspecies flexibility would remove saithe as a primary choke stock as it is considered to be within safe biological limits and would receive a transfer of quota from another stock. However scenario 2 would not have an impact on plaice and ling and therefore the choke point identified under scenario B3 would be unchanged under scenario 2.
	3	Survivability (majority of flatfish stocks)	Saithe and ling	318	49%	Survivability would remove plaice as a potential choke stock but there would be no impact on saithe or ling therefore the choke point identified under scenario B3 would be unchanged.
Combined Scenarios	4A	Combination of Scenarios 1A, 2 and 3	Saithe, ling, megrim and hake	618	94%	Survivability removes plaice as a primary choke stock but the combining of policy levers does not provide additional benefit as the days available under scenario 4A are the same as the days that would be available under single policy lever scenario 1A.
	4B	Combination of Scenarios 1B, 2 and 3	Ling	318	49%	Under survivability plaice would be removed as a primary choke stock and under interspecies flexibility saithe would be removed as a primary choke stock, however neither these scenarios nor de minimis MID would have an impact on ling and therefore the choke point remains the same.
	4C	Combination of Scenarios 1C, 2 and 3	Ling	318	49%	Under survivability plaice would be removed as a primary choke stock and under interspecies flexibility saithe would be removed as a primary choke stock, however neither these scenarios nor de minimis STRICT would have an impact on ling and therefore the choke point remains the same.

Table 4-6: England Nephrops Trawl: Primary Choke Stock and Choke Point under each Scenario in Area VI (West of Scotland) in 2019

4.4. SUMMARY OF THE CHOKE POINT BY SEA AREA UNDER EACH SCENARIO IN 2019

Figure 4-2 provides a summary of the impact of the landing obligation in 2019 under the baseline scenarios (B1-B3), the single policy lever scenarios (1A-3) and the combined policy lever scenarios (4A-4C). The summary reflects the choke points shown in the previous tables for Area IV and Area VI in 2019. Observations on Figure 4-2 include:

- The baseline scenarios all indicate how significant the impact of the landing obligation could be for the England nephrops trawl fleet segment in 2019, particularly in Area IV.
- The only single policy lever that has a notable impact compared to baseline scenario B3 would be de minimis LAX. De minimis LAX (1A) would be the only proposed scenario that is not stock specific.
- Combined scenarios 4B and 4C which incorporate stock specific de minimis definitions have a notable impact in Area IV compared to baseline scenario B3 but no additional benefit in Area VI.

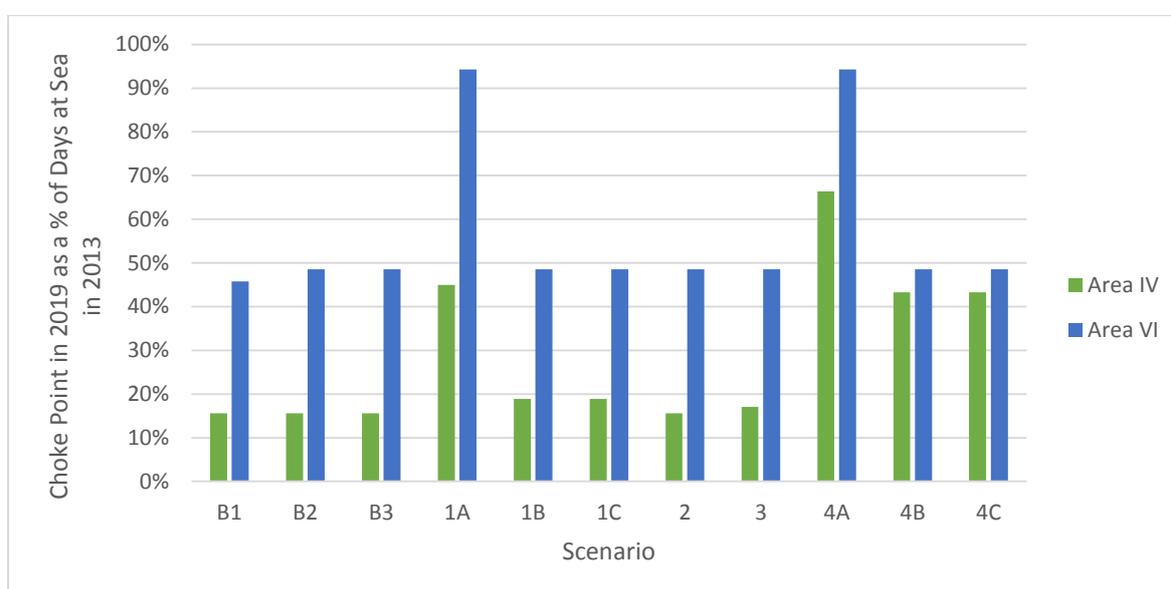


Figure 4-2: England nephrops trawl fleet - Impact of each scenario on the effort of the fleet (fishing days) in 2019, shown as a percentage of actual effort in 2013

4.5. TOP FIVE CHOKE STOCKS AND THEIR CHOKE POINT UNDER THE COMBINED POLICY LEVER SCENARIOS

The scenario analysis and the choke analysis (reported in Interim Report One) are dependent on the quantitative information available on the catching activity of different fleet segments in different sea areas. The quantitative information used in the scenario analysis is the best available. However, estimates of discard volumes, and therefore estimates of total catch, are determined from a sample of vessels and whilst the estimate can reasonably be expected to be representative, there is nevertheless a risk that discard estimates may not be accurate. The relative impact of policy levers may be different if discard rates are materially different from those used in modelling.

The purpose of the top five choke analysis presented in Table 4-7 is to identify what other stocks might create a choke problem for the England nephrops trawl fleet segment:

- if the identified primary choke stock turns out not to be the primary choke stock because reality varies from the recorded information available;
- if the fleet can avoid the primary choke stock; or
- if another way is found to address the primary choke stock.

Table 4-7 presents the top five choke stocks under baseline scenario B3 and the three combined policy lever scenarios. Area VII is shown in the Table but the England nephrops fleet was not active in Area VII in 2013.

Scenario	Area IV (2013 days at sea = 3,018 days)				Area VI (2013 days at sea = 656 days)				Area VII (2013 days at sea = 0 days)			
	2016		2019		2016		2019		2016		2019	
	Choke Stock	Choke Point (days)	Choke Stock	Choke Point (days)	Choke Stock	Choke Point (days)	Choke Stock	Choke Point (days)	Choke Stock	Choke Point (days)	Choke Stock	Choke Point (days)
Baseline scenario B3	No choke		Dabs	470	No choke		Saithe	318	Not active		Not active	
			Skate	470			Plaice	318				
			Hake	516			Ling	318				
			Turbot	1061			Hake	324				
			Cod	1106			Megrim	444				
Combined policy lever scenario 4A			Cod	2003			Hake	618				
			Ling	2016			Megrim	618				
			Hake	2016			Ling	618				
			Whiting	2018			Saithe	618				
			Saithe	2143			Anglerfish	633				
Combined policy lever scenario 4B			Cod	1306			Ling	318				
			Ling	1556			Hake	324				
			Whiting	2018			Megrim	444				
			Saithe	2190			Anglerfish	633				
			Hake	2552			-	-				
Combined policy lever scenario 4C			Cod	1306			Ling	318				
			Ling	1556			Hake	324				
			Saithe	2002			Megrim	444				
			Whiting	2018			Anglerfish	633				
			Hake	2552			-	-				

Table 4-7: England nephrops trawl fleet segment – top five choke stocks in Area IV and Area VI in 2016 and 2019 under baseline scenario B3 and all three combined policy lever scenarios

5. ENGLAND BEAM TRAWL SCENARIO ANALYSIS

The over 10m England beam trawl fleet segment consisted of 70 vessels in 2013 fishing in Area VII (10,083 days, 70% of total days) and Area IV, North Sea, (4,303 days, 30% of total days). There was also one day recorded in Area VI (West of Scotland)⁵. The scenario analysis presented in this report incorporates PO fleet segments with five or more vessels. The vessels not included may be either non-sector or belong to POs with fewer than five vessels in the segment analysed.

The PO fleet segments included in the scenario analysis represent 58 vessels. The number of vessels in the fleet segment varies from the choke analysis because of the exclusion of PO fleet segments with less than five vessels. However the number of vessels is larger than it would otherwise have been for the scenario analysis because some vessels that were categorised as whitefish trawl/seine vessels have been transferred into this segment because they target the same stocks as the beam trawl fleet segment.

The producer organisations which have vessels included in the scenario analysis for the England beam trawl fleet segment are:

- Cornish Fish Producers' Organisation (CFPO);
- North Sea Fishermen's Organisation (NSFO);
- Wales and West Coast Fishermen Producer Organisation (WWCFPO); and
- South Western Fish Producers' Organisation (SWFPO).

The findings for each beam trawl PO fleet segment are aggregated to provide an overall analysis of the relative impact of different scenarios on the activity and performance of the England beam trawl fleet segment. It is the aggregated analysis that is presented in this chapter.

The analysis does not consider what positive impact could be achieved from fleet-based responses that could help the fleet to avoid choke stocks. The extent to which technological, strategic or operational changes can be implemented to avoid choke stocks and reduce the impact of the landing obligation is not known and cannot be reasonably estimated across the whole of the UK fleet at this time.

The findings of the scenario analysis for the England beam trawl fleet segment are presented in two halves in chapter 5:

- Sections 5.1 and 5.2 report on the impact of the eleven scenarios on the performance of the England beam trawl fleet segment as a whole⁶. The focus of the analysis is on the impact of all scenarios on the revenue of the fleet segment. However, the impact of the three combined scenarios on landings, effort, operating profit and number of vessels is also reported.
- The second half of the chapter, Sections 5.3 to 5.5, reports on the impact of the scenarios in the different sea areas where the England beam trawl fleet is active. The analysis provides explanations for why the scenarios have the impact that is reported in the first half of the Chapter.

⁵ Source: Landing Obligation Economic Impact Assessment Interim Report One: Choke Analysis

⁶ It is advisable to have read chapter 2 before reviewing the results in the remainder of this Chapter.

If choke stocks exist in a sea area for the England beam trawl fleet, it is the primary choke stock, the stock which the fleet segment runs out of quota for first, that will limit the activity of the fleet. The primary choke stock and the number of days fishing that is possible until the choke occurs – the choke point – can be affected by the design of each scenario. The analysis in the second half of the chapter explores how the scenarios impact upon the primary choke stock and choke point for the segment as a whole.

Once the quota of a stock has been fully used by a PO fleet segment the analysis assumes that fishing by that PO fleet segment in the sea area affected will stop. Because the analysis for the England beam trawl fleet is an aggregated calculation of the impacts on the PO fleet segments it is possible that each PO fleet segment will be affected by different choke stocks and in different time frames.

The analysis presented is developed from information on end of year landings and therefore incorporates the benefits of in-year quota trading in the UK and internationally.

5.1. IMPACT OF EACH SCENARIO ON THE REVENUE OF THE ENGLAND BEAM TRAWL FLEET

An overview of the impact of all 11 scenarios on the revenue of the fleet segment is presented in Figure 5-1. The estimated revenue that could be achieved by the fleet segment under each scenario is presented as a percentage of the revenue achieved by the fleet segment in 2013. This allows comparison of the potential impact of the landing obligation in 2016 and 2019 to actual total segment revenue in 2013. Revenue in 2013 is represented by a horizontal blue line in Figure 5-1 which is set at 100%. The estimated revenue includes landings of quota species, non-quota species and any other earnings expected by the fleet. Revenue estimates also assume that the average price achieved per species in 2013 will be the average price achieved in each year analysed.

5.1.1. IMPACT OF BASELINE SCENARIOS ON REVENUE

The baseline scenarios represent the introduction of the landing obligation without the potential benefits of de minimis, interspecies flexibility and survivability. They are therefore considered to be worst-case scenarios. Table 5-1 presents the percentages used in the graph.

- Baseline scenario B1 does not provide a catch allowance for zero-TAC stocks and does not incorporate quota uplift. This is the worst-case scenario in the analysis. It is estimated that under baseline scenario B1 revenue for the England beam trawl fleet would be 81% of 2013 revenue in 2016 and 41% of 2013 revenue in 2019.
- Baseline scenario B2, which includes a 1.5% catch allowance for zero-TAC stocks (baseline scenario B2) has no impact on the revenue of the fleet in either 2016 or 2019.
- Baseline scenario B3 incorporates the catch allowance included in baseline scenario B2 plus quota uplift for some stocks. The application of quota uplift increases revenue by 7 percentage points in 2016 and 4 percentage points in 2019. Under baseline scenario B3 revenue is estimated at 88% of 2013 revenues in 2016 and 45% of 2013 levels in 2019 (Table 5-1).

5.1.2. IMPACT OF SINGLE AND COMBINED POLICY LEVER SCENARIOS ON REVENUE

Each policy lever scenario is applied to baseline scenario B3. This means that the policy levers of de minimis, interspecies flexibility and survivability are applied to a baseline that already incorporates:

- a catch allowance for zero-TAC stocks; and
- quota uplift for stocks deemed eligible for an uplift.

The impact of the single and combined policy lever scenarios on the revenue of the fleet segment are indicated in Figure 5-1 and detailed in Table 5-1.

The impact of each policy lever should be judged by comparing it to the percentage shown for baseline scenario B3.

Observations on the impact of the policy levers on revenue are:

- Although effort is held at a maximum of the days fished in 2013, in 2016 the revenue of the fleet segment would exceed 2013 levels under single policy lever scenarios 1A, 1B, 1C and 3, as shown in Figure 5-1. This occurs when there is no choke stock and quota uplift means that the fleet segment can land and sell fish that might previously have been discarded due to being over quota.
- In 2016, the biggest improvement on baseline scenario B3 for a single policy lever would be under survivability. This is the only fleet segment where scenario 3, survivability, can have an impact in 2016 as the stocks which are subject to the landing obligation for this fleet, plaice and sole, are also considered to be survivable under scenario 3. This means that under the transitional rules the definition of survivability under scenario 3 effectively negates the requirements of the landing obligation for the England beam trawl segment. This may not be acceptable.
- In 2016 interspecies flexibility (scenario 2) offers some benefit above baseline scenario B3 and would increase revenue by 4 percentage points compared to baseline scenario B3. Interspecies flexibility would have no impact in 2019.
- In all single policy lever scenarios (scenarios 1A-3), revenue would be substantially lower in 2019 than in 2016. This is because all demersal quota stocks become subject to the landing obligation and stocks which might previously have been considered an unwanted bycatch, and for which the fleet segment holds limited quota, would have to be landed in 2019 and counted against quota. For the England beam trawl fleet segment this would create a choke on fleet activity much earlier than in the transitional phase of the landing obligation under all individual policy lever scenarios.
- In 2019, the biggest improvement on baseline scenario B3 for a single policy lever would be under de minimis LAX (scenario 1A) as the revenue of the fleet would be 87% of 2013 revenue levels. This scenario would generate an improvement on baseline scenario B3 of 42 percentage points in 2019. However, de minimis LAX is simply a percentage of the total catch of the PO fleet segment and is not stock specific.
- In 2019, the two stock specific de minimis scenarios also provide benefit. De minimis MID, where the 5% is taken as a percentage of EU TAC, creates an improvement of 34 percentage points on baseline scenario B3, in de minimis STRICT where the 5% is taken as

a percentage of UK TAC the improvement is 33 percentage points and would support revenue of 78% of 2013 revenue levels.

- In 2019, survivability would provide less of a benefit for this fleet segment, compared to 2016. Under the survivability scenario in 2016 the revenue of the fleet would be 111% of 2013 levels. However in 2019 the revenue of the fleet would be 54% of 2013 levels.
- The combined scenarios can enable the policy levers to work together to lessen the impact of choke stocks and delay the choke point. The synergistic effect of the policy levers can result in revenue estimates higher than the value of any single policy lever.
 - In 2019, the benefit of combining the policy lever scenarios for this fleet segment would be notably better than the impact of the policy levers in isolation. Scenario 4A which incorporates the most favourable single policy lever of de minimis LAX (1A) results in revenues of 105% of 2013 levels, this would be a substantial increase of 60 percentage points on baseline scenario B3.
 - In 2019, the combined scenarios which incorporate the stock specific de minimis scenarios, 4B and 4C, support revenues of 102% and 89% of 2013 levels respectively. Therefore, even under the strictest definition of de minimis, de minimis STRICT, the benefit of combining the policy levers can support revenues 44 percentage points higher than under baseline scenario B3 and 11 percentage points higher than the de minimis STRICT scenarios 1C in isolation.

The reasons why the impact of each scenario occurs and why the impact can vary over time are explored in detail on a sea area by sea area basis in Section 5.3.

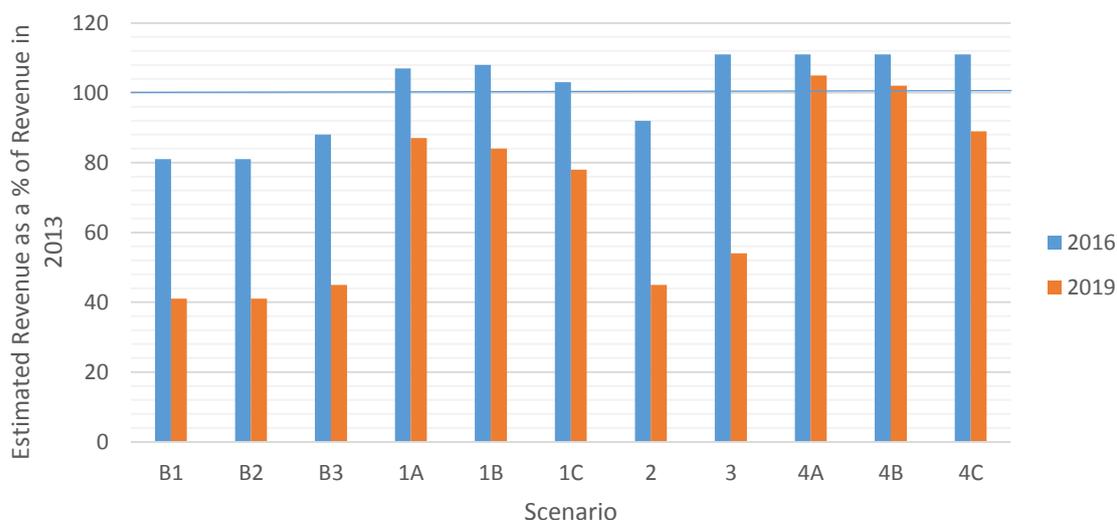


Figure 5-1: England beam trawl Fleet Revenue under each scenario as a percentage of actual revenue in 2013

	Scenario Label	Scenario Description	Estimated revenue in 2016 as a % of revenue in 2013	Estimated revenue in 2019 as a % of revenue in 2013
Baseline Scenarios	B1	Implementation of landing obligation with only transitional rules in place	81	41
	B2	B1 plus a catch allowance for zero-TAC stocks	81	41
	B3	B2 plus quota uplift, where applicable	88	45
Policy Lever Scenarios	1A	De Minimis Lax (5% of PO segment catch)	107	87
	1B	De Minimis Mid (5% of EU TAC)	108	84
	1C	De Minimis Strict (5% of UK TAC)	103	78
	2	Interspecies flexibility (for stocks considered to be within safe biological limits)	92	45
	3	Survivability (majority of flatfish stocks)	111	54
Combined Scenarios	4A	Combination of Scenarios 1A, 2 and 3	111	105
	4B	Combination of Scenarios 1B, 2 and 3	111	102
	4C	Combination of Scenarios 1C, 2 and 3	111	89

Table 5-1: Estimated revenue for the England beam trawl fleet segment under each scenario as a % of revenue in 2013

5.2. THE IMPACT OF COMBINED POLICY LEVER SCENARIOS ON OTHER PERFORMANCE MEASURES

The scenario analysis created a substantial amount of findings. In Table 5-2, alongside the impact on revenue, the estimated impact of the combined scenarios on the following measures of fleet activity and performance is also shown:

- Landings (tonnes);
- Effort (fishing days);
- Operating Profit (revenue minus operating costs, before deducting cost of capital); and
- Number of vessels. The number of vessels that can operate successfully under each scenario in each year is difficult to measure as the definition of 'operating successfully' will vary from vessel owner to vessel owner. The analysis has assumed that under the benefits created by the combined policy levers the number of vessels that can operate will, at a minimum be, the number of vessels that can continue to maintain the average number of fishing days per vessel in 2013.

The revenue under each scenario in Table 5-2, is the same as the revenue presented in Table 5-1. The figures in brackets represent the finding as a percentage of activity in 2013.

Observations on the impact of the combined policy lever scenarios on activity and business performance are:

- In 2016 and 2019 the landed volume would be above 2013 volumes under all three combined scenarios. In 2016 this is due to quota uplift and in 2019 this is due to the effect of the policy levers working in combination to remove almost all potential choke stocks for the England beam trawl fleet.
- In 2016 and 2019 effort (fishing days) under combined scenarios 4A and 4B is largely the same as the effort used by the fleet segment in 2013 (100% in 2016 and 98% or 97% in 2019). This demonstrates that under the combined policy lever scenarios that all choke stocks are largely removed by the policy lever scenarios when they work in combination.
- Under combined scenarios 4A and 4B the fleet would make an operating profit in both 2016 and 2019:
 - In 2016 and 2019 all three combined scenarios indicate that the fleet segment could be more profitable than it was in 2013. This is because higher volumes of fish are being landed and therefore revenue is higher. However, this assumes that all landings can achieve the average price for landings in 2013, and therefore does not consider the revenue effect of landing under minimum conservation reference size fish.

	Year	Baseline B3	Combined policy lever scenarios (percent of 2013 figures)		
			4a	4b	4c
Revenue (£'000s) (2013=£49,168)	2016	43,239 (88%)	54,344 (111%)	54,344 (111%)	54,344 (111%)
	2019	22,256 (45%)	51,496 (105%)	49,920 (102%)	43,544 (89%)
Landings (t) (2013=17,829 tonnes)	2016	19,669 (110%)	23,235 (130%)	23,235 (130%)	23,235 (130%)
	2019	6,559 (37%)	21,018 (118%)	19,789 (111%)	18,881 (106%)
Effort (days) (2013=12,543 days)	2016	8,969 (72%)	12,543 (100%)	12,543 (100%)	12,543 (100%)
	2019	5,580 (44%)	12,543 (100%)	12,340 (98%)	9,872 (79%)
Operating Profit (£'000s) (2013=£1,012)	2016	7,696	5,616	5,616	5,616
	2019	-1,544	3,239	2,959	1,560
Number of Vessels (#same effort) (2013=58 vessels)	2016	41 (71%)	58 (100%)	58 (100%)	58 (100%)
	2019	26 (45%)	58 (100%)	55 (95%)	44 (76%)

Table 5-2: Summary of Impact of Baseline Scenario B3 and Combined Policy Lever Scenarios on Performance Measures of the England beam trawl fleet segment in 2016 and 2019

Note: The number in brackets is the finding as a percentage of performance in 2013, which is shown in brackets in the first column

The model produced a substantial volume of detailed findings in addition to those presented in the activity and performance analysis above. We draw on these findings in the second part of the Chapter to further explain why the scenarios have the impact that they do for the England beam trawl fleet segment.

5.3. CHOKe STOCK AND CHOKe POINT BY SEA AREA UNDER EACH SCENARIO

The impact of the landing obligation is driven by the extent to which the fleet can continue to fish in each sea area, and this is determined by the presence, or not, of a choke stock. The potential benefit of each scenario is entirely dependent on the extent to which a policy lever can impact upon the primary choke stock. However, the primary choke stock will vary by sea area, and can be expected to vary between different POs.

The analysis which follows finds the stock which provides the fewest fishing days to the combined England beam trawl fleet as a whole. An individual PO may have a different primary choke stock to the segment as a whole. Thus, the sum of fishing days for the segment primary choke stock may be different from the sum of days until each individual PO would choke on its own primary choke stock. (n.b. The performance and activity analysis in the first half of this chapter is based on the sum of days until each PO reaches its own individual choke point.)

The following tables contain the primary choke stock and estimated choke point for the England beam trawl fleet under each of the eleven scenarios in:

- the North Sea (Area IV) in 2016 (Table 5-3);
- the North Sea (Area IV) in 2019 (Table 5-4);
- Area VII in 2016 (Table 5-5); and
- Area VII in 2019 (Table 5-6).

Commentary on the impact of each scenario is included in each table.

England and Wales Beam Trawl Fleet 2013 fishing days in Area IV (North Sea) = 2,278 days						
	Scenario Label	Description	Primary Choke Stock(s) in 2016	Days until choke point in Area IV	Days until choke point as % of 2013 days	Comment
Baseline Scenarios	B1	Implementation of landing obligation with only transitional rules in place	Plaice	1,039	46%	Baseline scenario B1 is the worst-case scenario.
	B2	B1 plus a catch allowance for zero-TAC stocks	Plaice	1,039	46%	Catch allowance would have no effect in Area IV (North Sea).
	B3	B2 plus quota uplift, where applicable	Plaice	1,235	54%	Plaice in Area IV would be eligible for uplift and would delay the choke point compared to the other baseline scenarios.
Policy Lever Scenarios	1A	De Minimis Lax (5% of PO segment catch)	Plaice	1,252	55%	
	1B	De Minimis Mid (5% of EU TAC)	Plaice	1,547	68%	De minimis MID would not change the primary choke stock but would delay the choke point compared to baseline scenario B3.
	1C	De Minimis Strict (5% of UK TAC)	Plaice	1,273	56%	De minimis STRICT would not change the primary choke stock or delay the choke point compared to baseline scenario B3.
	2	Interspecies flexibility (for stocks considered to be within safe biological limits)	Plaice	1,236	54%	Interspecies flexibility would not change the primary choke stock or delay the choke point compared to baseline scenario B3.
	3	Survivability (majority of flatfish stocks)	No choke	-	-	Survivability would remove both plaice and sole as potential choke stocks which effectively would mean that under scenario 3 the landing obligation has no effect on the fishing activity of the England beam trawl fleet.
Combined Scenarios	4A	Combination of Scenarios 1A, 2 and 3	No choke	-	-	The inclusion of the survivability scenario in the combined scenario removes all potential choke stocks.
	4B	Combination of Scenarios 1B, 2 and 3	No choke	-	-	The inclusion of the survivability scenario in the combined scenario removes all potential choke stocks.
	4C	Combination of Scenarios 1C, 2 and 3	No choke	-	-	The inclusion of the survivability scenario in the combined scenario removes all potential choke stocks.

Table 5-3: England and Wales Beam Trawl Fleet: Primary Choke Stock and Choke Point under each Scenario in Area IV (North Sea) in 2016

England and Wales Beam Trawl Fleet 2013 fishing days in Area IV (North Sea) = 2,278 days						
	Scenario Label	Description	Primary Choke Stock(s) in 2019	Days until choke point in Area IV	Days until choke point as % of 2013 days	Comment
Baseline Scenarios	B1	Implementation of landing obligation with only transitional rules in place	Whiting	478	21%	Baseline scenario B1 is the worst-case scenario.
	B2	B1 plus a catch allowance for zero-TAC stocks	Whiting	478	21%	Catch allowance would have no effect in Area IV (North Sea).
	B3	B2 plus quota uplift, where applicable	Whiting	789	35%	Whiting would be eligible for uplift and would delay the choke point compared to the other baseline scenarios but would not change the choke stock.
Policy Lever Scenarios	1A	De Minimis Lax (5% of PO segment catch)	Whiting	905	40%	De minimis LAX would have no effect on the choke stock but would delay the choke point compared to scenario B3.
	1B	De Minimis Mid (5% of EU TAC)	Whiting	1,148	50%	De minimis MID would not change the primary choke stock but would delay the choke point compared to baseline scenario B3.
	1C	De Minimis Strict (5% of UK TAC)	Whiting	915	40%	De minimis STRICT would not change the primary choke stock but would delay the choke point compared to baseline scenario B3.
	2	Interspecies flexibility (for stocks considered to be within safe biological limits)	Whiting	789	35%	Interspecies flexibility would not change the primary choke stock or delay the choke point compared to baseline scenario B3.
	3	Survivability (majority of flatfish stocks)	Whiting	789	35%	Survivability would not change the primary choke stock or delay the choke point compared to baseline scenario B3.
Combined Scenarios	4A	Combination of Scenarios 1A, 2 and 3	No choke	-	100%	The combination of survivability, interspecies flexibility and de minimis LAX would be particularly effective for this fleet segment and result in no choke stocks under scenario 4A in 2019.
	4B	Combination of Scenarios 1B, 2 and 3	Whiting, saithe, ling and hake	2,077	91%	The combination of survivability, interspecies flexibility and de minimis MID would substantially delay the choke point compared to scenario B3.
	4C	Combination of Scenarios 1C, 2 and 3	Whiting and saithe	2,117	93%	The combination of survivability, interspecies flexibility and de minimis STRICT would substantially delay the choke point compared to scenario B3.

Table 5-4: England and Wales Beam Trawl Fleet: Primary Choke Stock and Choke Point under each Scenario in Area IV (North Sea) in 2019

England and Wales Beam Trawl Fleet 2013 fishing days in Area VII = 10,259 days						
	Scenario Label	Description	Primary Choke Stock(s) in 2016	Days until choke point in Area VII	Days until choke point as % of 2013 days	Comment
Baseline Scenarios	B1	Implementation of landing obligation with only transitional rules in place	Plaice FG and plaice 7HJK	8,001	78%	Baseline scenario B1 is the worst-case scenario.
	B2	B1 plus a catch allowance for zero-TAC stocks	Plaice FG and plaice 7HJK	8,001	78%	Catch allowance would have no effect in Area VII.
	B3	B2 plus quota uplift, where applicable	Plaice FG and plaice 7HJK	8,001	78%	Quota uplift would have no effect in Area VII.
Policy Lever Scenarios	1A	De Minimis Lax (5% of PO segment catch)	No choke	-	100%	De minimis LAX would remove all potential choke stocks in 2016.
	1B	De Minimis Mid (5% of EU TAC)	No choke	-	100%	De minimis MID would remove all potential choke stocks in 2016.
	1C	De Minimis Strict (5% of UK TAC)	Plaice 7HJK	9.432	92%	De minimis STRICT would not change the primary choke stock but would substantially delay the choke point compared to baseline scenario B3.
	2	Interspecies flexibility (for stocks considered to be within safe biological limits)	Plaice FG and plaice 7HJK	8.001	78%	Interspecies flexibility would not change the primary choke stock or delay the choke point compared to baseline scenario B3.
	3	Survivability (majority of flatfish stocks)	No choke	-	100%	Survivability would remove all plaice and sole stocks as potential choke stocks which effectively would mean that under scenario 3 the landing obligation has no effect on the fishing activity of the England beam trawl fleet in 2016.
Combined Scenarios	4A	Combination of Scenarios 1A, 2 and 3	No choke	-	100%	The inclusion of the survivability scenario and de minimis LAX in the combined scenario removes all potential choke stocks in 2016.
	4B	Combination of Scenarios 1B, 2 and 3	No choke	-	100%	The inclusion of the survivability scenario and de minimis MID in the combined scenario removes all potential choke stocks in 2016.
	4C	Combination of Scenarios 1C, 2 and 3	No choke	-	100%	The inclusion of the survivability scenario in the combined scenario removes all potential choke stocks in 2016.

Table 5-5: England and Wales Beam Trawl Fleet: Primary Choke Stock and Choke Point under each Scenario in Area VII in 2016

England and Wales Beam Trawl Fleet 2013 fishing days in Area VII = 10,259 days						
	Scenario Label	Description	Primary Choke Stock(s)	Days until choke point	Days until choke point as % of 2013 days	Comment
Baseline Scenarios	B1	Implementation of landing obligation with only transitional rules in place	Whiting 7B-K	7,250	71%	Baseline scenario B1 is the worst-case scenario.
	B2	B1 plus a catch allowance for zero-TAC stocks	Whiting 7B-K	7,250	71%	Catch allowance would have no effect in Area VII.
	B3	B2 plus quota uplift, where applicable	Whiting 7B-K	7,250	71%	Quota uplift would have no effect in Area VII.
Policy Lever Scenarios	1A	De Minimis Lax (5% of PO segment catch)	Whiting 7B-K, plaice 7DE, 7FG and 7HJK	10,080	98%	De minimis LAX would substantially delay the choke point compared to scenario B3.
	1B	De Minimis Mid (5% of EU TAC)	Plaice 7HJK	9,153	89%	De minimis MID would not change the primary choke stock but would substantially delay the choke point compared to baseline scenario B3.
	1C	De Minimis Strict (5% of UK TAC)	Plaice 7HJK	8,621	84%	De minimis STRICT would not change the primary choke stock but would delay the choke point compared to baseline scenario B3.
	2	Interspecies flexibility (for stocks considered to be within safe biological limits)	Whiting 7B-K	7,250	71%	Interspecies flexibility would not change the primary choke stock or delay the choke point compared to baseline scenario B3.
	3	Survivability (majority of flatfish stocks)	Whiting 7B-K	7,250	71%	Survivability would not change the primary choke stock or delay the choke point compared to baseline scenario B3.
Combined Scenarios	4A	Combination of Scenarios 1A, 2 and 3	No choke	-	100%	The combination of all policy lever scenarios under scenario 4A would remove all potential choke stocks for this fleet in Area VII.
	4B	Combination of Scenarios 1B, 2 and 3	No choke	-	100%	The combination of all policy lever scenarios under scenario 4B would remove all potential choke stocks for this fleet in Area VII.
	4C	Combination of Scenarios 1C, 2 and 3	Whiting 7B-K	7,750	76%	The choke point occurs under scenario 4C occurs earlier than under 1C, this is an effect of how the benefit of the combined scenarios is allocated across sea areas. A higher proportion of the benefits under scenario 4C is allocated in the model to Area IV at the expense of Area VII.

Table 5-6: England and Wales Beam Trawl Fleet: Primary Choke Stock and Choke Point under each Scenario in Area VII in 2019

5.4. SUMMARY OF THE CHOKE POINT BY SEA AREA IN 2019 COMPARED TO DAYS AT SEA IN 2013

Figure 5-2 provides a summary of the impact of the landing obligation in 2019 under the baseline scenarios (B1-B3), the single policy lever scenarios (1A-3) and the combined policy lever scenarios (4A-4C). The summary reflects the choke points shown in the previous tables for Area IV and Area VII in 2019. Observations on Figure 5-2 include:

- In Area IV the baseline scenarios all indicate how significant the impact of the landing obligation could be for the England beam trawl fleet segment in 2019.
- The impact of the landing obligation would be less significant in Area VII in 2019. Under the baseline scenarios in 2019, which reflect the introduction of the landing obligation for all demersal quota stocks without the application of policy levers, the vessels in the fleet segment could operate at just over 70% of the days at sea in 2013. Of the six fleet segments analysed, the beam trawl fleet in Area VII experiences the least impact from the landing obligation in 2019.
- Under combined policy lever scenario 4A the fleet segment could continue to fish for the maximum number of days allowed in the model (equal to days at sea in 2013) in both Area IV and Area VII.

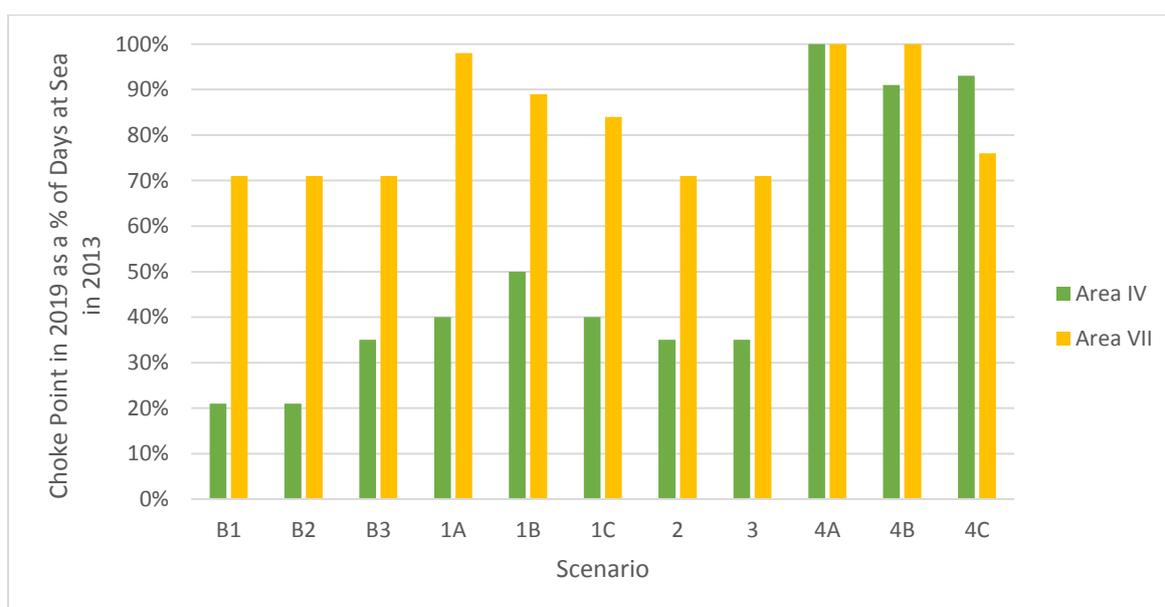


Figure 5-2: England beam trawl fleet - Impact of each scenario on the effort of the fleet (days at sea) in 2019, shown as a percentage of actual effort in 2013

5.5. TOP FIVE CHOKE STOCKS AND THEIR CHOKE POINT UNDER THE COMBINED POLICY LEVER SCENARIOS

Table 5-7 contains information on the top five choke stocks in the North Sea (Area IV) and Area VII for the England beam trawl fleet segment.

The scenario analysis and the choke analysis (reported in Interim Report One) are dependent on the quantitative information available on the catching activity of different fleet segments in different sea areas. The quantitative information used in the scenario analysis is the best available. However, estimates of discard volumes, and therefore estimates of total catch, are

determined from a sample of vessels and whilst the estimate can reasonably be expected to be representative, there is nevertheless a risk that discard estimates may not be accurate. The relative impact of policy levers may be different if discard rates are materially different from those used in modelling.

The purpose of the top five choke analysis presented in Table 5-7 is to identify what other stocks might create a choke problem for the Scotland whitefish trawl/seine fleet segment, and when:

- if the identified primary choke stock turns out not to be the primary choke stock because reality varies from the recorded information available;
- if the fleet can avoid the primary choke stock; or
- if another way is found to address the primary choke stock.

Table 5-7 presents the top five choke stocks under baseline scenario B3 and the three combined policy lever scenarios. Area VI is shown in the Table but the England beam fleet was not active in Area VI in 2013.

Scenario	Area IV (North Sea) 2013 days at sea = 2,278 days				Area VI (West of Scotland) 2013 days at sea = 1 day				Area VII 2013 days at sea = 10,259 days			
	2016		2019		2016		2019		2016		2019	
	Choke Stock	Choke Point (days)	Choke Stock	Choke Point (days)	Choke Stock	Choke Point (days)	Choke Stock	Choke Point (days)	Choke Stock	Choke Point (days)	Choke Stock	Choke Point (days)
Baseline scenario B3	Plaice	1,235	Whiting	789	-		-		Plaice FG	8,001	Whiting 7B-K	7,250
	sole	1,716	Plaice	1,178					Plaice 7HJK	8,001	Nephrops	7,775
			Dabs	1,315					Plaice 7DE	8,621	Plaice FG	8,001
			Saithe	1,388					Sole ECh	10,232	Plaice 7HJK	8,001
			Skate	1,663					Sole 7HJK	10,234	Plaice 7DE	8,621
Combined policy lever scenario 4A	No choke	-	No choke	-					No choke	-	No choke	-
Combined policy lever scenario 4B	No choke	-	No choke	-					No choke	-	No choke	-
Combined policy lever scenario 4C	No choke	-	Whiting	2,117					No choke	-	Whiting 7B-K	7,750
			Saithe	2,118							Nephrops	9,094
			Hake	2,121							Pollack	10,222
			Ling	2,121							-	
			Cod	2,237								

Table 5-7: England beam trawl fleet segment – top five choke stocks in Area IV and Area VII in 2016 and 2019 under baseline scenario B3 and all three combined policy lever scenarios

6. NORTHERN IRELAND NEPHROPS TRAWL SCENARIO ANALYSIS

The over 10m Northern Ireland nephrops trawl fleet segment consisted of 99 vessels in 2013 mostly fishing in Area VII (10,659 days, 77% of total days), and Area VI, West of Scotland (2,338 days, 17% of total days). There was some activity in Area IV, North Sea (767 days, 6% of total days).

The scenario analysis presented in this report incorporates PO fleet segments with five or more vessels. The vessels not included may be either non-sector or belong to POs with fewer than five vessels in the segment analysed.

The producer organisations which have vessels included in the scenario analysis for the Northern Ireland nephrops trawl fleet segment are:

- Anglo-North Irish Fishermen's Producer Organisation (ANIFPO); and
- Northern Ireland Fishermen's Producer Organisation (NIFPO).

The findings for both of the nephrops trawl PO fleet segment are aggregated to provide an overall analysis of the relative impact of different scenarios on the activity and performance of the Northern Ireland nephrops trawl fleet segment. It is the aggregated analysis that is presented in this chapter.

The analysis does not consider what positive impact could be achieved from fleet-based responses that could help the fleet to avoid choke stocks. The extent to which technological, strategic or operational changes can be implemented to avoid choke stocks and reduce the impact of the landing obligation is not known and cannot be reasonably estimated across the whole of the UK fleet at this time.

The findings of the scenario analysis for the Northern Ireland nephrops trawl fleet segment are presented in two halves in chapter 5.4:

- Sections 6.1 and 6.2 report on the impact of the eleven scenarios on the performance of the Northern Ireland nephrops trawl fleet segment as a whole⁷. The focus of the analysis is on the impact of all scenarios on the revenue of the fleet segment. However, the impact of the three combined scenarios on landings, effort, operating profit and number of vessels is also reported.
- The second half of the chapter, Sections 6.3 to 6.5, reports on the impact of the scenarios in the different sea areas where the Northern Ireland nephrops trawl fleet is active. The analysis provides explanations for why the scenarios have the impact that is reported in the first half of the Chapter.

⁷ It is advisable to have read chapter 2 before reviewing the results in the remainder of this Chapter.

If choke stocks exist in a sea area for the Northern Ireland nephrops trawl fleet, it is the primary choke stock, the stock which the fleet segment runs out of quota for first, that will limit the activity of the fleet. The primary choke stock and the number of days fishing that is possible until the choke occurs – the choke point – can be affected by the design of each scenario. The analysis in the second half of the chapter explores how the scenarios impact upon the primary choke stock and choke point for the segment as a whole.

Once the quota of a stock has been fully used by a PO fleet segment the analysis assumes that fishing by that PO fleet segment in the sea area affected will stop. Because the analysis for the Northern Ireland nephrops trawl fleet is an aggregated calculation of the impacts on two PO fleet segments it is possible that each PO fleet segment will be affected by different choke stocks and in different time frames, due to the different quota holdings in each PO.

6.1. IMPACT OF EACH SCENARIO ON THE REVENUE OF THE NORTHERN IRELAND NEPHROPS FLEET

An overview of the impact of all 11 scenarios on the revenue of the fleet segment is presented in Figure 6-1. The estimated revenue that could be achieved by the fleet segment under each scenario is presented as a percentage of the revenue achieved by the fleet segment in 2013. This allows comparison of the potential impact of the landing obligation in 2016 and 2019 to actual total segment revenue in 2013. Revenue in 2013 is represented by a horizontal blue line in Figure 6-1.

The estimated revenue includes landings of quota species, non-quota species and other earnings expected by the fleet. Revenue estimates also assume that the average price achieved per species in 2013 will be the average price achieved in each year analysed.

6.1.1. IMPACT OF BASELINE SCENARIOS ON REVENUE

The baseline scenarios represent the introduction of the landing obligation without the potential benefits of de minimis, interspecies flexibility and survivability. They are therefore considered to be worst-case scenarios. Table 6-1 shows the percentages used in Figure 6-1.

- Baseline scenario B1 does not provide a catch allowance for zero-TAC stocks and does not incorporate quota uplift. This is the worst-case scenario in the analysis. It is estimated that under baseline scenario B1 fleet revenue for the Northern Ireland nephrops trawl fleet would be 100% of 2013 revenue in 2016 and 7% of 2013 revenue in 2019.
- Baseline scenario B2 estimates fleet segment revenue would be 100% of 2013 revenue in 2016 and 8% of 2013 revenue in 2019. In 2019 the inclusion of a 1.5% catch allowance for zero-TAC stocks would increase revenue by 1 percentage points to 8% of 2013 revenue, compared to the worst-case scenario of B1.
- Baseline scenario B3 incorporates the catch allowance included in baseline scenario B2 plus quota uplift for eligible stocks. In 2016 this improves the revenue of the fleet by a further 11 percentage points to 111% of 2013 revenues. However, in 2019 there would be no benefit from uplift and therefore the revenue for the fleet under scenarios B2 and B3 is the same (Figure 6-1 and Table 6-1).

6.1.2. IMPACT OF SINGLE AND COMBINED POLICY LEVER SCENARIOS ON REVENUE

Each policy lever scenario is applied to baseline scenario B3. This means that the policy levers of de minimis, interspecies flexibility and survivability are applied to a baseline that already incorporates:

- a catch allowance for zero-TAC stocks; and
- quota uplift for stocks deemed eligible for an uplift.

The impacts of the single and combined policy lever scenarios on the revenue of the fleet segment are indicated in Figure 6-1 and detailed in Table 6-1.

The impact of each policy lever should be judged by comparing it to the percentage shown for baseline scenario B3.

Observations on the impact of the single and combined policy levers are:

- In 2016, once quota uplift is applied to nephrops (baseline scenario B3) the revenue of the fleet would be expected to exceed revenue earned in 2013 under all policy lever scenarios. This would occur because there would be no choke stock and the allocation of quota uplift to the fleet means that the fleet segment could land and sell fish that might previously have been discarded due to being over quota.
- In 2016, the policy levers are not required as under baseline scenario B3 there are no choke stocks identified in any sea area for the Northern Ireland nephrops trawl fleet.
- In all scenarios revenue would be substantially lower in 2019 than in 2016. This is because all demersal quota stocks become subject to the landing obligation and stocks which might previously have been considered an unwanted bycatch, and for which the fleet segment holds limited quota, would have to be landed in 2019 and counted against quota. For the Northern Ireland nephrops trawl fleet segment this would create a choke on fleet activity much earlier than in the transitional phase of the landing obligation.
- In 2019, the biggest improvement on baseline scenario B3 for a single policy lever would be under de minimis LAX (scenario 1A) as the revenue of the fleet would be 28% of 2013 revenue levels. This scenario would generate an improvement on baseline scenario B3 of 20 percentage points in 2019. However, de minimis LAX is simply a percentage of the total catch of the PO fleet segment and is not stock specific.
- In 2019, the two stock specific de minimis scenarios provide a small benefit. De minimis MID, where the 5% is taken as a percentage of EU TAC, provides some benefit and creates an improvement of 4 percentage points on baseline scenario B3. Under de minimis STRICT where the 5% is taken as a percentage of UK TAC the improvement on baseline scenario B3 would be only one percentage point which would lead to revenue for the fleet equal to 9% of total revenue in 2013.
- In 2019, interspecies flexibility (scenario 2) would have no benefit for the fleet segment.
- In 2019, survivability (scenario 3) would have a small benefit and revenue would increase to 9% of 2013 levels, an increase of one percentage point compared to baseline scenario B3.
- The combined scenarios can enable the policy levers to work together to lessen the impact of choke stocks and delay the choke point. The synergistic effect of the policy

levers can result in revenue estimates higher than the value of any single policy lever and this is evident in the Northern Ireland nephrops fleet segment.

- In 2019, the benefit of combining the policy lever scenarios for this fleet segment would be better than the impact of the policy levers in isolation. Scenario 4A which incorporates the most favourable single policy lever of de minimis LAX (1A) results in revenues of 39% of 2013 levels. This would be an increase of 31 percentage points on baseline scenario B3.
- In 2019, the combined scenarios which incorporate the stock specific de minimis scenarios (4B and 4C) support revenues of 15% and 14% of 2013 levels respectively.

The benefit of policy levers, even under the most generous interpretation of de minimis, provide limited mitigation once the transition period is over. The findings show that the policy levers tested in the scenario analysis do have some benefit for the fleet but they also show that there is a clear need for fleet-based solutions in the Northern Ireland nephrops trawl fleet to address the challenge of the landing obligation.

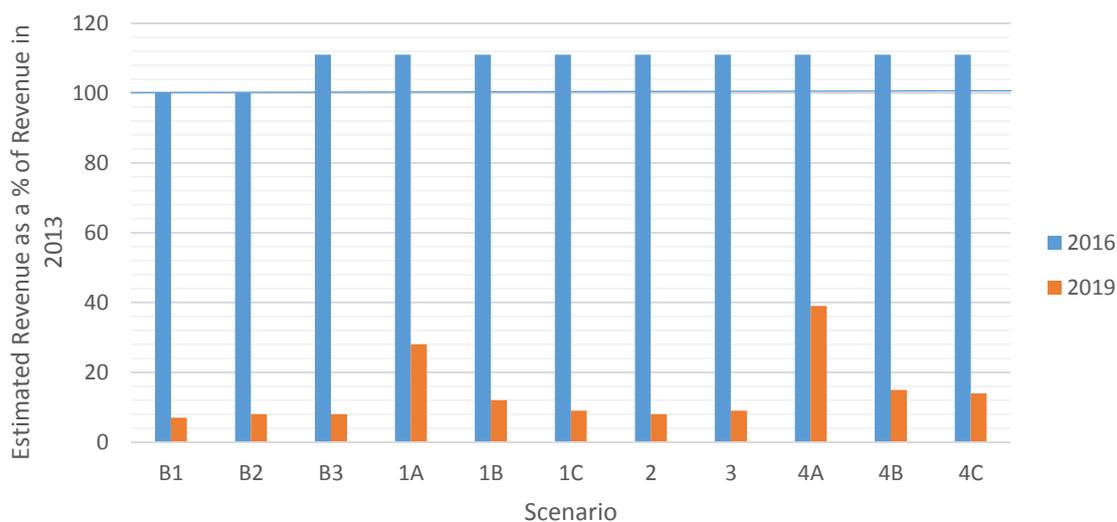


Figure 6-1: Northern Ireland Nephrops Trawl Fleet Revenue in 2016 and 2019 under each scenario as a percentage of actual revenue in 2013

	Scenario Label	Scenario Description	Estimated revenue in 2016 as a % of revenue in 2013	Estimated revenue in 2019 as a % of revenue in 2013
Baseline Scenarios	B1	Implementation of landing obligation with only transitional rules in place	100	7
	B2	B1 plus a catch allowance for zero-TAC stocks	100	8
	B3	B2 plus quota uplift, where applicable	111	8
Policy Lever Scenarios	1A	De Minimis Lax (5% of PO segment catch)	111	28
	1B	De Minimis Mid (5% of EU TAC)	111	12
	1C	De Minimis Strict (5% of UK TAC)	111	9
	2	Interspecies flexibility (for stocks considered to be within safe biological limits)	111	8
	3	Survivability (majority of flatfish stocks)	111	9
Combined Scenarios	4A	Combination of Scenarios 1A, 2 and 3	111	39
	4B	Combination of Scenarios 1B, 2 and 3	111	15
	4C	Combination of Scenarios 1C, 2 and 3	111	14

Table 6-1: Estimated revenue for the Northern Ireland Nephrops Trawl fleet segment under each scenario as a % of revenue in 2013

6.2. THE IMPACT OF COMBINED POLICY LEVER SCENARIOS ON OTHER PERFORMANCE MEASURES

In Table 6-2, alongside the impact on revenue, the estimated impact of the combined scenarios on the following measures of fleet activity and performance is also shown:

- Landings (tonnes);
- Effort (fishing days);
- Operating Profit (revenue minus operating costs, before deducting cost of capital); and
- Number of vessels. The number of vessels that can operate successfully under each scenario in each year is difficult to measure as the definition of 'operating successfully' will vary from vessel owner to vessel owner. The analysis has assumed that under the benefits created by the combined policy levers the number of vessels that can operate will, at a minimum be, the number of vessels that can continue to maintain the average number of fishing days per vessel in 2013.

The revenue under each scenario in Table 6-2, is the same as the revenue presented in Table 6-1. The figures in brackets represent the finding as a percentage of activity in 2013.

Observations on the impact of the combined policy lever scenarios on activity and business performance are:

- In 2016, the landed volume under baseline scenario B3 and all three combined scenarios would be above 2013 volumes. This is a result of quota uplift for nephrops.
- In 2019 a more dramatic impact could be experienced by the fleet and landings reflect a similar pattern to revenue. The combined scenarios 4B and 4C would support landings of 14% and 13% of 2013 landings respectively which would represent an increase of 6 percentage points and 5 percentage points on baseline scenario B3 in 2019. Scenario 4A would be the most favourable with landings of 3,680 tonnes estimated, which would represent 39% of the landings made by the fleet in 2013 and an improvement of 31 percentage points on baseline scenario B3.
- In 2019 the effort (fishing days) under all three combined scenarios would be substantially less than the effort used by the fleet segment in 2013. The best scenario in 2019 (4A) suggests the fleet can fish for 29% of the days used in 2013 and the other two combined scenarios (4B and 4C) suggest that the fleet can fish for 9% of the days used in 2013. Combined scenarios 4B and 4C offer limited benefit over the baseline position, prior to the application of any policy lever scenarios.
- Operating profits are not expected in 2019 under scenarios 4B and 4C (Table 6-2).
- If each vessel in the fleet segment was to be at sea for the average number of days each vessel in the fleet was at sea in 2013, this would suggest that under the three combined policy lever scenarios the fleet could reduce from 112 vessels to between 10 and 34 vessels.

The substantial impact that the analysis suggests would occur in 2019 indicates that under each scenario a choke stock would halt fishing activity at an early stage in the year in both main sea areas where the Northern Ireland nephrops trawl fleet operates. There is no doubt that under the assumptions and definitions used in the scenario analysis the landing obligation has the

potential to have a substantial impact; and the proposed policy levers offer little mitigation. The reality is that where limited quota is held for frequently caught stocks, there is little that any policy lever can do to lessen the challenges of the landing obligation. Therefore, the solutions for this fleet segment must be found elsewhere.

It should be noted that the analysis in Area VII is undertaken in a way that treats Area VII as a single area.

	Year	Baseline B3	Combined policy lever scenarios (percent of 2013 figures)		
			4a	4b	4c
Revenue (£'000s) (2013=£21,403)	2016	23,668 (111%)	23,668 (111%)	23,668 (111%)	23,668 (111%)
	2019	1,777 (8%)	8,240 (39%)	3,219 (15%)	3,065 (14%)
Landings (t) (2013=9,509)	2016	10,634 (112%)	10,634 (112%)	10,634 (112%)	10,634 (112%)
	2019	750 (8%)	3,680 (39%)	1,312 (14%)	1,239 (13%)
Effort (days) (2013=15,657 days)	2016	15,657 (100%)	15,657 (100%)	15,657 (100%)	15,657 (100%)
	2019	783 (5%)	4,506 (29%)	1,443 (9%)	1,343 (9%)
Operating Profit (£'000s) (2013=£3,831)	2016	5,504	5,504	5,504	5,504
	2019	-2,369	-308	-1,168	-1,725
Number of Vessels (same effort as 2013) (2013=112 vessels)	2016	112 (100%)	112 (100%)	112 (100%)	112 (100%)
	2019	7 (6%)	34 (30%)	11 (10%)	10 (9%)

Table 6-2: Summary of Impact of Baseline Scenario B3 and Combined Policy Lever Scenarios on Performance Measures of the Northern Ireland nephrops trawl fleet segment in 2016 and 2019.

Note: The number in brackets is the finding as a percentage of performance in 2013, which is shown in brackets in the first column

The model produced a substantial volume of detailed findings in addition to those presented in the activity and performance analysis above. We draw on these findings in the second part of the Chapter to further explain why the scenarios have the impact that they do for the Northern Ireland nephrops trawl fleet segment.

6.3. CHOKE STOCK AND CHOKE POINT BY SEA AREA UNDER EACH SCENARIO

The following analysis explains why the policy levers might only have limited benefit for this fleet segment.

The impact of the landing obligation is driven by the extent to which the fleet can continue to fish in each sea area, and this is determined by the presence, or not, of a choke stock. The potential benefit of each scenario is entirely dependent on the extent to which a policy lever can impact upon the primary choke stock. However, the primary choke stock will vary by sea area, and can be expected to vary between different POs.

The analysis which follows finds the stock which provides the fewest fishing days to the combined Northern Ireland nephrops trawl fleet as a whole. An individual PO may have a different primary choke stock to the segment as a whole. Thus, the sum of fishing days for the segment primary choke stock may be different from the sum of days until each individual PO would choke on its own primary choke stock. (n.b. The performance and activity analysis in the first half of this chapter is based on the sum of days until each PO reaches its own individual choke point.)

The following tables contain the primary choke stock and estimated choke point for the Northern Ireland nephrops trawl fleet under each of the eleven scenarios in:

- West of Scotland (Area VI) in 2016 (Table 6-3);
- West of Scotland (Area VI) in 2019 (Table 6-4);
- Area VII in 2016 (Table 6-5); and
- Area VII in 2019 (Table 6-6).

Commentary on the impact of each scenario is included in each table. Area IV is not included due to the relatively small proportion of fleet activity (6% of total days) that occurred in Area IV in 2013.

Northern Ireland Nephrops Trawl Fleet 2013 days at sea in Area VI (West of Scotland) = 3,233 days						
	Scenario Label	Description	Primary Choke Stock(s) in 2016	Days until choke point in Area VI	Days until choke point as % of 2013 days	Comment
Baseline Scenarios	B1	Implementation of landing obligation with only transitional rules in place	No choke	-	-	Baseline scenario B1 is the worst-case scenario. However in 2016 there would be no choke and the fleet could continue to fish at 2013 effort levels.
	B2	B1 plus a catch allowance for zero-TAC stocks	No choke	-	-	Catch allowance would not be required in 2016 in Area VI as there is no choke.
	B3	B2 plus quota uplift, where applicable	No choke	-	-	Quota uplift would apply to nephrops in Area VI. Therefore under baseline scenario B3, once quota uplift is applied to the TAC for nephrops, more nephrops can be landed but effort is restricted to 2013 levels in the model.
Policy Lever Scenarios	1A	De Minimis Lax (5% of PO segment catch)				The Northern Ireland nephrops trawl fleet would have no requirement for any policy levers in Area VI (West of Scotland) in 2016 as no choke stocks have been identified under baseline scenario B3.
	1B	De Minimis Mid (5% of EU TAC)				
	1C	De Minimis Strict (5% of UK TAC)				
	2	Interspecies flexibility (for stocks considered to be within safe biological limits)				
	3	Survivability (majority of flatfish stocks)				
Combined Scenarios	4A	Combination of Scenarios 1A, 2 and 3				The Northern Ireland nephrops trawl fleet would have no requirement for combined policy levers in Area VI (West of Scotland) in 2016 as no choke stocks have been identified under baseline scenario B3.
	4B	Combination of Scenarios 1B, 2 and 3				
	4C	Combination of Scenarios 1C, 2 and 3				

Table 6-3: Northern Ireland Nephrops Trawl Fleet: Primary Choke Stock and Choke Point under each Scenario in Area VI (West of Scotland) in 2016

Northern Ireland Nephrops Trawl Fleet 2013 days at sea in Area VI (West of Scotland) = 3,233 days						
	Scenario Label	Description	Primary Choke Stock(s) in 2019	Days until choke point in Area VI	Days until choke point as % of 2013 days	Comment
Baseline Scenarios	B1	Implementation of landing obligation with only transitional rules in place	Cod 6A	0	0%	Baseline scenario B1 is the worst-case scenario.
	B2	B1 plus a catch allowance for zero-TAC stocks	Plaice, ling, sole and pollock	162	5%	The catch allowance means that whiting would no longer be the primary choke stock. With whiting removed there are four stocks that would create a choke at the same time but in a slightly longer timeframe.
	B3	B2 plus quota uplift, where applicable	Plaice, ling, sole and pollock	162	5%	Quota uplift would have no effect on the primary choke stocks identified in Area VI (West of Scotland) as none are considered to be eligible for uplift.
Policy Lever Scenarios	1A	De Minimis Lax (5% of PO segment catch)	Plaice, ling, sole, pollock and hake	662	20%	De minimis LAX would not change the primary choke stocks but would delay the choke point substantially, compared to scenario B3. Hake would also become a primary choke stock under 1A.
	1B	De Minimis Mid (5% of EU TAC)	Plaice, ling, sole and pollock	162	5%	De minimis MID would have no effect on the primary choke stocks or the choke point identified under baseline scenario B3.
	1C	De Minimis Strict (5% of UK TAC)	Plaice, ling, sole and pollock	162	5%	De minimis STRICT would have no effect on the primary choke stocks or the choke point identified under baseline scenario B3.
	2	Interspecies flexibility (for stocks considered to be within safe biological limits)	Plaice, ling, sole and pollock	162	5%	Interspecies flexibility would have no effect in Area VI as none of the primary choke stocks identified under baseline scenario B3 are considered to be within safe biological limits.
	3	Survivability (majority of flatfish stocks)	Ling and pollock	162	5%	Survivability would remove plaice and sole as potential choke stocks but there would be no impact on ling or pollock therefore the choke point identified under scenario B3 would be unchanged.
Combined Scenarios	4A	Combination of Scenarios 1A, 2 and 3	Ling and pollock	662	20%	Survivability would remove plaice and sole as potential choke stocks and this enables de minimis LAX to be more effective on other choke stocks and the choke point would be substantially delayed, compared to scenario B3.
	4B	Combination of Scenarios 1B, 2 and 3	Ling and pollock	162	5%	Under survivability plaice and sole would be removed as potential choke stocks, however none of the stock specific policy levers (1B, 2 or 3) would have any effect on ling or pollock and therefore scenario 4B would have no effect on the choke point identified under baseline scenario B3.
	4C	Combination of Scenarios 1C, 2 and 3	Ling and pollock	162	5%	Under survivability plaice and sole would be removed as potential choke stocks, however none of the stock specific policy levers (1C, 2 or 3) have any effect on ling or pollock and therefore scenario 4C would have no effect on the choke point identified under baseline scenario B3.

Table 6-4: Northern Ireland Nephrops Trawl Fleet: Primary Choke Stock and Choke Point under each Scenario in Area VI (West of Scotland) in 2019

Northern Ireland Nephrops Trawl Fleet days at sea in Area VII in 2013 = 11,046 days						
	Scenario Label	Description	Primary Choke Stock(s) in 2016	Days until choke point in Area VII	Days until choke point as % of 2013 days	Comment
Baseline Scenarios	B1	Implementation of landing obligation with only transitional rules in place	Nephrops	9,499	86%	Baseline scenario B1 is the worst-case scenario.
	B2	B1 plus a catch allowance for zero-TAC stocks	Nephrops	9,499	86%	There are no zero-TAC stocks in Area VII.
	B3	B2 plus quota uplift, where applicable	No choke	-	-	Quota uplift would remove nephrops as a potential choke stock for the Northern Ireland nephrops trawl fleet in Area VII in 2016.
Policy Lever Scenarios	1A	De Minimis Lax (5% of PO segment catch)				The Northern Ireland nephrops trawl fleet would have no requirement for any policy levers in Area VII in 2016 as no choke stocks have been identified under baseline scenario B3.
	1B	De Minimis Mid (5% of EU TAC)				
	1C	De Minimis Strict (5% of UK TAC)				
	2	Interspecies flexibility (for stocks considered to be within safe biological limits)				
	3	Survivability (majority of flatfish stocks)				
Combined Scenarios	4A	Combination of Scenarios 1A, 2 and 3				The Northern Ireland nephrops trawl fleet would have no requirement for combined policy levers in Area VII in 2016 as no choke stocks have been identified under baseline scenario B3.
	4B	Combination of Scenarios 1B, 2 and 3				
	4C	Combination of Scenarios 1C, 2 and 3				

Table 6-5: Northern Ireland Nephrops Trawl Fleet: Primary Choke Stock and Choke Point under each Scenario in Area VII in 2016

Northern Ireland Nephrops Trawl Fleet days at sea in Area VII in 2013= 11,046 days						
	Scenario Label	Description	Primary Choke Stock(s) in 2019	Days until choke point in Area VII	Days until choke point as % of 2013 days	Comment
Baseline Scenarios	B1	Implementation of landing obligation with only transitional rules in place	Whiting 7A	552	5%	Baseline scenario B1 is the worst-case scenario.
	B2	B1 plus a catch allowance for zero-TAC stocks	whiting 7A	552	5%	There are no zero-TAC stocks in Area VII.
	B3	B2 plus quota uplift, where applicable	Whiting 7A	552	5%	Quota uplift would remove whiting 7B-K as a primary choke stock but would have no effect on the choke point as whiting 7A remains as a primary choke stock.
Policy Lever Scenarios	1A	De Minimis Lax (5% of PO segment catch)	Whiting 7B-K and whiting 7A	1,952	18%	De minimis LAX would delay the choke point substantially, compared to scenario B3. Whiting 7A would remain a primary choke stock and whiting 7B-K would also become a primary choke stock under scenario 1A.
	1B	De Minimis Mid (5% of EU TAC)	Whiting 7A	652	6%	De minimis MID would not change the primary choke stock but would delay the choke point, compared to scenario B3.
	1C	De Minimis Strict (5% of UK TAC)	Whiting 7A	552	5%	De minimis STRICT would not change the primary choke stock or delay the choke point, compared to scenario B3.
	2	Interspecies flexibility (for stocks considered to be within safe biological limits)	Whiting 7A	552	5%	Interspecies flexibility would not change the primary choke stock or delay the choke point, compared to scenario B3.
	3	Survivability (majority of flatfish stocks)	Whiting 7A	552	5%	Survivability would have no effect on the choke stock or choke point identified under scenario B3.
Combined Scenarios	4A	Combination of Scenarios 1A, 2 and 3	Whiting 7A	2,752	25%	The combination of de minimis LAX, interspecies flexibility and survivability work together to delay the choke point. This occurs because de minimis LAX is not stock specific and therefore in this scenario its benefit can be focused on whiting 7A as a choke stock and interspecies flexibility can be used for other potential choke stocks such as whiting 7B-K, cod 7A and haddock 7A (see top 5 choke analysis in Section 6.6).
	4B	Combination of Scenarios 1B, 2 and 3	Whiting 7A	652	6%	The combination of de minimis MID, interspecies flexibility and survivability work together to somewhat delay the choke point compared to scenario B3.
	4C	Combination of Scenarios 1C, 2 and 3	Whiting 7A	552	5%	The combination of de minimis STRICT, interspecies flexibility and survivability would have no effect on the choke stock or choke point compared to scenario B3.

Table 6-6: Northern Ireland Nephrops Trawl: Primary Choke Stock and Choke Point under each Scenario in Area VII in 2019

6.4. SUMMARY OF THE CHOKE POINT BY SEA AREA UNDER EACH SCENARIO IN 2019

Figure 6-2 provides a summary of the impact of the landing obligation in 2019 under the baseline scenarios (B1-B3), the single policy lever scenarios (1A-3) and the combined policy lever scenarios (4A-4C). The summary reflects the choke points shown in the previous tables for Area VI and Area VII in 2019. Observations on Figure 6-2 include:

- The baseline scenarios all indicate how significant the impact of the landing obligation could be for the Northern Ireland nephrops fleet segment in 2019 in both Area VI and Area VII.
- The single policy levers have a limited impact compared to baseline scenario B3. Even de minimis LAX, which tends to offer substantial improvement for other fleet segments, has limited impact.
- The combined policy lever scenarios have limited effect in Area VI and Area VII,.

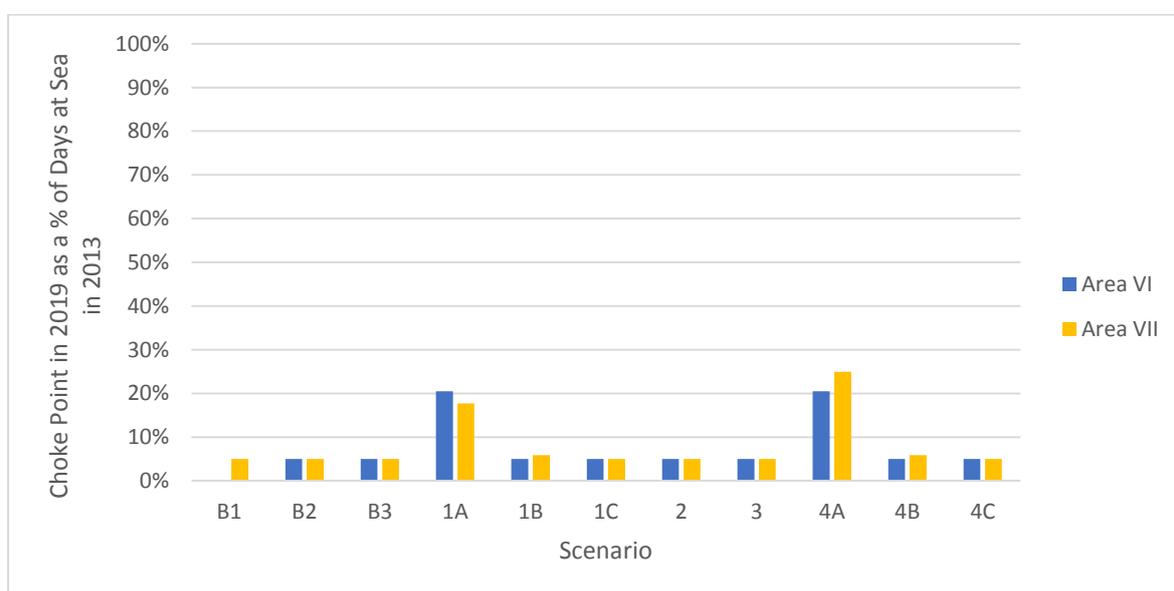


Figure 6-2: Northern Ireland nephrops trawl fleet - Impact of each scenario on the effort of the fleet (days at sea) in 2019, shown as a percentage of actual effort in 2013

6.5. TOP FIVE CHOKE STOCKS AND THEIR CHOKE POINT UNDER THE COMBINED POLICY LEVER SCENARIOS

The scenario analysis and the choke analysis (reported in Interim Report One) are dependent on the quantitative information available on the catching activity of different fleet segments in different sea areas. The quantitative information used in the scenario analysis is the best available. However, estimates of discard volumes, and therefore estimates of total catch, are determined from a sample of vessels and whilst the estimate can reasonably be expected to be representative, there is nevertheless a risk that discard estimates may not be accurate. The relative impact of policy levers may be different if discard rates are materially different from those used in modelling.

The purpose of the top five choke analysis presented in Table 6-7 is to identify what other stocks might create a choke problem for the Northern Ireland nephrops trawl fleet segment:

- if the identified primary choke stock turns out not to be the primary choke stock because reality varies from the recorded information available;

- if the fleet can avoid the primary choke stock; or
- if another way is found to address the primary choke stock.

Table 6-7 presents the top five choke stocks under baseline scenario B3 and the three combined policy lever scenarios. Area IV (North Sea) is included for the first time in the analysis for completeness but activity in this area was very limited in 2013. However, the table shows that under the scenarios activity levels in Area IV could be very similar to Area VI without alternative solutions to the challenges created by the landing obligation.

Scenario	Area IV (North Sea) 2013 days at sea = 1,379 days				Area VI (West of Scotland) 2013 days at sea = 3,233 days				Area VII 2013 days at sea = 11,046 days			
	2016		2019		2016		2019		2016		2019	
	Choke Stock	Choke Point (days)	Choke Stock	Choke Point (days)	Choke Stock	Choke Point (days)	Choke Stock	Choke Point (days)	Choke Stock	Choke Point (days)	Choke Stock	Choke Point (days)
Baseline scenario B3	No choke	-	Skate	69	No choke	-	Plaice	162	Nephrops	9,499	Whiting 7a	552
			Hake	92			Ling	162	-	-	Plaice 7A	1,105
			Dabs	311			Sole	162			Plaice fg	1,658
			Turbot	485			Pollack	162			Cod 7A	3,756
			Cod	505			Hake	219			Haddock 7A	3,756
Combined policy lever scenario 4A			Ling	1,092			Ling	662	Nephrops	10,499	Whiting 7A	2,752
			Hake	1,092			Pollack	662	-	-	Cod 7A	4,228
			Cod	1,092			Hake	901			Haddock 7A	4,855
			Whiting	1,092			Megrim	1304			Whiting 7B-K	5,082
			Saithe	1,130			Saithe	2,339			Anglerfish	10,604
Combined policy lever scenario 4B			Cod	629			Ling	162	Nephrops	10,899	Whiting 7A	652
			Ling	728			Pollack	162	-	-	Cod 7A	3,756
			Whiting	927			Hake	219			Haddock 7A	4,639
			Saithe	1,030			Saithe	1,154			Whiting 7B-K	4,958
			Hake	1,041			Megrim	1,304			Anglerfish	10,604
Combined policy lever scenario 4C			Cod	629			Ling	162	Nephrops	10,199	Whiting 7A	552
			Ling	728			Pollack	162	-	-	Cod 7A	3,756
			Whiting	927			Hake	219			Haddock 7A	4,639
			Saithe	954			Saithe	1,154			Whiting 7B-K	4,958
			Hake	1,041			Megrim	1,304			Anglerfish	10,604

Table 6-7: Northern Ireland nephrops trawl fleet segment – top five choke stocks in Area IV, Area VI and Area VII in 2016 and 2019 under baseline scenario B3 and all three combined policy lever scenario

7. SCOTLAND WHITEFISH TRAWL AND SEINE SCENARIO ANALYSIS

The over 10m Scotland whitefish trawl/seine fleet segment consisted of 121 vessels in 2013 mostly fishing in Area IV, North Sea (16,797 days, 79% of total days), and Area VI, West of Scotland (3,231 days, 15% of total days)⁸. There was limited fishing by the fleet in Area VII (1,127, 5% of total days).

The scenario analysis presented in this report incorporates PO fleet segments with five or more vessels. The vessels not included may be either non-sector or belong to POs with fewer than five vessels in the segment analysed. The PO fleet segments included in the scenario analysis represent 103 vessels or 85% of the national fleet that was included in the choke analysis.

The producer organisations which have vessels included in the scenario analysis for the Scotland whitefish trawl and seine fleet segment are:

- Aberdeen Fish Producers' Organisation (AFPO);
- North East of Scotland Fishermen's Organisation (NESFO);
- Shetland Fish Producers' Organisation (SFPO); and
- Scottish Fishermen's Organisation (SFO).

The findings for each whitefish trawl/seine PO fleet segment are aggregated to provide an overall analysis of the relative impact of different scenarios on the activity and performance of the Scotland whitefish trawl/seine fleet segment. It is the aggregated analysis that is presented in this chapter.

The analysis does not consider what positive impact could be achieved from fleet-based responses that could help the fleet to avoid choke stocks. The extent to which technological, strategic or operational changes can be implemented to avoid choke stocks and reduce the impact of the landing obligation is not known and cannot be reasonably estimated across the whole of the UK fleet at this time.

The findings of the scenario analysis for the Scotland whitefish trawl/seine fleet segment are presented in two halves in chapter 7:

- Sections 0 and 7.2 report on the impact of the eleven scenarios on the performance of the Scotland whitefish trawl/seine fleet segment as a whole⁹. The focus of the analysis is on the impact of all scenarios on the revenue of the fleet segment. However, the impact of the three combined scenarios on landings, effort, operating profit and number of vessels is also reported.
- The second half of the chapter, Sections 7.3 to 7.5, reports on the impact of the scenarios in the different sea areas where the Scotland whitefish trawl/seine fleet is active. The analysis provides explanations for why the scenarios have the impact that is reported in the first half of the Chapter.

If choke stocks exist in a sea area for the Scotland whitefish trawl/seine fleet, it is the primary choke stock, the stock which the fleet segment runs out of quota for first, that will limit the activity of the fleet. The primary choke stock and the number of days fishing that is possible until

⁸ Source: Landing Obligation Economic Impact Assessment Interim Report One: Choke Analysis

⁹ It is advisable to have read chapter 2 before reviewing the results in the remainder of this Chapter.

the choke occurs – the choke point – can be affected by the design of each scenario. The analysis in the second half of the chapter explores how the scenarios impact upon the primary choke stock and choke point for the segment as a whole.

Once the quota of a stock has been fully used by a PO fleet segment the analysis assumes that fishing by that PO fleet segment in the sea area affected will stop. Because the analysis for the Scotland whitefish trawl/Seine fleet is an aggregated calculation of the impacts on PO fleet segments it is possible that different PO fleet segments will be affected by different choke stocks and in different time frames.

The analysis presented is developed from information on end of year landings and therefore incorporates the benefits of in-year quota trading in the UK and internationally.

7.1. IMPACT OF EACH SCENARIO ON THE REVENUE OF THE SCOTLAND WHITEFISH TRAWL/SEINE FLEET

An overview of the impact of all 11 scenarios on the revenue of the fleet segment is presented in Figure 7-1. The estimated revenue that could be achieved by the fleet segment under each scenario is presented as a percentage of the revenue achieved by the fleet segment in 2013. This allows comparison of the potential impact of the landing obligation in 2016 and 2019 to actual total segment revenue in 2013. Revenue in 2013 is represented by a horizontal blue line in Figure 7-1. The estimated revenue includes landings of quota species, non-quota species and other earnings expected by the fleet, such as income from oil industry guard duties. Revenue estimates also assume that the average price achieved per species in 2013 will be the average price achieved in each year analysed.

7.1.1. IMPACT OF BASELINE SCENARIOS ON REVENUE

The baseline scenarios represent the introduction of the landing obligation without the potential benefits of de minimis, interspecies flexibility and survivability. They are therefore considered to be worst-case scenarios. Table 7-1 presents the percentages used in Figure 7-1.

- Baseline scenario B1 does not provide a catch allowance for zero-TAC stocks and does not incorporate quota uplift. This is the worst-case scenario in the analysis. It is estimated that under baseline scenario B1 fleet revenue would be 66% of 2013 revenue in 2016 and 35% of 2013 revenue in 2019.
- Baseline scenario B2 estimates fleet segment revenue would be 79% of 2013 revenue in 2016 and 44% of 2013 revenue in 2019. In 2016 and 2019 the inclusion of a 1.5% catch allowance for zero-TAC stocks would increase revenue by 13 percentage points and 9 percentage points of 2013 revenue respectively, compared to scenario B1.
- Baseline scenario B3 incorporates the catch allowance included in baseline scenario B2 plus quota uplift for some stocks. However, as evident in the relatively small difference between the percentages for baseline scenarios B2 and B3 in both 2016 and 2019, the benefit of quota uplift to the Scotland whitefish trawl/fleet segment could be limited under the proposed scenarios (Table 7-1).

7.1.2. IMPACT OF SINGLE AND COMBINED POLICY LEVER SCENARIOS ON REVENUE

Each policy lever scenario is applied to baseline scenario B3. This means that the policy levers of de minimis, interspecies flexibility and survivability are applied to a baseline that already incorporates:

- a catch allowance for zero-TAC stocks; and
- quota uplift for stocks deemed eligible for an uplift.

The impacts of the single and combined policy lever scenarios on the revenue of the fleet segment are indicated in Figure 7-1 and detailed in Table 7-1.

The impact of each policy lever should be judged by comparing it to the percentage shown for baseline scenario B3.

Observations on the impact of the policy levers on revenue are:

- Although effort is held at a maximum of the days fished in 2013, revenue can still exceed 2013 levels as observed in 2016 under single policy lever scenarios 1A, 1B, and 2. This occurs when there is no choke stock, or the choke point is very close to actual days at sea in 2013, and quota uplift means that the fleet segment can land and sell fish that might previously have been discarded due to being over quota.
- In all scenarios, revenue is substantially lower in 2019 than in 2016. This is because all demersal quota stocks become subject to the landing obligation and stocks which might previously have been considered an unwanted bycatch, such as skate and dabs, would have to be landed in 2019 and counted against limited quota. This is likely to create a choke on fleet activity much earlier than in the transitional phase of the landing obligation.
- The biggest improvement on baseline scenario B3 for a single policy lever, in both 2016 and 2019, is de minimis LAX (scenario 1A) as the revenue of the fleet would be 115% and 93% respectively. This scenario would generate an improvement on baseline scenario B3 of 34 percentage points in 2016 and 48 percentage points in 2019. However, de minimis LAX is simply a percentage of the total catch of the PO fleet segment and is not stock specific.
- Of the two stock based de minimis scenarios, de minimis MID, where the 5% is taken as a percentage of EU TAC, is substantially more favourable than de minimis STRICT, where the 5% is taken as a percentage of UK TAC. The benefit in 2016, compared to baseline scenario B3, is 31 and 2 percentage points respectively. In 2019, de minimis MID increases revenue, compared to baseline scenario B3, by 19 percentage points and de minimis STRICT increases revenue by 6 percentage points
- Interspecies flexibility (scenario 2) also has a substantial effect in 2016 as it supports revenue that is 21 percentage points higher than under baseline B3. Interspecies flexibility continues to have benefit in 2019 although it improves revenue by only 4 percentage points compared to B3.
- Survivability (scenario 3) has no benefit in 2016 as none of the species subject to the landing obligation under transitional rules can benefit from this policy lever. However in 2019, survivability as defined in the scenario, increases revenue by 21 percentage points compared to baseline scenario B3.
- The combined scenarios can enable the policy levers to work together to lessen the impact of choke stocks and delay the choke point. The synergistic effect of the policy levers can result in revenue estimates higher than the value of any single policy lever and there is evidence of this in the Scotland whitefish trawl/Seine fleet segment as all three

combined scenarios would produce revenue in excess of the single policy lever scenarios incorporated into each combined scenario.

- In each combined scenario the revenue estimated for 2016 exceeds revenue in 2013. The increase is greatest under scenario 4a (115% of 2013 revenues), then 4b (113%) and finally 4c (103%) (Table 7-1).
- The pattern of benefit by scenario is the same in 2019, although all combined scenarios result in revenue for the fleet segment that is below 2013 revenue. Of the combined scenarios, scenario 4c results in the lowest revenue at 89% of 2013 revenue. This is to be expected given the more strict definition of de minimis in scenario 4c.

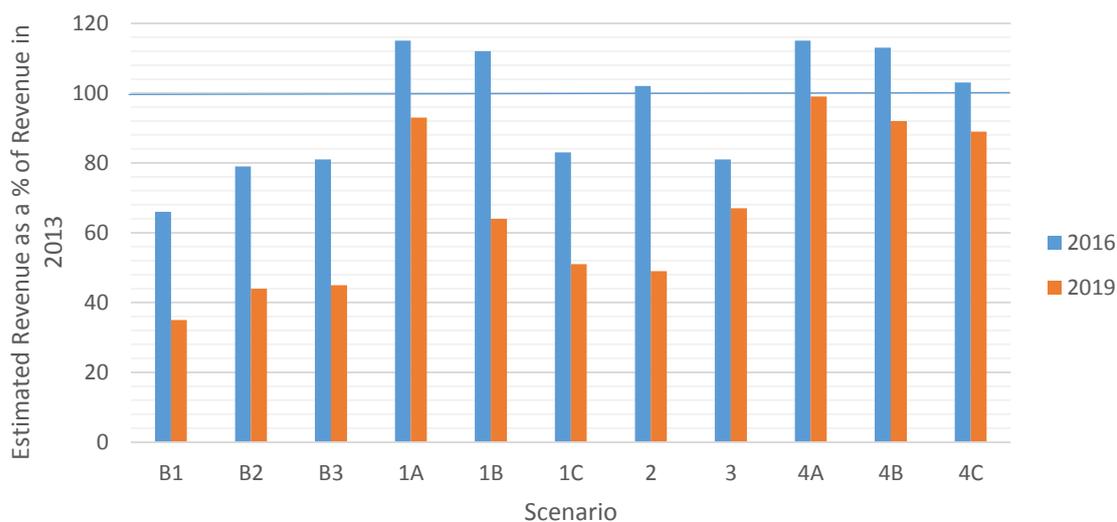


Figure 7-1: Scotland Whitefish Trawl/Seine Fleet Revenue under each scenario as a percentage of actual revenue in 2013

	Scenario Label	Scenario Description	Estimated revenue in 2016 as a % of revenue in 2013	Estimated revenue in 2019 as a % of revenue in 2013
Baseline Scenarios	B1	Implementation of landing obligation with only transitional rules in place	66	35
	B2	B1 plus a catch allowance for zero-TAC stocks	79	44
	B3	B2 plus quota uplift, where applicable	81	45
Policy Lever Scenarios	1A	De Minimis Lax (5% of PO segment catch)	115	93
	1B	De Minimis Mid (5% of EU TAC)	112	64
	1C	De Minimis Strict (5% of UK TAC)	83	51
	2	Interspecies flexibility (for stocks considered to be within safe biological limits)	102	49
	3	Survivability (majority of flatfish stocks)	81	67
Combined Scenarios	4A	Combination of Scenarios 1A, 2 and 3	115	99
	4B	Combination of Scenarios 1B, 2 and 3	113	92
	4C	Combination of Scenarios 1C, 2 and 3	103	89

Table 7-1: Estimated revenue for the Scotland whitefish trawl/seine fleet segment under each scenario as a % of revenue in 2013

7.2. THE IMPACT OF COMBINED POLICY LEVER SCENARIOS ON OTHER PERFORMANCE MEASURES

The scenario analysis created a substantial amount of findings. In Table 7-2, alongside the impact on revenue, the estimated impact of the combined scenarios on the following measures is also shown:

- Landings (tonnes);
- Effort (fishing days);
- Operating Profit (revenue minus operating costs, before deducting cost of capital); and
- Number of vessels. The number of vessels that can operate successfully under each scenario in each year is difficult to measure as the definition of 'operating successfully' will vary from vessel owner to vessel owner. The analysis has assumed that under the benefits created by the combined policy levers the number of vessels that can operate will, at a minimum be, the number of vessels that can continue to maintain the average number of fishing days per vessel in 2013.

The revenue under each scenario in Table 7-2, is the same as the revenue presented in Table 7-1. The figures in brackets represent the finding as a percentage of activity in 2013.

Observations on the impact of the combined policy lever scenarios on activity and business performance are:

- In 2016, the landed volume is above 2013 volumes under all three combined scenarios. This is a result of quota uplift. In 2019, combined scenario 4A continues to support landings greater than 2013 volumes. However scenarios 4B and 4C result in estimated landed volumes below 2013 volumes. The lowest landings in 2019 (92% of 2013 levels) would be under combined scenario 4C which incorporates de minimis STRICT alongside interspecies flexibility and survivability.
- In 2016 and 2019 effort (fishing days) for all three combined scenarios is less than the effort used by the fleet segment in 2013. This indicates that under each scenario in each year a choke stock is halting fishing activity in at least one sea area for at least one PO. The best scenario in 2019 (4A) suggests the fleet can fish for 75% of the days used in 2013 and the worst combined scenario in 2019 (4C) suggests that the fleet can fish for 64% of the days used in 2013. A detailed analysis of primary choke stock by sea area under each scenario is provided in the second part of the chapter
- The operating profit for the fleet segment under all three combined policy lever scenarios is estimated to be higher in 2019 than it was in 2013.
- If each vessel in the fleet segment was to be at sea for the average number of days each vessel was at sea in 2013 this would suggest that under the three combined policy lever scenarios the fleet could reduce from 103 vessels to between 65 and 78 vessels in 2019.
- In 2019 there is only a small difference in landings, operating profit and revenue between scenarios 4b and 4c. There is a slightly larger difference between the two scenarios for effort and the number of vessels.

	Year	Baseline B3	Combined policy lever scenarios (percent of 2013 figures)		
			4a	4b	4c
Revenue (£'000s) (2013=£102,912)	2016	83,051 (81%)	118,859 (115%)	116,357 (113%)	105,703 (103%)
	2019	46,572 (45%)	101,661 (99%)	95,102 (92%)	91,409 (89%)
Landings (t) (2013=60,108 tonnes)	2016	49,388 (82%)	71,641 (119%)	70,394 (117%)	64,027 (107%)
	2019	25,871 (43%)	61,704 (103%)	57,197 (95%)	55,265 (92%)
Effort (days) (2013=17,382 days)	2016	11,117 (64%)	17,220 (99%)	16,607 (96%)	14,691 (85%)
	2019	5,077 (29%)	13,101 (75%)	11,938 (69%)	11,125 (64%)
Operating Profit (£'000s) (2013=£8,164)	2016	11,171	20,589	20,662	18,023
	2019	961	19,250	17,896	17,460
Number of Vessels (#same effort) (2013=103 vessels)	2016	66 (64%)	101 (98%)	98 (95%)	86 (83%)
	2019	32 (31%)	78 (76%)	70 (68%)	65 (63%)

Table 7-2: Summary of Impact of Baseline Scenario B3 and Combined Policy Lever Scenarios on Performance Measures of the Scotland whitefish trawl/Seine fleet segment in 2016 and 2019.

Note: The number in brackets is the finding as a percentage of performance in 2013, which is shown in brackets in the first column

The model produced a substantial volume of detailed findings in addition to those presented in the activity and performance analysis above. We draw on these findings in the second part of the Chapter to further explain why the scenarios have the impact that they do for the Scotland whitefish trawl/Seine fleet segment.

7.3. CHOKE STOCK AND CHOKE POINT BY SEA AREA UNDER EACH SCENARIO

The following analysis explains why the policy levers have the identified benefit for this fleet segment.

The impact of the landing obligation is driven by the extent to which the fleet can continue to fish in each sea area, and this is determined by the presence, or not, of a choke stock. The potential benefit of each scenario is entirely dependent on the extent to which a policy lever can impact upon the primary choke stock. However, the primary choke stock will vary by sea area, and can be expected to vary between different POs.

The analysis which follows finds the stock which provides the fewest fishing days to the combined Scotland whitefish trawl/Seine fleet as a whole. An individual PO may have a different primary choke stock to the segment as a whole. Thus, the sum of fishing days for the segment primary choke stock may be different from the sum of days until each individual PO would choke on its own primary choke stock. (n.b. The performance and activity analysis in the first half of this chapter is based on the sum of days until each PO reaches its own individual choke point.)

The following tables contain the primary choke stock and estimated choke point for the Scotland whitefish trawl/Seine fleet under each of the eleven scenarios in:

- the North Sea (Area IV) in 2016 (Table 7-3);
- the North Sea (Area IV) in 2019 (Table 7-4);
- the West of Scotland (Area VI) in 2016 (Table 7-5); and

- the West of Scotland (Area VI) in 2019 (Table 7-6).

Commentary on the impact of each scenario is included in each table.

Scotland whitefish trawl/Seine fleet days at sea in Area IV (North Sea) in 2013 = 13,947 days						
	Scenario Label	Description	Primary Choke Stock(s) in 2016	Days until choke point in Area IV	Days until choke point as % of 2013 days	Comment
Baseline Scenarios	B1	Implementation of landing obligation with only transitional rules in place	Whiting	8,307	60%	Baseline scenario B1 is the worst-case scenario.
	B2	B1 plus a catch allowance for zero-TAC stocks	Whiting	8,307	60%	There are no zero-TAC stocks in Area IV.
	B3	B2 plus quota uplift, where applicable	Saithe	8,508	61%	Quota uplift would change the primary choke stock to saithe but the benefit is limited to 200 days for the fleet.
Policy Lever Scenarios	1A	De Minimis Lax (5% of PO segment catch)	Saithe	13,808	99%	De minimis LAX would not change the primary choke stock but would substantially delay the choke point (13,808 days) to close to 2013 days at sea (13,947 days).
	1B	De Minimis Mid (5% of EU TAC)	Saithe	13,808	99%	De minimis MID would not change the primary choke stock but would substantially delay the choke point (13,808 days) to close to 2013 days at sea (13,947 days).
	1C	De Minimis Strict (5% of UK TAC)	Saithe	8,908	64%	De minimis STRICT would not change the primary choke stock but would delay the choke point by 400 days, compared to scenario B3.
	2	Interspecies flexibility (for stocks considered to be within safe biological limits)	Saithe	11,544	83%	Interspecies flexibility would not change the primary choke stock but would substantially delay the choke point, compared to scenario B3.
	3	Survivability (majority of flatfish stocks)	Saithe	8,508	61%	Survivability would have no effect in 2016 as the stocks subject to the landing obligation in the scenario analysis are not classed as survivable.
Combined Scenarios	4A	Combination of Scenarios 1A, 2 and 3	Saithe and whiting	13,818	99%	The combination of de minimis LAX and interspecies flexibility in combined scenario 4A has a very modest additional impact compared to the de minimis LAX scenario (10 days). Under scenario 4A the choke point has been delayed until whiting also becomes a primary choke stock.
	4B	Combination of Scenarios 1B, 2 and 3	Saithe and whiting	13,818	99%	The combination of de minimis MID and interspecies flexibility in combined scenario 4B has a very modest additional impact compared to the de minimis MID scenario (10 days). Under scenario 4B the choke point has been delayed until whiting also becomes a primary choke stock.
	4C	Combination of Scenarios 1C, 2 and 3	Saithe	11,646	84%	The combination of single policy levers under scenario 4C has relatively more impact than the combination of policy levers in scenario 4A and 4B. Compared to the single policy lever of interspecies flexibility (scenario 2) the additional impact is approximately 100 days.

Table 7-3: Scotland whitefish trawl/Seine fleet: Primary Choke Stock and Choke Point under each Scenario in Area IV in 2016

Scotland whitefish trawl/Seine fleet days at sea in Area IV (North Sea) in 2013 = 13,947 days						
	Scenario Label	Description	Primary Choke Stock(s) in 2019	Days until choke point in Area IV	Days until choke point as % of 2013 days	Comment
Baseline Scenarios	B1	Implementation of landing obligation with only transitional rules in place	Skate	5,491	39%	Baseline scenario B1 is the worst-case scenario.
	B2	B1 plus a catch allowance for zero-TAC stocks	Skate	5,491	39%	There are no zero-TAC stocks in Area IV.
	B3	B2 plus quota uplift, where applicable	Skate	5,491	39%	Quota uplift would have no effect on the primary choke stock.
Policy Lever Scenarios	1A	De Minimis Lax (5% of PO segment catch)	Saithe and skate	9,168	66%	De minimis LAX would add saithe as a primary choke stock and significantly delay the choke point compared to scenario B3.
	1B	De Minimis Mid (5% of EU TAC)	Skate	6,091	44%	De minimis MID would not change the primary choke stock but would delay the choke point compared to scenario B3.
	1C	De Minimis Strict (5% of UK TAC)	Skate	5,791	42%	De minimis STRICT would not change the primary choke stock but would delay the choke point compared to scenario B3.
	2	Interspecies flexibility (for stocks considered to be within safe biological limits)	Skate	5,491	39%	Interspecies flexibility could not have an impact on skate as the primary choke stock as skate is not considered to be in safe biological limits.
	3	Survivability (majority of flatfish stocks)	Saithe	6,302	45%	Survivability would remove skate as a potential choke stock and saithe would become the primary choke stock and delay the choke point, compared to scenario B3.
Combined Scenarios	4A	Combination of Scenarios 1A, 2 and 3	Hake, saithe, ling and tusk	10,175	73%	Under survivability skate and dabs are removed as potential choke stocks. This allows interspecies flexibility to become more effective and along with de minimis LAX could change the primary choke stocks to hake, saithe, ling and tusk and substantially delay the choke point.
	4B	Combination of Scenarios 1B, 2 and 3	Saithe and tusk	9,355	67%	The comment above for scenario 4A describes the reasons for the success of all three combined scenarios. However, the inclusion of tusk as a choke stock may be limiting the potential benefit of 4B and 4C. There is limited knowledge of tusk discard rates, it has a low EU and UK TAC which limits the potential value of stock specific de minimis scenarios and it is not considered to be within safe biological limits so interspecies flexibility cannot be used. The lack of knowledge on tusk means that when it appears as the primary choke stock there is less certainty in the findings.
	4C	Combination of Scenarios 1C, 2 and 3	Tusk	8,542	61%	

Table 7-4: Scotland whitefish trawl/Seine fleet: Primary Choke Stock and Choke Point under each Scenario in Area IV (North Sea) in 2019

Scotland whitefish trawl/Seine fleet days at sea in Area VI (West of Scotland) in 2013 = 2,866 days						
	Scenario Label	Description	Primary Choke Stock(s) in 2016	Days until choke point in Area VI	Days until choke point as % of 2013 days	Comment
Baseline Scenarios	B1	Implementation of landing obligation with only transitional rules in place	Cod 6A	0	0%	Baseline scenario B1 is the worst-case scenario. The effect of cod 6A would mean the fleet could not go to sea in Area VI in 2016.
	B2	B1 plus a catch allowance for zero-TAC stocks	Saithe	2,110	74%	Catch allowance significantly reduces the likelihood of zero-TAC stocks becoming the primary choke stocks. Under scenario B2, saithe becomes the primary choke stock. There are no other choke stocks identified for this fleet segment in Area VI in 2016.
	B3	B2 plus quota uplift, where applicable	Saithe	2,110	74%	Quota uplift would have no effect on saithe.
Policy Lever Scenarios	1A	De Minimis Lax (5% of PO segment catch)	Saithe	2,710	95%	De minimis LAX would not change the primary choke stock but would delay the choke point compared to scenario B3.
	1B	De Minimis Mid (5% of EU TAC)	Saithe	2,110	74%	De minimis MID would not change the primary choke stock or the choke point compared to scenario B3.
	1C	De Minimis Strict (5% of UK TAC)	Saithe	2,110	74%	De minimis STRICT would not change the primary choke stock or the choke point compared to scenario B3.
	2	Interspecies flexibility (for stocks considered to be within safe biological limits)	Saithe	2,476	86%	Interspecies flexibility would be available to delay the choke caused by saithe but would not remove it as the primary choke stock.
	3	Survivability (majority of flatfish stocks)	Saithe	2,110	74%	Survivability would have no effect in 2016 as the stocks subject to the landing obligation in the scenario analysis are not classed as survivable.
Combined Scenarios	4A	Combination of Scenarios 1A, 2 and 3	Saithe	2,834	99%	The combined scenario 4A does create additional impact compared to any single policy lever. The combination of de minimis LAX and interspecies flexibility would not remove the only choke stock but would delay the choke point.
	4B	Combination of Scenarios 1B, 2 and 3	Saithe	2,476	86%	The combined scenario 4B does not create additional impact compared to the single policy lever of interspecies flexibility (scenario 2).
	4C	Combination of Scenarios 1C, 2 and 3	Saithe	2,476	86%	The combined scenario 4C does not create additional impact compared to the single policy lever of interspecies flexibility (scenario 2).

Table 7-5: Scotland whitefish trawl/Seine fleet: Primary Choke Stock and Choke Point under each Scenario in Area VI in 2016

Scotland whitefish trawl/Seine fleet days at sea in Area VI (West of Scotland) in 2013 = 2,866 days						
	Scenario Label	Description	Primary Choke Stock(s) in 2019	Days until choke point in Area VI	Days until choke point as % of 2013 days	Comment
Baseline Scenarios	B1	Implementation of landing obligation with only transitional rules in place	Cod 6a	0	0%	Baseline scenario B1 is the worst-case scenario. The effect of cod 6A would mean the fleet could not go to sea in Area VI in 2019.
	B2	B1 plus a catch allowance for zero-TAC stocks	Megrim	1,142	40%	Catch allowance significantly reduces the likelihood of zero-TAC stocks becoming the primary choke stocks. Under scenario B2, megrim becomes the primary choke stock in 2019.
	B3	B2 plus quota uplift, where applicable	Hake	1,332	46%	Quota uplift would change the primary choke stock to hake and delay the choke point.
Policy Lever Scenarios	1A	De Minimis Lax (5% of PO segment catch)	Hake, saithe, plaice, megrim and ling	2,532	88%	De minimis LAX would increase the number of primary choke stocks and would significantly delay the choke point compared to scenario B3.
	1B	De Minimis Mid (5% of EU TAC)	Hake	1,332	46%	De minimis MID would not change the primary choke stock or the choke point compared to scenario B3.
	1C	De Minimis Strict (5% of UK TAC)	Hake	1,332	46%	De minimis STRICT would not change the primary choke stock or the choke point compared to scenario B3.
	2	Interspecies flexibility (for stocks considered to be within safe biological limits)	Plaice	1,986	69%	Interspecies flexibility would support a transfer of quota to hake and change the primary choke stock to plaice. The choke point would be delayed compared to scenario B3.
	3	Survivability (majority of flatfish stocks)	Hake	1,332	46%	Survivability would not change the primary choke stock or the choke point compared to scenario B3.
Combined Scenarios	4A	Combination of Scenarios 1A, 2 and 3	Hake, saithe, megrim and ling	2,521	88%	Under survivability plaice is removed as a potential choke stock. This allows interspecies flexibility to become more effective and along with de minimis LAX could substantially delay the choke point, compared to scenario B3.
	4B	Combination of Scenarios 1B, 2 and 3	Ling	2,140	75%	Under survivability plaice is removed as a potential choke stock. This allows interspecies flexibility to become more effective and along with de minimis MID could change the primary choke stock to ling and substantially delay the choke point, compared to scenario B3.
	4C	Combination of Scenarios 1C, 2 and 3	Ling	2,140	75%	Under survivability plaice is removed as a potential choke stock. This allows interspecies flexibility to become more effective and along with de minimis STRICT could change the primary choke stock to ling and substantially delay the choke point, compared to scenario B3.

Table 7-6: Scotland whitefish trawl/Seine fleet: Primary Choke Stock and Choke Point under each Scenario in Area VI (West of Scotland) in 2019

7.4. SUMMARY OF THE CHOKE POINT BY SEA AREA IN 2019 COMPARED TO DAYS AT SEA IN 2013

Figure 7-2 provides a summary of the impact of the landing obligation in 2019 under the baseline scenarios (B1-B3), the single policy lever scenarios (1A-3) and the combined policy lever scenarios (4A-4C). The summary reflects the choke points shown in the previous tables for Area IV and Area VI in 2019. Observations on Figure 7-2 include:

- The baseline scenarios all indicate how significant the impact of the landing obligation could be for the Scotland whitefish trawl/seine fleet segment in 2019 in both Area IV and Area VI.
- The single policy levers have a limited impact compared to baseline scenario B3, with the exception of de minimis LAX in Area VI and interspecies flexibility in Area VI.
- All three combined scenarios have a notable impact in both Area IV and Area VII.

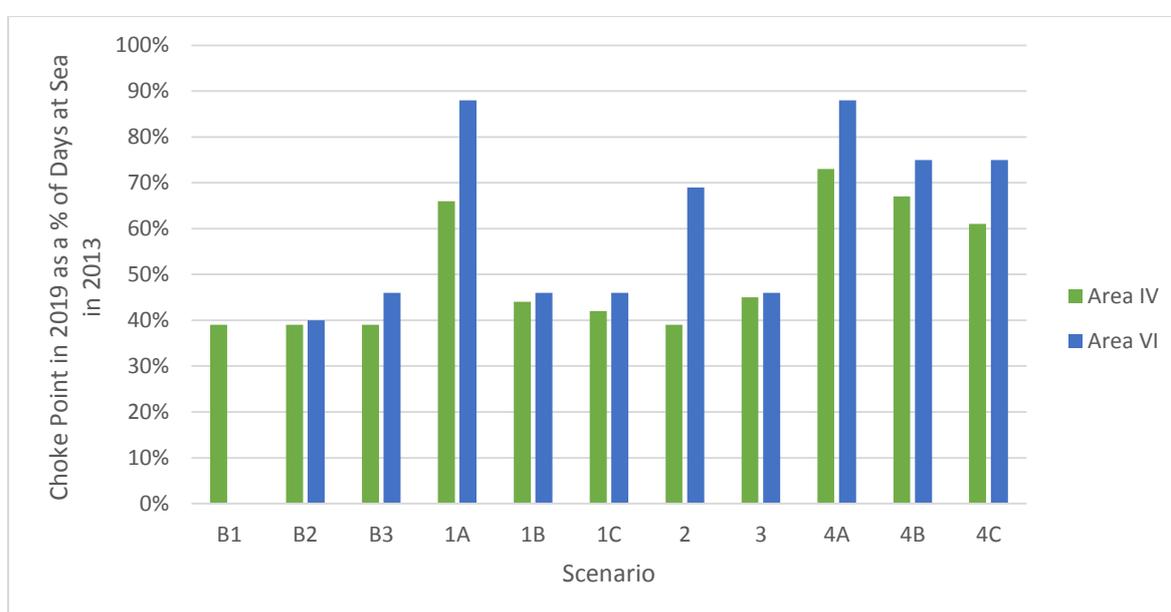


Figure 7-2: Scotland Whitefish Trawl/Seine Fleet - Impact of each scenario on the effort of the fleet (days at sea) in 2019, shown as a percentage of actual effort in 2013

7.5. TOP FIVE CHOKE STOCKS AND THEIR CHOKE POINT UNDER THE COMBINED POLICY LEVER SCENARIOS

Table 7-7 contains information on the top five choke stocks in the North Sea (Area IV) and West of Scotland (Area VI) for the Scotland whitefish trawl/seine fleet segment.

The scenario analysis and the choke analysis (reported in Interim Report One) are dependent on the quantitative information available on the catching activity of different fleet segments in different sea areas. The quantitative information used in the scenario analysis is the best available. However, estimates of discard volumes, and therefore estimates of total catch, are determined from a sample of vessels and whilst the estimate can reasonably be expected to be representative, there is nevertheless a risk that discard estimates may not be accurate. The relative impact of policy levers may be different if discard rates are materially different from those used in modelling.

The purpose of the top five choke analysis presented in Table 7-7 is to identify what other stocks might create a choke problem for the Scotland whitefish trawl/Seine fleet segment, and when:

- if the identified primary choke stock turns out not to be the primary choke stock because reality varies from the recorded information available;
- if the fleet can avoid the primary choke stock; or
- if another way is found to address the primary choke stock.

Table 7-7 presents the top five choke stocks under baseline scenario B3 and the three combined policy lever scenarios. Area VII is included for the first time in the analysis for completeness but activity in this area was limited in 2013.

Scenario	Area IV (North Sea) 2013 days at sea = 13,947 days				Area VI (West of Scotland) 2013 days at sea = 2,866 day				Area VII 2013 days at sea = 489 days			
	2016		2019		2016		2019		2016		2019	
	Choke Stock	Choke Point (days)	Choke Stock	Choke Point (days)	Choke Stock	Choke Point (days)	Choke Stock	Choke Point (days)	Choke Stock	Choke Point (days)	Choke Stock	Choke Point (days)
Baseline scenario B3	Saithe	8,508	Skate	5,491	saithe	2,110	Hake	1,332	Whiting 7B-K	419	Plaice 7DE	298
	Whiting	13,710	Saithe	6,203			Megrim	1,344			Plaice 7A	338
			Dabs	8,079			Plaice	1,986			Plaice 7HJK	338
			Tusk	8,542			Saithe	2,110			Whiting 7B-K	419
			Hake	9,340			Ling	2,140			Pollack	480
Combined policy lever scenario 4A	Whiting	13,818	Hake	10,175	saithe	2,834	Hake	2,521	No choke	-	Pollack	480
	Saithe	13,818	Tusk	10,175			Ling	2,521				
			Saithe	10,175			Saithe	2,521				
			Ling	10,175			Megrim	2,521				
			Whiting	10,427			Anglerfish	2,832				
Combined policy lever scenario 4B	Whiting	13,818	Tusk	9,355	saithe	2,476	Ling	2,140	No choke	-	Pollack	480
	Saithe	13,818	Saithe	9,230			Megrim	2,146				
			Hake	9,469			Saithe	2,188				
			Ling	9,664			Anglerfish	2,824				
			Whiting	10,222			Boarfish	2,866				
Combined policy lever scenario 4C	Saithe	11,646	Tusk	8,542	saithe	2,476	Ling	2,140	No choke	-	Pollack	480
	Whiting	13,663	Hake	9,340			Saithe	2,215				
			Ling	9,374			Megrim	2,259				
			Whiting	9,749			Anglerfish	2,824				
			saithe	11,044			boarfish	2,866				

Table 7-7: Scotland whitefish trawl/Seine fleet segment – top five choke stocks in Area IV, Area VI and Area VII in 2016 and 2019 under baseline scenario B3 and all three combined policy lever scenarios

8. SCOTLAND NEPHROPS TRAWL SCENARIO ANALYSIS

The over 10m Scotland nephrops trawl fleet segment consisted of 208 vessels in 2013 mostly fishing in Area VI, West of Scotland (20,495 days, 61% of total days), and Area IV, North Sea (12,261 days, 37% of total days). There was some activity in Area VII (701 days, 2% of total days).

The scenario analysis presented in this report incorporates PO fleet segments with five or more vessels. The vessels not included may be either non-sector or belong to POs with fewer than five vessels in the segment analysed. The PO fleet segments included in the scenario analysis represent 172 vessels or 83% of the national fleet included in the choke analysis.

The producer organisations which have vessels included in the scenario analysis for the Scotland nephrops trawl fleet segment are:

- North East of Scotland Fishermen's Organisation (NESFO);
- Northern Producers Organisation (NPO);
- Scottish Fishermen's Organisation (SFO);
- The Fife Fishermen's Producer Organisation (TFFPO);
- West of Scotland Fishermen's Producer Organisation (WoSFPO).

The findings for each nephrops trawl PO fleet segment are aggregated to provide an overall analysis of the relative impact of different scenarios on the activity and performance of the Scotland nephrops trawl fleet segment. It is the aggregated analysis that is presented in this chapter.

The analysis does not consider what positive impact could be achieved from fleet-based responses that could help the fleet to avoid choke stocks. The extent to which technological, strategic or operational changes can be implemented to avoid choke stocks and reduce the impact of the landing obligation is not known and cannot be reasonably estimated across the whole of the UK fleet at this time.

The findings of the scenario analysis for the Scotland nephrops fleet segment are presented in two halves in chapter 8:

- Sections 8.1 and 8.2 report on the impact of the eleven scenarios on the performance of the Scotland nephrops fleet segment as a whole¹⁰. The focus of the analysis is on the impact of all scenarios on the revenue of the fleet segment. However, the impact of the three combined scenarios on landings, effort, operating profit and number of vessels is also reported.
- The second half of the chapter, Sections 8.3 to 8.5, reports on the impact of the scenarios in the different sea areas where the Scotland nephrops fleet is active. The analysis provides explanations for why the scenarios have the impact that is reported in the first half of the Chapter.

¹⁰ It is advisable to have read chapter 2 before reviewing the results in the remainder of this Chapter.

If choke stocks exist in a sea area for the Scotland nephrops trawl fleet, it is the primary choke stock, the stock which the fleet segment runs out of quota for first, that will limit the activity of the fleet. The primary choke stock and the number of days fishing that is possible until the choke occurs – the choke point – can be affected by the design of each scenario. The analysis in the second half of the chapter explores how the scenarios impact upon the primary choke stock and choke point for the segment as a whole.

Once the quota of a stock has been fully used by a PO fleet segment the analysis assumes that fishing by that PO fleet segment in the sea area affected will stop. Because the analysis for the Scotland nephrops trawl fleet is an aggregated calculation of the impacts on four PO fleet segments it is possible that different PO fleet segments will be affected by different choke stocks and in different time frames.

The analysis presented is developed from information on end of year landings and therefore incorporates the benefits of in-year quota trading in the UK and internationally.

8.1. IMPACT OF EACH SCENARIO ON THE REVENUE OF THE SCOTLAND NEPHROPS FLEET

An overview of the impact of all 11 scenarios on the revenue of the fleet segment is presented in Figure 8-1. The estimated revenue that could be achieved by the fleet segment under each scenario is presented as a percentage of the revenue achieved by the fleet segment in 2013. This allows comparison of the potential impact of the landing obligation in 2016 and 2019 to actual total segment revenue in 2013. Revenue in 2013 is represented by a horizontal blue line in Figure 8-1. The estimated revenue includes landings of quota species, non-quota species and other earnings expected by the fleet. Revenue estimates also assume that the average price achieved per species in 2013 will be the average price achieved in each year analysed.

8.1.1. IMPACT OF BASELINE SCENARIOS ON REVENUE

The baseline scenarios represent the introduction of the landing obligation without the potential benefits of de minimis, interspecies flexibility and survivability. They are therefore considered to be worst-case scenarios. Table 8-1 shows the percentages used in Figure 8-1.

- Baseline scenario B1 does not provide a catch allowance for zero-TAC stocks and does not incorporate quota uplift. This is the worst-case scenario in the analysis. It is estimated that under baseline scenario B1 fleet revenue for the Scotland nephrops fleet would be 100% of 2013 revenue in 2016 and 9% of 2013 revenue in 2019.
- Baseline scenario B2 estimates fleet segment revenue would be 100% of 2013 revenue in 2016 and 12% of 2013 revenue in 2019. In 2019 the inclusion of a 1.5% catch allowance for zero-TAC stocks would increase revenue by 3 percentage points, compared to the worst-case scenario of B1.
- Baseline scenario B3 incorporates the catch allowance included in baseline scenario B2 plus quota uplift for eligible stocks. In 2016 this improves the revenue of the fleet by 5 percentage points to 105% of 2013 revenues. However, in 2019 there is no benefit from uplift and therefore the revenue for the fleet under scenarios B2 and B3 are the same (Figure 8-1 and Table 8-1).

8.1.2. IMPACT OF SINGLE AND COMBINED POLICY LEVER SCENARIOS ON REVENUE

Each policy lever scenario is applied to baseline scenario B3. This means that the policy levers of de minimis, interspecies flexibility and survivability are applied to a baseline that already incorporates:

- a catch allowance for zero-TAC stocks; and
- quota uplift for stocks deemed eligible for an uplift.

The impacts of the single and combined policy lever scenarios on the revenue of the fleet segment are indicated in Figure 8-1 and detailed in Table 8-1.

The impact of each policy lever should be judged by comparing it to the percentage shown for baseline scenario B3. However, for the Scotland nephrops fleet an improvement on baseline scenario B3 only occurs in a small number of cases.

Observations on the impact of the single and combined policy levers are:

- In 2016, once quota uplift is applied to nephrops (baseline scenario B3) the revenue of the fleet would exceed revenue earned in 2013 (105%). This occurs because there is no choke stock and the allocation of quota uplift to the fleet means that the fleet segment can land and sell fish that might previously have been discarded due to being over quota. This means that in 2016 the policy levers are not required as under baseline scenario B3 there are no choke stocks for this fleet segment in any sea area.
- Under all scenarios, revenue would be substantially lower in 2019 than in 2016. This is because all demersal quota stocks become subject to the landing obligation and stocks which might previously have been considered an unwanted bycatch, and for which the fleet segment holds limited quota, would have to be landed in 2019 and counted against quota. For the Scotland nephrops trawl fleet segment this would create a choke on fleet activity much earlier than in the transitional phase of the landing obligation.
- In 2019, the biggest improvement on baseline scenario B3 for a single policy lever is de minimis LAX (scenario 1A) as the revenue of the fleet would be 49% of 2013 revenue levels. This scenario would generate an improvement on baseline scenario B3 of 37 percentage points in 2019. However, de minimis LAX is simply a percentage of the total catch of the PO fleet segment and is not stock specific.
- The two stock specific de minimis scenarios provide a small benefit. De minimis MID, where the 5% is taken as a percentage of EU TAC, provides some benefit and creates an improvement of 3% on baseline scenario B3. Under de minimis STRICT, where the 5% is taken as a percentage of UK TAC, the improvement on baseline scenario B3 is one percentage point, which would lead to revenue for the fleet equal to 13% of total revenue in 2013.
- Interspecies flexibility (scenario 2) and survivability (scenario 3) have no benefit in 2019.
- However, despite interspecies flexibility and survivability scenarios providing no benefit in isolation, the combined scenarios can enable the policy levers to work together with de minimis to delay the choke point. The synergistic effect of the policy levers can result in revenue estimates higher than the value of any single policy lever and there is evidence of this in the Scotland nephrops fleet segment as all three combined scenarios

would produce revenue in excess of any single policy lever scenario incorporated into each combined scenario.

- In 2019, the benefit of combining the policy lever scenarios for this fleet segment is notably better than the impact of the policy levers in isolation. Scenario 4A which incorporates the most favourable single policy lever of de minimis LAX (1A) results in revenues of 54% of 2013 levels this is a substantial increase of 42 percentage points on baseline scenario B3.
- In 2019, the combined scenarios which incorporate the stock specific de minimis scenarios (4B and 4C) support revenues of 17-18% of 2013 levels. Therefore, under the stock specific combined scenarios the Scotland nephrops trawl fleet would only achieve revenue that is 5-6 percentage points higher than under baseline scenario B3 (Table 8-1).

The reasons why the impact of each scenario is limited are explored in detail on a sea area by sea area basis in the second part of the chapter.

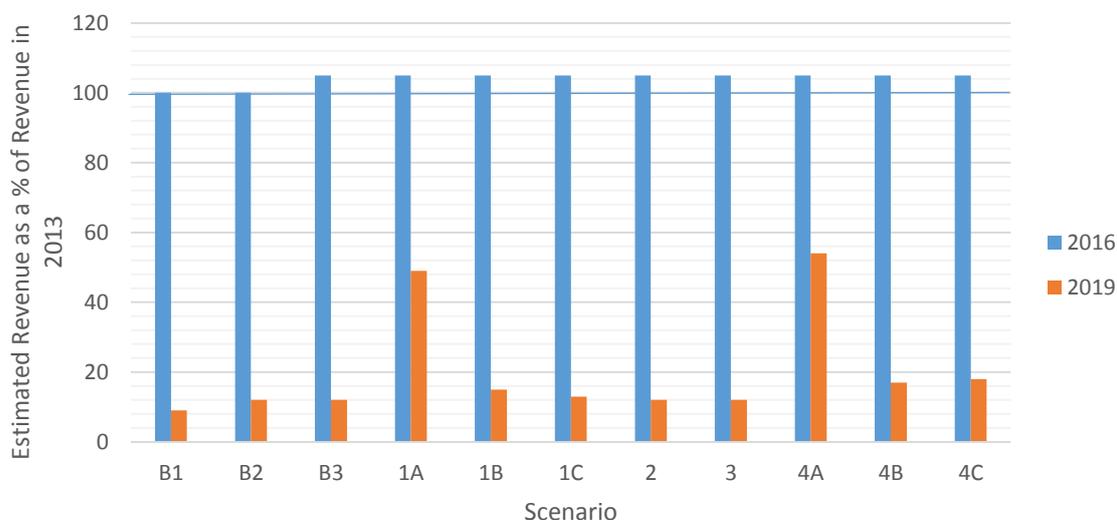


Figure 8-1: Scotland Nephrops Fleet Revenue under each scenario in 2016 and 2019, as a percentage of actual revenue in 2013

	Scenario Label	Scenario Description	Estimated revenue in 2016 as a % of revenue in 2013	Estimated revenue in 2019 as a % of revenue in 2013
Baseline Scenarios	B1	Implementation of landing obligation with only transitional rules in place	100	9
	B2	B1 plus a catch allowance for zero-TAC stocks	100	12
	B3	B2 plus quota uplift, where applicable	105	12
Policy Lever Scenarios	1A	De Minimis Lax (5% of PO segment catch)	105	49
	1B	De Minimis Mid (5% of EU TAC)	105	15
	1C	De Minimis Strict (5% of UK TAC)	105	13
	2	Interspecies flexibility (for stocks considered to be within safe biological limits)	105	12
	3	Survivability (majority of flatfish stocks)	105	12
Combined Scenarios	4A	Combination of Scenarios 1A, 2 and 3	105	54
	4B	Combination of Scenarios 1B, 2 and 3	105	17
	4C	Combination of Scenarios 1C, 2 and 3	105	18

Table 8-1: Estimated revenue for the Scotland nephrops trawl fleet segment under each scenario as a % of revenue in 2013

8.2. THE IMPACT OF COMBINED POLICY LEVER SCENARIOS ON OTHER PERFORMANCE MEASURES

In Table 8-2, alongside the impact on revenue, the estimated impact of the combined scenarios on the following activity and performance measures is also shown:

- Landings (tonnes);
- Effort (fishing days);
- Operating Profit (revenue minus operating costs, before deducting cost of capital); and
- Number of vessels. The number of vessels that can operate successfully under each scenario in each year is difficult to measure as the definition of 'operating successfully' will vary from vessel owner to vessel owner. The analysis has assumed that under the benefits created by the combined policy levers the number of vessels that can operate will at a minimum be the number of vessels that can continue to maintain the average number of fishing days used per vessel in the fleet segment in 2013.

The revenue under each scenario in Table 8-2 is the same as the revenue presented in Table 8-1. The figures in brackets represent the finding as a percentage of activity in 2013 (Table 8-2).

Observations on the impact of the combined policy lever scenarios on activity and business performance are:

- In 2016, the landed volume would be above 2013 volumes under all three combined scenarios. This is a result of quota uplift for nephrops.
- In 2019, when a more dramatic impact is experienced by the fleet, landings reflect the findings on revenue and combined scenarios 4B and 4C would support landing volumes equivalent to 18% of 2013 volumes and an improvement of 11% on baseline scenario B3.
- In 2019, the effort (fishing days) under all three combined scenarios would be substantially less than the effort used by the fleet segment in 2013. The scenario with most impact in 2019 (4A) suggests the fleet can fish for 49% of the days used in 2013 and both other combined scenarios (4B and 4C) suggest that the fleet can fish for 12% of the days used in 2013.
- The profitability of the fleet segment is expected to improve in 2016. However in 2019 only combined scenario 4A indicates that an operating profit is achievable.
- If each vessel in the fleet segment was to be at sea for the average number of days each vessel in the fleet was at sea in 2013 this would suggest that under the three combined policy lever scenarios the active fleet would reduce from 172 vessels to between 18 and 83 vessels (Table 8-2).

There is no doubt that, under the assumptions and definitions used in the scenario analysis, the landing obligation has the potential to have a substantial impact on the Scotland nephrops fleet segment in 2019; and the proposed policy levers offer little mitigation. The reality is that where limited quota is held for frequently caught stocks, there is little that any policy lever can do to lessen the challenges of the landing obligation. The solutions for this fleet segment therefore must be found elsewhere.

	Year	Baseline B3	Combined policy lever scenarios (percent of 2013 figures)		
			4a	4b	4c
Revenue (£'000s) (2013=£48,407)	2016	50,758 (105%)	50,758 (105%)	50,758 (105%)	50,758 (105%)
	2019	5,774 (12%)	26,045 (54%)	8,412 (17%)	8,522 (18%)
Landings (t) (2013=18,756 tonnes)	2016	20,701 (110%)	20,432 (109%)	20,432 (109%)	20,432 (109%)
	2019	1,406 (7%)	10,839 (58%)	3,468 (18%)	3,341 (18%)
Effort (days) (2013=28,175 days)	2016	28,175 (100%)	28,158 (100%)	28,158 (100%)	28,158 (100%)
	2019	1,420 (5%)	13,670 (49%)	3,344 (12%)	3,339 (12%)
Operating Profit (£'000s) (2013=£6,923)	2016	8,745	8,745	8,745	8,745
	2019	-6,402	1,465	-5,278	-5,233
Number of Vessels (same effort as 2013) (2013=172 vessels)	2016	172 (100%)	172 (100%)	172 (100%)	172 (100%)
	2019	11 (6%)	83 (48%)	18 (10%)	18 (10%)

Table 8-2: Summary of Impact of Baseline Scenario B3 and Combined Policy Lever Scenarios on Performance Measures of the Scotland nephrops trawl fleet segment in 2016 and 2019.

Note: The number in brackets is the finding as a percentage of performance in 2013, which is shown in brackets in the first column

The model produced a substantial volume of detailed findings in addition to those presented in the performance and activity analysis above. We draw on these findings in the second part of the Chapter to further explain why the scenarios have the impact that they do for the Scotland nephrops trawl fleet segment.

8.3. CHOKe STOCK AND CHOKe POINT BY SEA AREA UNDER EACH SCENARIO

The impact of the landing obligation is driven by the extent to which the fleet can continue to fish in each sea area, and this is determined by the presence, or not, of a choke stock. The potential benefit of each scenario is entirely dependent on the extent to which a policy lever can impact upon the primary choke stock. However, the primary choke stock will vary by sea area, and can be expected to vary between different POs.

The analysis which follows finds the stock which provides the fewest fishing days to the combined Scotland nephrops trawl fleet as a whole. An individual PO may have a different primary choke stock to the segment as a whole. Thus, the sum of fishing days for the segment primary choke stock may be different from the sum of days until each individual PO would choke on its own primary choke stock. (n.b. The performance and activity analysis in the first half of this chapter is based on the sum of days until each PO reaches its own individual choke point.)

The following tables contain the primary choke stock and estimated choke point for the Scotland nephrops trawl fleet under each of the eleven scenarios in:

- the North Sea (Area IV) in 2016 (Table 8-3);
- the North Sea (Area IV) in 2019 (Table 8-4);
- the West of Scotland (Area VI) in 2016 (Table 8-5); and
- the West of Scotland (Area VI) in 2019 (Table 8-6).

Commentary on the impact of each scenario is included in each table. Area VII is not included due to the relatively small proportion of fleet activity that occurs in Area VII.

Scotland nephrops trawl fleet days at sea in Area IV (North Sea) in 2013 = 9,998 days						
	Scenario Label	Description	Primary Choke Stock(s) in 2016	Days until choke point in Area IV	Days until choke point as % of 2013 days	Comment
Baseline Scenarios	B1	Implementation of landing obligation with only transitional rules in place	Nephrops	9,425	94%	Baseline scenario B1 is the worst-case scenario. However in 2016 the extent of the choke caused by landing all nephrops catch would only be 6 days less than the days fished in 2013.
	B2	B1 plus a catch allowance for zero-TAC stocks	Nephrops	9,425	94%	There are no zero-TAC stocks in Area IV (North Sea).
	B3	B2 plus quota uplift, where applicable	No choke	-	-	Quota uplift would apply to nephrops in Area IV. Therefore under baseline scenario B3, once quota uplift is applied to the TAC for nephrops, nephrops is removed as a potential choke stock in 2016.
Policy Lever Scenarios	1A	De Minimis Lax (5% of PO segment catch)				The Scotland nephrops trawl fleet would have no requirement for any policy levers in Area IV (North Sea) in 2016 as no choke stocks have been identified under baseline scenario B3.
	1B	De Minimis Mid (5% of EU TAC)				
	1C	De Minimis Strict (5% of UK TAC)				
	2	Interspecies flexibility (for stocks considered to be within safe biological limits)				
	3	Survivability (majority of flatfish stocks)				
Combined Scenarios	4A	Combination of Scenarios 1A, 2 and 3				The Scotland nephrops trawl fleet would have no requirement for combined policy levers in Area IV (North Sea) in 2016 as no choke stocks have been identified under baseline scenario B3.
	4B	Combination of Scenarios 1B, 2 and 3				
	4C	Combination of Scenarios 1C, 2 and 3				

Table 8-3: Scotland Nephrops Trawl Fleet: Primary Choke Stock and Choke Point under each Scenario in Area IV (North Sea) in 2016

Scotland nephrops trawl fleet days at sea in Area IV (North Sea) in 2013 = 9,998 days						
	Scenario Label	Description	Primary Choke Stock(s) in 2019	Days until choke point in Area IV	Days until choke point as % of 2013 days	Comment
Baseline Scenarios	B1	Implementation of landing obligation with only transitional rules in place	Skate	570	6%	Baseline scenario B1 is the worst-case scenario.
	B2	B1 plus a catch allowance for zero-TAC stocks	Skate	570	6%	There are no zero-TAC stocks in Area IV (North Sea).
	B3	B2 plus quota uplift, where applicable	Skate	570	6%	Quota uplift would have no effect on the primary choke stock.
Policy Lever Scenarios	1A	De Minimis Lax (5% of PO segment catch)	Hake	3,601	36%	De minimis LAX would change the primary choke stock to hake and significantly delay the choke point, compared to scenario B3.
	1B	De Minimis Mid (5% of EU TAC)	Hake	1,001	10%	De minimis MID would change the primary choke stock to hake and delay the choke point, compared to scenario B3.
	1C	De Minimis Strict (5% of UK TAC)	Hake	739	7%	De minimis STRICT would change the primary choke stock to hake and delay the choke point, compared to scenario B3.
	2	Interspecies flexibility (for stocks considered to be within safe biological limits)	Skate	570	6%	Interspecies flexibility could not have an impact on skate as the primary choke stock as skate is not considered to be in safe biological limits.
	3	Survivability (majority of flatfish stocks)	Hake	618	6%	Survivability would remove skate as a potential choke stock but hake would become the primary choke stock and create a choke soon after skate would have.
Combined Scenarios	4A	Combination of Scenarios 1A, 2 and 3	Cod and hake	4,508	45%	Under survivability skate and dabs are removed as potential choke stocks. This allows interspecies flexibility to become more effective and along with de minimis LAX could change the primary choke stock to cod and substantially delay the choke point, compared to scenario B3.
	4B	Combination of Scenarios 1B, 2 and 3	Cod	3,452	35%	Under survivability skate and dabs are removed as potential choke stocks. This allows interspecies flexibility to become more effective and along with de minimis MID could change the primary choke stock to cod and substantially delay the choke point, compared to scenario B3.
	4C	Combination of Scenarios 1C, 2 and 3	Cod	3,452	35%	Under survivability skate and dabs are removed as potential choke stocks. This allows interspecies flexibility to become more effective and along with de minimis STRICT could change the primary choke stock to cod and substantially delay the choke point, compared to scenario B3.

Table 8-4: Scotland Nephrops Trawl Fleet: Primary Choke Stock and Choke Point under each Scenario in Area IV (North Sea) in 2019

Scotland nephrops trawl fleet days at sea in Area VI (West of Scotland) in 2013 = 17,553 days						
	Scenario Label	Description	Primary Choke Stock(s) in 2016	Days until choke point in Area VI	Days until choke point as % of 2013 days	Comment
Baseline Scenarios	B1	Implementation of landing obligation with only transitional rules in place	No choke	-	-	Baseline scenario B1 is the worst-case scenario. However in 2016 there would be no choke stock for the Scotland nephrops trawl fleet in Area VI (West of Scotland).
	B2	B1 plus a catch allowance for zero-TAC stocks	No choke	-	-	Catch allowance would have no effect in Area VI (West of Scotland) as there are no choke stocks in 2016.
	B3	B2 plus quota uplift, where applicable	No choke	-	-	Quota uplift would not be required for the Scotland nephrops trawl fleet in Area VI in 2016.
Policy Lever Scenarios	1A	De Minimis Lax (5% of PO segment catch)				The Scotland nephrops trawl fleet would have no requirement for any policy levers in Area VI (West of Scotland) in 2016 as no choke stocks have been identified under any of the baseline scenarios.
	1B	De Minimis Mid (5% of EU TAC)				
	1C	De Minimis Strict (5% of UK TAC)				
	2	Interspecies flexibility (for stocks considered to be within safe biological limits)				
	3	Survivability (majority of flatfish stocks)				
Combined Scenarios	4A	Combination of Scenarios 1A, 2 and 3				The Scotland nephrops trawl fleet would have no requirement for combined policy levers in Area VI (West of Scotland) in 2016 as no choke stocks have been identified under any of the baseline scenarios.
	4B	Combination of Scenarios 1B, 2 and 3				
	4C	Combination of Scenarios 1C, 2 and 3				

Table 8-5: Scotland Nephrops Trawl Fleet: Primary Choke Stock and Choke Point under each Scenario in Area VI (West of Scotland) in 2016

Scotland nephrops trawl fleet days at sea in Area VI (West of Scotland) in 2013 = 17,553 days						
	Scenario Label	Description	Primary Choke Stock(s) in 2019	Days until choke point in Area VI	Days until choke point as % of 2013 days	Comment
Baseline Scenarios	B1	Implementation of landing obligation with only transitional rules in place	Cod 6A	294	2%	Baseline scenario B1 is the worst-case scenario.
	B2	B1 plus a catch allowance for zero-TAC stocks	Saithe, plaice and ling	878	5%	Catch allowance would mean cod 6A is no longer the primary choke stock. With cod 6A removed there are three stocks that would create a choke at the same time.
	B3	B2 plus quota uplift, where applicable	Saithe, plaice and ling	878	5%	Quota uplift would have no effect on the primary choke stocks identified in the West of Scotland as none are considered to be eligible for uplift.
Policy Lever Scenarios	1A	De Minimis Lax (5% of PO segment catch)	Saithe, plaice, ling and hake	7,778	44%	De minimis LAX would not change the primary choke stocks but would delay the choke point substantially, compared to scenario B3. Hake would also become a primary choke stock under 1A.
	1B	De Minimis Mid (5% of EU TAC)	Saithe, plaice and ling	878	5%	De minimis MID would not change the primary choke stocks or delay the choke point, compared to scenario B3.
	1C	De Minimis Strict (5% of UK TAC)	Saithe, plaice and ling	878	5%	De minimis STRICT would not change the primary choke stocks or delay the choke point, compared to scenario B3.
	2	Interspecies flexibility (for stocks considered to be within safe biological limits)	Plaice and ling	878	5%	Interspecies flexibility would remove saithe as a primary choke stock as it is considered to be within safe biological limits and would receive a transfer of quota from another stock. However scenario 2 would not have an impact on plaice and ling and therefore the choke point identified under scenario B3 is unchanged under scenario 2.
	3	Survivability (majority of flatfish stocks)	Saithe and ling	878	5%	Survivability would remove plaice as a potential choke stock but there would be no impact on saithe or ling therefore the choke point identified under scenario B3 is unchanged.
Combined Scenarios	4A	Combination of Scenarios 1A, 2 and 3	Ling, hake and pollock	8,278	47%	Survivability removes plaice as a primary choke stock and this enables de minimis LAX and interspecies flexibility to be more effective on other choke stocks and the choke point would be substantially delayed, compared to scenario B3.
	4B	Combination of Scenarios 1B, 2 and 3	Ling	878	5%	Under survivability plaice is removed as a primary choke stock and under interspecies flexibility saithe is removed as a primary choke stock, however neither these scenarios nor de minimis MID would have an impact on ling and therefore the choke point remains the same as under B3.
	4C	Combination of Scenarios 1C, 2 and 3	Ling	878	5%	Under survivability plaice is removed as a primary choke stock and under interspecies flexibility saithe is removed as a primary choke stock, however neither these scenarios nor de minimis STRICT would have an impact on ling and therefore the choke point remains the same as under B3.

Table 8-6: Scotland Nephrops Trawl: Primary Choke Stock and Choke Point under each Scenario in Area VI (West of Scotland) in 2019

8.4. SUMMARY OF THE CHOKE POINT BY SEA AREA IN 2019 COMPARED TO DAYS AT SEA IN 2013

Figure 8-2 provides a summary of the impact of the landing obligation in 2019 under the baseline scenarios (B1-B3), the single policy lever scenarios (1A-3) and the combined policy lever scenarios (4A-4C). The summary reflects the choke points shown in the previous tables for Area IV and Area VI in 2019. Observations on Figure 8-2 include:

- The baseline scenarios all indicate how significant the impact of the landing obligation could be for the Scotland nephrops fleet segment in 2019 in both Area IV and Area VI.
- The only single policy lever that has a notable impact compared to baseline scenario B3 is de minimis LAX. De minimis LAX (1A) is the only proposed scenario that is not stock specific.
- All three combined scenarios have a relatively greater impact in Area IV than in Area VI.

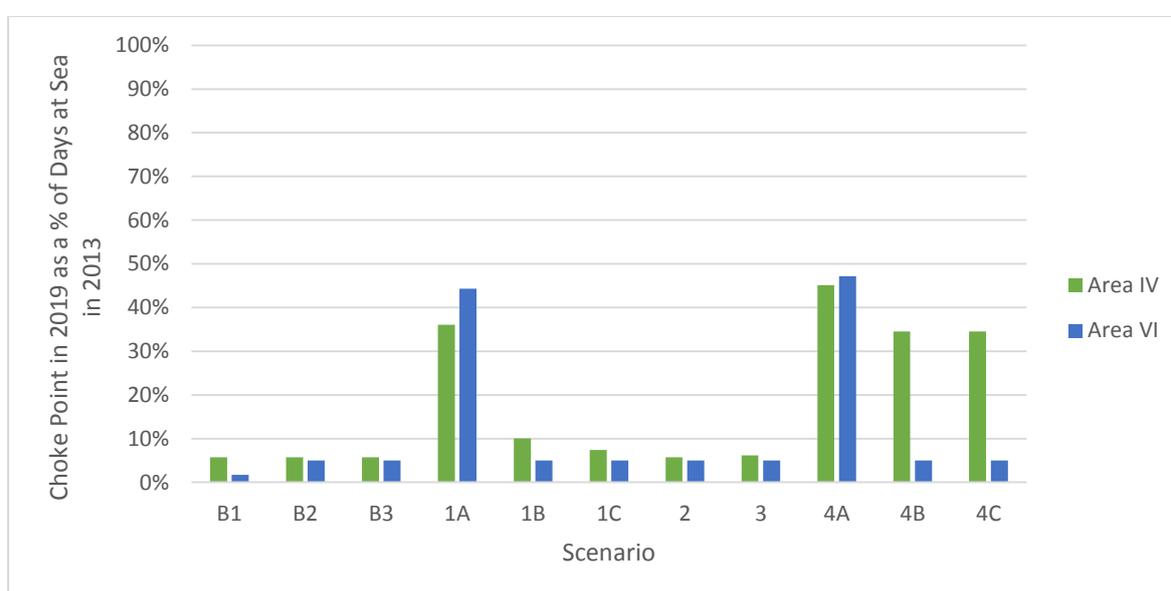


Figure 8-2: Scotland nephrops trawl fleet - Impact of each scenario on the effort of the fleet (days at sea) in 2019, shown as a percentage of actual effort in 2013

8.5. TOP FIVE CHOKE STOCKS AND THEIR CHOKE POINT UNDER THE COMBINED POLICY LEVER SCENARIOS

Table 8-7 contains information on the top five choke stocks in the North Sea (Area IV) and West of Scotland (Area VI) for the Scotland nephrops trawl fleet segment.

The scenario analysis and the choke analysis (reported in Interim Report One) are dependent on the quantitative information available on the catching activity of different fleet segments in different sea areas. The quantitative information used in the scenario analysis is the best available. However, estimates of discard volumes, and therefore estimates of total catch, are determined from a sample of vessels and whilst the estimate can reasonably be expected to be representative, there is nevertheless a risk that discard estimates may not be accurate. The relative impact of policy levers may be different if discard rates are materially different from those used in modelling.

The purpose of the top five choke analysis presented in Table 8-7 is to identify what other stocks might create a choke problem for the Scotland nephrops trawl fleet segment:

- if the identified primary choke stock turns out not to be the primary choke stock because reality varies from the recorded information available;
- if the fleet can avoid the primary choke stock; or
- if another way is found to address the primary choke stock.

Table 8-7 presents the top five choke stocks under baseline scenario B3 and the three combined policy lever scenarios. Area VII is included for the first time in the analysis for completeness but the fleet segment's activity in Area VII was limited in 2013.

Scenario	Area IV (2013 = 9,998 days)				Area VI (2013 = 17,553 days)				Area VII (2013 = 615 days)			
	2016		2019		2016		2019		2016		2019	
	Choke Stock	Choke Point (days)	Choke Stock	Choke Point (days)	Choke Stock	Choke Point (days)	Choke Stock	Choke Point (days)	Choke Stock	Choke Point (days)	Choke Stock	Choke Point (days)
Baseline scenario B3	No choke	-	Skate	570	No choke	-	Saithe	878	No choke	-	Whiting 7a	32
			Hake	618			Plaice	878			Plaice 7A	93
			Dabs	1,162			Ling	878			Whiting 7B-K	144
			Cod	3,411			Sole	1,157			Plaice fg	191
			Turbot	3,519			Hake	1,188			Plaice 7HJK	191
Combined policy lever scenario 4A			Cod	4,508			Ling	8,278			Whiting 7A	532
			Hake	4,508			Hake	8,278			Whiting 7B-K	541
			Ling	5,028			Pollack	8,278				
			Tusk	5,720			Megrim	10,165				
			Whiting	6,349			Saithe	14,653				
Combined policy lever scenario 4B			Cod	3,452			Ling	878			Whiting 7A	32
			Tusk	3,820			Hake	1,188				
			Ling	4,463			Pollack	1,978				
			Hake	4,758			Megrim	7,081				
			Whiting	6,326			Saithe	15,144				
Combined policy lever scenario 4C			Cod	3,452			Ling	878			Whiting 7A	32
			Tusk	3,820			Hake	1,188				
			Ling	4,463			Pollack	1,978				
			Hake	4,758			Megrim	7,081				
			Saithe	6,245			Saithe	15,144				

Table 8-7: Scotland nephrops trawl/seine fleet segment – top five choke stocks in Area IV, Area VI and Area VII in 2016 and 2019 under baseline scenario B3 and all three combined policy lever scenarios

9. VOLUME AND VALUE OF CATCH AND UNCAUGHT TAC

The purpose of chapter 9 is to provide a UK perspective on the volume and value of TAC that could be caught in 2016 and 2019 under baseline scenario B3 and the three combined policy lever scenarios (4A, 4B and 4C). The analysis assumes that, under each scenario, once the choke point has occurred in a sea area that the affected fleet segment will be unable to catch its remaining quota in the sea area and the quota will remain unused. TAC is an economic asset at local, national and European levels. TAC that remains uncaught therefore has a negative economic impact.

The chapter contains two analyses:

- The first analysis provides an estimate of the total landings and revenue that could be earned by all six home nation fleet segments from each sea area in 2019, as a percentage of landings and revenue achieved in 2013. The analysis includes the findings under baseline scenario B3 and the three combined policy lever scenarios
- The second analysis provides an estimate of TAC, total landings and the revenue that could be earned by all 45 fleet segments included in the bioeconomic model. This is the only analysis in this report that covers all 45 segments incorporated in the bioeconomic model. The analysis also values the TAC that would remain uncaught under the three combined policy lever scenarios.

9.1. TOTAL LANDINGS AND REVENUE FROM EACH SEA AREA UNDER THE COMBINED POLICY LEVER SCENARIOS

The analysis aggregates the findings for all six home nation fleet segments to estimate:

- the total volume of landings that could be landed from each sea area in 2019 as a percentage of the actual landings by the fleet segments in 2013; and
- the total revenue that could be earned from each sea area in 2019 as a percentage of the revenue earned in 2013 (prices are held constant).

Table 9-1 contains the findings. Under the most favourable combined policy lever scenario 4A, which incorporates de minimis LAX, total revenue earned by all six fleet segments from each sea area in 2019 would be 94% of the revenue earned from Area IV, 66% of the revenue earned from Area VI in 2013 and 76% of the revenue earned from Area VII in 2013.

Under the least favourable combined policy lever scenario 4C, which incorporates de minimis STRICT, total revenue earned by all six fleet segments from each sea area in 2019 could be 77% of the revenue earned in 2013 from Area IV, 39% of the revenue earned from Area VI in 2013 and 54% of the revenue earned from Area VII in 2013.

Under combined scenarios 4B and 4C, the greatest negative impact from the landing obligation, measured as a proportion of landings and revenue in 2013, would occur in Area VI (53% of landings and 39% of revenue).

	Area IV (North Sea) as % of 2013		Area VI (West of Scotland) as % of 2013		Area VII as % of 2013	
	Landings 2019	Revenue 2019	Landings 2019	Revenue 2019	Landings 2019	Revenue 2019
4A	101%	94%	78%	66%	71%	76%
4B	89%	80%	53%	39%	59%	65%
4C	86%	77%	53%	39%	50%	54%

Table 9-1: Total landings and revenue by scenario in 2019 as a % of actual landings and revenue in 2013

9.2. VOLUME AND VALUE OF UNCAUGHT QUOTA

The analysis in Section 9.2 is the only analysis in this report that includes the findings from all 45 fleet segments included in the bioeconomic model. The purpose of the analysis is to indicate how choke stocks and choke points could result in the UK not fully utilising its TAC. The consequence of this would be that the UK economy would not fully benefit from the value of TAC as an economic asset

Table 9-2 shows the volume caught, the volume uncaught and the estimated value of uncaught fish. The PO segments are aggregated to show a total volume and value for each home nation and the UK as a whole.

The analysis makes no assumptions about whether this quota could be caught in a way which completely avoids the identified choke stocks or if the quota could be sold and caught by someone else not affected by a choke stock in the sea area. The potential value of uncaught quota certainly suggests that there would be an incentive to find a solution.

9.2.1. BEST CASE COMBINED SCENARIO 4A: VALUE OF CATCH AND VALUE OF UNCAUGHT TAC

In 2019, once the landing obligation is fully implemented, Table 9-2 shows that under the best case scenario 4A, 114,395 tonnes of the estimated 160,400 tonnes of TAC likely to be available to the UK fleet would be caught and landed (71%). Therefore an estimated 29% of the volume of total UK TAC in 2019 would remain uncaught. The value of the fish caught under scenario 4A in 2019 could be £227.6 million. Although 29% of the volume remains uncaught, this equates to 33% of the potential value of the TAC (£114.3 million).

A comparison of the proportion and value of fish left in the sea by home nation fleet segment under the best case combined policy lever scenario 4A shows:

- In 2019, under scenario 4A the fleet segments analysed in England and Wales would land 76% (£86 million) of the value of available TAC which could leave 24% (£26.6 million) of the available TAC value in the sea;
- In 2019, under scenario 4A the fleet segments analysed in Northern Ireland would land 41% (£13.4 million) of the value of available TAC which could leave 59% (£19.5 million) of the available TAC value in the sea; and
- In 2019, under scenario 4A the fleet segments analysed in Scotland would land 65% (£128.2 million) of the value of available TAC which could leave 35% (£68.2 million) of the available TAC value in the sea.

9.2.2. WORST-CASE COMBINED SCENARIO 4C: VALUE OF CATCH AND VALUE OF UNCAUGHT TAC

In 2019, once the landing obligation is fully implemented, Table 9-2 shows that under the worst-case combined policy lever scenario 4C, 93,264 tonnes of the estimated 161,307 tonnes available to the UK fleet would be caught and landed (58%). Therefore an estimated 42% of the volume of total UK TAC in 2019 would remain uncaught under the rules of the landing obligation and the exemptions and derogations proposed in scenario 4C. In 2019, the value of the fish caught and landed under scenario 4C would be £181.2 million.

A comparison of the proportion and value of fish left in the sea by home nation under the worst-case combined policy lever scenario 4C shows:

- In 2019, under scenario 4C the fleet segments analysed in England and Wales would catch and land 65% (£73.4 million) of the value of available TAC which could leave 35% (£39.7 million) of the available TAC value in the sea;
- In 2019, under scenario 4C the fleet segments analysed in Northern Ireland would catch and land 24% (£7.9 million) of the value of available TAC which could leave 76% (£25 million) of the available TAC value in the sea; and
- In 2019, under scenario 4C the fleet segments analysed in Scotland would catch and land 51% (£99.9 million) of the value of available TAC which could leave 49% (£97.7 million) of the available TAC value in the sea.

			Estimate 2016		Estimate 2019	
UK	Scenario		tonnes	£'000s	tonnes	£'000s
UK	4a	TAC	159,170	341,822	160,400	341,925
		Landings	145,894	292,046	114,395	227,603
		Left in sea	13,276	49,776	46,005	114,322
	4b	TAC	159,170	341,822	160,219	341,574
		Landings	144,962	289,791	97,211	194,208
		Left in sea	14,208	52,031	63,009	147,366
	4c	TAC	159,170	341,822	161,307	343,650
		Landings	137,033	275,652	93,264	181,224
		Left in sea	22,137	66,171	68,043	162,426
England and Wales			tonnes	£'000s	tonnes	£'000s
England and Wales	4a	TAC	44,062	118,113	42,099	112,658
		Landings	39,337	92,658	35,149	86,045
		Left in sea	4,725	25,455	6,950	26,613
	4b	TAC	44,062	118,113	42,059	112,554
		Landings	39,355	92,670	32,686	82,338
		Left in sea	4,707	25,443	9,374	30,216
	4c	TAC	44,062	118,113	42,263	113,086
		Landings	38,504	90,352	30,908	73,410
		Left in sea	5,558	27,761	11,355	39,676
Northern Ireland			tonnes	£'000s	tonnes	£'000s
Northern Ireland	4a	TAC	15,415	32,584	15,572	32,845
		Landings	14,105	29,310	6,798	13,376
		Left in sea	1,310	3,274	8,773	19,468
	4b	TAC	15,415	32,584	15,563	32,831
		Landings	14,100	29,302	4,444	8,283
		Left in sea	1,315	3,282	11,119	24,547
	4c	TAC	15,415	32,584	15,605	32,900
		Landings	13,797	28,832	4,244	7,897
		Left in sea	1,618	3,752	11,361	25,003
Scotland			tonnes	£'000s	tonnes	£'000s
Scotland	4a	TAC	99,692	191,125	102,729	196,422
		Landings	92,452	170,078	72,448	128,181
		Left in sea	7,241	21,047	30,282	68,241
	4b	TAC	99,692	191,125	102,597	196,189
		Landings	91,506	167,819	60,081	103,586
		Left in sea	8,186	23,306	42,516	92,603
	4c	TAC	99,692	191,125	103,439	197,664
		Landings	84,731	156,467	58,112	99,917
		Left in sea	14,961	34,658	45,328	97,747

Table 9-2: Fish left in the sea, volume and value (End of year landings)

10. SUMMARY AND CONCLUSIONS

The Landing Obligation Economic Impact Assessment is being undertaken at a challenging time for the fishing industry. The landing obligation for demersal quota stocks is to be phased in from 1 January 2016 and represents a very substantial change in the management of EU fisheries. One of the greatest challenges for the industry and government is that there is a great deal of uncertainty about the potential impact of the 'discard ban', and whether solutions exist that could help the demersal fishing fleet to avoid the situation of choke stocks. The concern over choke stocks is that they could significantly reduce a fleet's opportunity to catch its other available quota. This scenario analysis assumes that, if a choke point occurs as a result of insufficient quota for a stock, the affected PO will stop fishing in the relevant sea area.

The choke analysis provided in Interim Report One provided information on likely choke stocks and choke points for home nation fleet segments in the UK. The purpose of the scenario analysis is to consider how the exemptions and derogations proposed in Article 15, referred to as policy levers, could affect the impact of the landing obligation on the activity and business performance of the six main home nation fleet segments in the UK. In the scenario analysis the impact of the policy levers is tested against a baseline which includes quota uplift and a catch allowance for zero-TAC stocks.

The following points have been emphasised in the report and must be considered when reviewing the findings of the scenario analysis:

- The activity data which used in the bioeconomic model is from 2013. Therefore the discard rates and the ICES advice for stocks relates to 2013.
- The calculation of choke points is based on estimated catch data. Catch estimates includes landings and discards. However, discard rates are informed by a sample of trips and therefore there may be a difference between estimated and actual discard rates.
- The scenarios test policy levers that have not been defined or implemented yet. The project team has created the scenarios using the information available.
- The scenario analysis only considers the relative impact of the following policy levers: quota uplift, catch allowance for zero-TAC stocks, de minimis, interspecies flexibility and survivability. The scenario analysis does not consider the impact of fleet-based technological, operational or strategic solutions to address the issue of choke stocks or the use of additional policy levers.

Although the development of a bioeconomic model and scenario analysis in these conditions is challenging, with the introduction of the landing obligation imminent it was considered vital to better understand the scale of the challenge and, importantly, the extent to which policy levers might mitigate some of the negative impacts expected.

The six fleet segments analysed for this report are:

- England whitefish trawl/seine fleet;
- England nephrops trawl fleet;
- England beam trawl fleet;
- Northern Ireland nephrops trawl fleet;
- Scotland whitefish trawl/seine fleet; and
- Scotland nephrops trawl fleet.

10.1. SCENARIO DEFINITIONS

The scenario analysis for all six fleet segments incorporates eleven scenarios:

- Baseline Scenario B1 – this is the worst case scenario in the analysis. Baseline scenario B1 implements the landing obligation with only transitional rules in place i.e. no quota uplift or any additional policy adjustment.
- Baseline Scenario B2 – this builds on baseline scenario B1 and adds a catch allowance of 1.5% for zero-TAC stocks.
- Baseline Scenario B3 – baseline scenario builds on baseline scenario B2 and applies quota uplift to eligible stocks.

All further scenarios build on baseline scenario B3 and therefore include a catch allowance and quota uplift.

- Single policy lever scenario 1A – de minimis LAX is an interpretation of de minimis which exempts 5% of the total catch of a PO fleet segment from the landing obligation i.e. the exemption is not stock specific.
- Single policy lever scenario 1B – de minimis MID is an interpretation of de minimis which exempts up to 5% of the total catch of a stock from the landing obligation, as long as total UK discards do not exceed 5% of the EU TAC for the stock.
- Single policy lever scenario 1C – de minimis STRICT is an interpretation of de minimis which exempts up to 5% of the total catch of a stock from the landing obligation, as long as total UK discards do not exceed 5% of the UK TAC for the stock.
- Single policy lever scenario 2 – the interspecies flexibility derogation is applied under scenario 2. The scenario enables the catch of a stock that exceeds the quota held AND is a stock that is within safe biological limits can be covered by quota from another stock (up to a maximum of 9% per stock).
- Single policy lever scenario 3 – the survivability exemption is applied under scenario 3. The definition of survivability in the scenario analysis assumes that skates and rays, plaice, sole, lemon sole, dabs and turbot are exempt and can therefore be discarded.
- Combined policy lever scenario 4A – combines single policy levers defined under Scenarios 1A, 2 and 3 and applies them to baseline scenario B3.
- Combined policy lever scenario 4B – combines single policy levers defined under Scenarios 1B, 2 and 3 and applies them to baseline scenario B3.
- Combined policy lever scenario 4C – combines single policy levers defined under Scenarios 1C, 2 and 3 and applies them to baseline scenario B3.

10.2. FINDINGS

The summary findings presented below provide information on the impact of baseline scenario B3 and combined policy lever scenario 4B only. Baseline scenario B3 is expected to represent the most realistic baseline situation and combined policy lever scenario 4B is considered to reflect a reasonably realistic de minimis definition.

10.2.1. WHITEFISH TRAWL/SEINE FLEET IN 2016

The scenario analysis assumes that in 2016 only cod, haddock, whiting and saithe will be subject to the landing obligation for whitefish trawl/seine fleets. The scenario analysis was designed before the regional proposals were created.

Although four species are included in the scenario analysis for 2016, only two of these, saithe and whiting, are expected to have the potential to create a choke under baseline scenario B3.

Under baseline scenario B3 it is estimated that in 2016 the total revenue of both whitefish trawl/seine fleet segments (England and Scotland) could reduce from £132 million in 2013 to £107.6 million (81% of 2013 revenue). Under combined policy lever scenario 4B the outlook would be substantially improved and revenue could reach £149.6 million, which would equate to 113% of the revenue earned by the fleet segment in 2013. Although choke stocks would still exist under all single and combined policy lever scenarios in 2016, the choke points are very close to the number of days actually fished in 2013 and, with quota uplift, fish that would previously have been discarded could be landed and sold, generating additional revenue.

10.2.2. WHITEFISH TRAWL/SEINE FLEET IN 2019

In 2019 all demersal quota stocks will be subject to the landing obligation. Under baseline scenario B3 it is estimated that in 2019 the total revenue of both whitefish trawl/seine fleet segments (England and Scotland) could reduce from £132 million in 2013 to £57.7 million (44% of 2013 revenue). Under combined policy lever scenario 4B the outlook would be substantially improved and it is estimated that, should this scenario be implemented as envisaged, revenue could reach £124.6 million, which would equate to 94% of revenue earned by the Scotland and England fleet segments in 2013.

There are several possible choke stocks that would affect the fleet segment under combined scenario 4B but hake, ling, megrim and saithe feature highly in the top five list of chokes in both Area IV and Area VI under scenario 4B. Pollack and whiting 7B-K would be the only choke stocks in Area VII for the England whitefish trawl/seine fleet.

Under the combined policy lever scenarios, survivability would be of significant benefit to both Scotland and England whitefish fleet segments in 2019 as it removes flatfish as potential choke stocks which enables interspecies flexibility and stock specific de minimis policy levers to be more effective.

10.2.3. NEPHROPS TRAWL FLEET IN 2016

In 2016 the scenario analysis assumes that only nephrops will be subject to the landing obligation for the nephrops trawl fleet segments. Once quota uplift is applied to nephrops there would be no requirement for policy lever scenarios to support the activity of the three home nation nephrops trawl segments as all three segments can fish at 2013 levels. Furthermore, the fleet segments could achieve revenue higher than in 2013 because, as a result of quota uplift, the fleet segment could sell catch that previously would have been discarded.

10.2.4. NEPHROPS TRAWL FLEET IN 2019

In 2019 all demersal quota stocks will be subject to the landing obligation. Under baseline scenario B3 it is estimated that in 2019 the total revenue of all three nephrops fleet segments (England, Northern Ireland and Scotland) could reduce from £75.3 million in 2013 to £8.8 million (12% of 2013 revenue). Under combined policy lever scenario 4B the outlook would be improved slightly and revenue could be £14.6 million (19% of 2013 revenue) in 2019.

Of the six fleet segments analysed, the three nephrops trawl fleet segments are expected to experience proportionately the greatest negative impact as a result of the landing obligation, under the assumptions of this modelling.

In all three home nation nephrops trawl fleet segments, de minimis LAX (scenario 1A) provides the greatest benefit. This is because de minimis LAX is not linked to a stock or TAC and can be used for all of the top choke stocks until the derogation is fully used by each PO. The benefit of de minimis LAX is even greater

under combined policy lever scenario 4A. The additional benefit would occur because the policy levers are working in combination and survivability exempts the majority of flatfish from the landing obligation. Therefore the impact of de minimis LAX in scenario 4A would be greater as, once flatfish are removed, the exemption would be divided between fewer potential choke stocks. The benefit of this would be most notable in the nephrops and beam trawl segments as flatfish frequently represent two or more of the top five choke stocks under the baseline scenarios. The only exception would be the England nephrops trawl fleet segment in Area VI which under baseline scenario B3 would have one flatfish in the top five choke stocks.

The nephrops trawl fleets benefit little from the other stock specific policy lever scenarios of de minimis MID, de minimis STRICT and interspecies flexibility. This lack of impact is the result of:

- choke stocks that are not within safe biological limits, such as ling, and therefore cannot benefit from interspecies flexibility; and
- stocks with very low TACs such as whiting 7A which means that stock specific de minimis scenarios (1B and 1C) can have little benefit.

10.2.5. BEAM TRAWL FLEET IN 2016

There is only one beam trawl fleet in the scenario analysis, the England beam trawl fleet. In 2016 the scenario analysis assumes that only plaice and sole will be subject to the landing obligation for the beam trawl fleet segment. Under baseline scenario B3 it is estimated that in 2016 the total revenue of the beam trawl fleet segment could reduce from £49.2 million in 2013 to £43.2 million (88% of 2013 revenues).

However, the definition adopted for the survivability scenario (scenario 3) in the analysis means that plaice and sole are exempt from the landing obligation. This means that the fleet segment can continue to fish for the same number of days that were fished in 2013. Furthermore, as a result of quota uplift, the fleet segment could sell catch that previously would have been discarded.

Under combined policy lever scenario 4B, which incorporates the survivability policy lever, revenue could reach £54.3 million, which would equate to 111% of the revenue earned by the fleet segment in 2013. There would be no choke stocks under any of the combined scenarios due to the inclusion of the survivability policy lever. The worst outcome for the fleet under a policy lever scenario would be under interspecies flexibility (scenario 2) which estimates that revenue in 2016 could be 92% of 2013 revenue.

10.2.6. BEAM TRAWL FLEET IN 2019

In 2019 all quota demersal stocks will be subject to the landing obligation. However, the scenario analysis suggests that the revenue of the beam trawl fleet could remain strong under the combined policy levers.

Under baseline scenario B3 it is estimated that in 2019 the total revenue of the beam trawl fleet segment could reduce from £49.2 million in 2013 to £22.3 million (45% of 2013 revenues). Under combined policy lever scenario 4B the outlook would be substantially improved and it is estimated that, should this scenario be implemented as envisaged, revenue could reach £50 million, which would exceed the revenue earned by the fleet in 2013 and equate to 102% of 2013 revenue. Even under this scenario choke stocks exist in 2019 however the estimated choke point would be close to the fleet's actual days at sea in 2013.

With flatfish stocks exempt from the landing obligation under scenario 3, the fleet benefits from the ability to use de minimis and interspecies flexibility to delay the choke point that could be caused by other stocks such as whiting and saithe.

10.3. CONCLUSIONS

The development of the bioeconomic model and scenario analysis have resulted in large and very complex analyses. This report provides information by home nation fleet segment, which includes aggregated analyses for 21 PO fleet segments. The analysis presented is based on the volume of landings at year end in 2013 and recorded discard rates.

The question which the scenario analysis sought to answer in relation to the landing obligation was ‘What are the potential different outcomes for the fleet depending on the introduction of various policy levers?’

The findings presented throughout the report and summarised above show that the potential benefit of the policy levers, as defined for the scenario analysis, vary substantially between different fleet segments and in different sea areas. Therefore, each policy lever is seen to be more or less important for each fleet segment in each sea area.

The fleet segments that can benefit from the survivability exemption appear to gain the most. The benefit from survivability occurs because either targeted stocks are categorised as survivable (beam trawl fleet) or primary choke stocks are categorised as survivable (skate in Area IV for Scotland whitefish trawl and seine fleet).

The stock-specific de minimis scenarios (MID and STRICT) provide valuable benefit where potential choke stocks have a relatively high EU or UK TAC, however, the most significant benefit comes in cases when these scenarios are combined with interspecies flexibility and survivability.

In isolation, interspecies flexibility can only create benefit if the primary choke stock is considered to be in safe biological limits. In 2019, when all demersal quota stocks become subject to the landing obligation, the potential of the interspecies flexibility scenario to have an impact is significantly reduced as more bycatch stocks become the primary choke stock and limited scientific information means that many of these stocks cannot be classed as within safe biological limits. The analysis shows that in 2019, across all six fleet segments, interspecies flexibility would only provide a benefit, when working in isolation, for the Scotland whitefish fleet in Area VI, when hake is identified as the primary choke stock in the baseline scenario. However, interspecies flexibility can be a valuable policy lever from 2019 when used in combination with other policy levers.

Even considering the benefit of the most generously defined policy levers, the analysis shows that a significant volume and value of quota could remain uncaught as a result of the landing obligation (£147.4 million of uncaught UK TAC in 2019 under combined policy lever scenario 4B). Fleet-based solutions to avoid choke stocks, such as technological, strategic or operational changes that are driven by vessel owners, will be vital to avoid the short term economic cost to the UK of uncaught TAC.

In conclusion, baseline scenario B3 presents the potential outlook without the benefit of policy lever scenarios and also without the benefit of fleet-based solutions. The outputs of baseline scenario B3 is in many cases dramatic when compared to actual fleet activity and performance in 2013. However, analyses of the combined policy lever scenarios show that substantial benefit could be achieved for the whitefish trawl/seine fleets and the beam trawl fleet – if the implementation turns out to resemble our scenario definitions (Figure 10-1).

However, the policy levers appear unable to mitigate the substantial impact of the landing obligation on the nephrops trawl fleets (Figure 10-1). The analysis shows that mitigation of the impact of the landing obligation in these fleet segments is likely to be dependent on fleet-based solutions or an alternative policy approach.

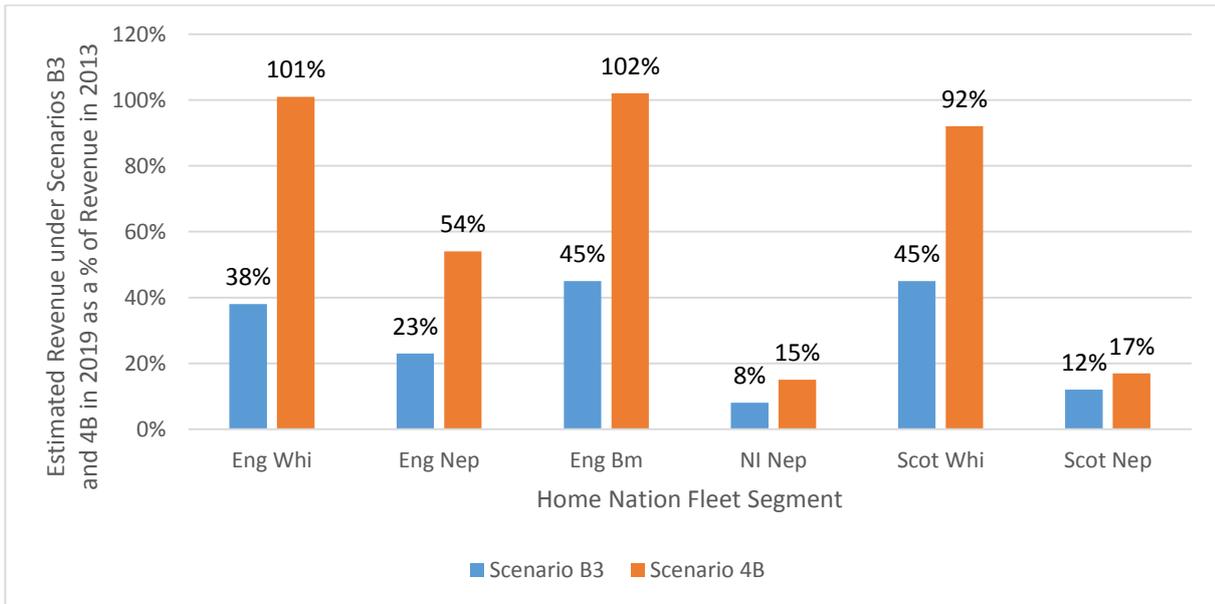


Figure 10-1: Estimated Revenue of each Home Nation Fleet Segment in 2019 as a percentage of revenue earned in 2013, under baseline scenario B3 and combined scenario 4B.

Note: The revenue estimates in this analysis include revenue from activities in addition to landings of demersal quota stocks

APPENDIX A: BIOECONOMIC MODEL METHODOLOGY

The landing obligation economic impact assessment bioeconomic (LOEB) model has been developed to support the decision making process for the implementation of the landing obligation to identified demersal fleets in the UK. The approach models the landing obligation under the basic premise that fishing for a fleet will stop when the first quota stock's allocation of quota is reached (the choke point). In addition, policy instruments such as inter-species flexibility, quota uplift, de minimis and survivability measures are also modelled. These are then investigated in different combinations forming scenarios. The outcome is one where fleet activity and profitability are simulated. It enables the investigation of the landing obligation under different scenarios. The LOEB model developed here uses the same foundations as Fishrent¹¹ to provide an analysis of the landing obligation EIA for the UK catching segment.

The LOEB model is not a micro-management tool. For example, it does not estimate the potential impacts of the landing obligation on individual fishing vessels but on the fleet as a whole. Thus the averaging assumptions used may not contain specific local detail (e.g. by port) but will be indicative of general effects.

An overview of the main components of the model are presented below.

The LOEB model is presented in Table A1. As shown, four modules link together to describe the fisheries modelled. In each module the key components and their relationships are indicated with dimensions of fleet (f), stock (s) and year (y).

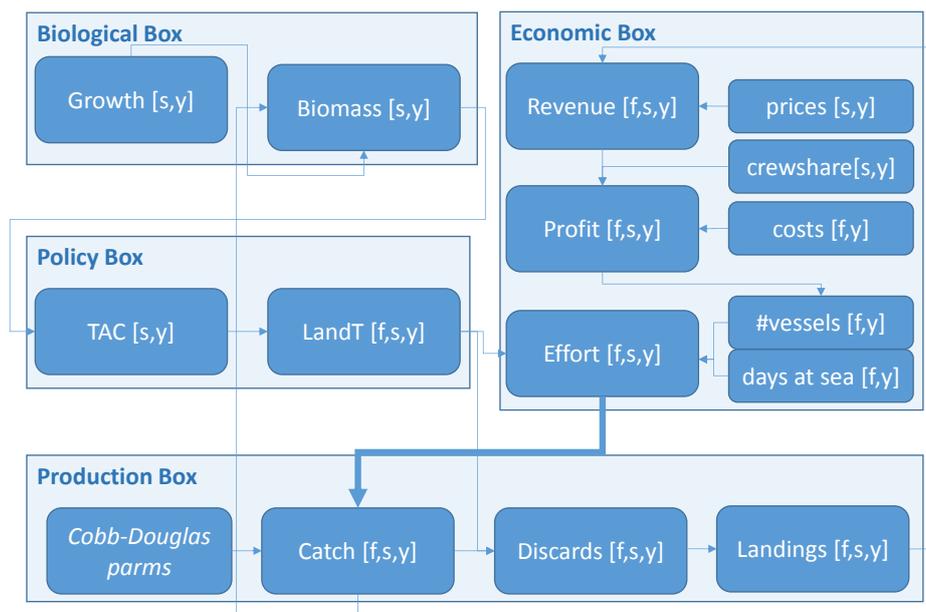


Table A1. LOEB model structure including key components, dimensions and relationships.

The **biological box** contains two important calculations, namely biomass and growth. The biology in Fishrent is based on the idea of a mass balance equation, that is, the biomass of a stock in the current year equals the biomass plus growth minus catch of that stock in the previous year. In Fishrent, growth is parameterised to historic data. There are 51 stocks modelled.

The **production box** simulates the catch attained from a given year's fishing effort and stock biomass with a parameterised catchability (q) by fleet and stock. Catch is then calculated using the standard approach of

¹¹ Salz P., E. Buisman, H. Frost, P. Accadia, R. Prellezo and K. Soma. 2010. Study on the remuneration of spawning stock biomass. EU Study Final Report, Framian: 298 pages.

catchability multiplied by effort multiplied by stock biomass. Note that total catch of a stock (feeding into the above biological box) can be calculated using the assumption that fleets outside the model (e.g. other Member States) continue fishing at levels similar to current. Note that for any stock where sufficient recruitment and biomass data is not available then catch per unit effort is implemented.

The **policy box** controls the identification of total allowable catches (TACs) and the calculation of fishing effort to meet the TACs under two different policy conditions:

TACmin: the most restrictive TAC is used to determine the level of effort that a fleet can exert,

TACmax: the least restrictive TAC is used to determine the level of effort that a fleet can exert.

So, in both cases the effort required for a fleet segment to catch its quota of each stock is calculated. TACmin is identified as the MINIMUM effort across a fleet segment's stocks, i.e. simulating a choke stock stopping fishing at the lowest effort required to meet the quota of at least one stock. TACmax is identified as the MAXIMUM effort, i.e. simulating the effect that all quota can be caught with any over-quota catch identified as discards.

The target TAC for each stock in a given year is firstly identified based on a calculation using the standard Baranov equation as used in stock assessments taking account of target fishing mortality (e.g. F_{MSY}) and natural mortality (i.e. M) of a stock. A limit is imposed in the model that a TAC cannot change by more than a given percentage (e.g. 5%) year on year. Each TAC by stock and year is then allocated across fleets modelled based on historic TAC share (i.e. TACsh) towards relative stability. With the TAC share estimated, the level of effort required to catch that amount of stock (i.e. target Effort) can be calculated. With the TACmin identified for a fleet, policy levers (such as de minimis, survivability and/or inter-species quota) can be overlaid to adjust effort to allow for the implementation of the exemption thus enabling increased catch to closer achieve the TAC share.

The **economic box** identifies the effort in each year for each fleet based on the above and calculates the revenue of fleets, from landings and prices, as well as additional revenue from other species. Crew costs are based on a proportion of revenue, variable costs of the number of days fished (i.e. Effort) and fixed and capital costs on the number of vessels in a fleet. Gross cash flow (or operating profit) and net profit can then be calculated directly.

Data required for the key fleets and stocks modelled includes:

- Economic data (by fleet segment) – number of vessels, average days at sea, vessel price, investment parameters, fuel price, other fishing revenue, variable costs, fixed costs, crew costs, fuel costs, capacity costs
- Management data (by stock and fleet segment) – TAC share, vessel catch composition
- Biological data (by stock) – biomass, recruitment parameters, fishing and natural mortalities
- Production data (by stock and fleet segment) – catchabilities, catch parameters, discard parameters (for undersized/overquota catch), fish prices.

The assumptions and parameters regarding stock biomass in any given year are developed using ICES and STECF data where available. The economic data for UK fleets is held by Seafish and is used at the level defined in the fleet segments identified. The economic data categories used in the above model specification are consistent with data held by Seafish and prepared for the EU data collection framework.

APPENDIX B: DISCARD RATES

Area	Stock	England Beam Trawl	England Whitefish	England Nephrops	N. Ireland Nephrops	Scotland Whitefish	Scotland Nephrops
IV	Haddock	0.0%	8.9%	15.8%	15.8%	8.8%	15.9%
IV	Cod	48.2%	23.0%	70.7%	70.7%	24.0%	73.1%
IV	Whiting	99.2%	20.3%	30.2%	30.2%	19.6%	30.1%
IV	Saithe	0.0%	39.8%	16.8%	16.8%	39.0%	16.8%
IV	Plaice	91.7%	34.5%	72.4%	72.4%	38.6%	76.0%
IV	Hake	0.0%	36.2%	93.6%	93.6%	36.1%	94.1%
IV	Anglerfish	0.0%	1.2%	1.6%	1.6%	0.8%	1.6%
IV	Megrim	0.0%	7.5%	3.8%	3.8%	7.5%	3.7%
IV	Nephrops	0.0%	0.5%	0.1%	0.1%	5.7%	5.7%
IV	Lemon Sole	0.0%	10.0%	55.7%	55.7%	10.0%	55.7%
IV	Dabs	0.0%	95.0%	95.0%	95.0%	95.0%	95.0%
IV	Turbot	0.0%	0.0%	60.2%	60.2%	0.0%	60.2%
IV	Skate	0.0%	60.6%	95.0%	95.0%	60.6%	95.0%
IV	Sole	13.9%	7.0%	14.1%	14.1%	0.0%	21.7%
IV	Ling	0.0%	31.5%	54.5%	54.5%	31.5%	55.4%
IV	Tusk	0.0%	38.8%	95.0%	95.0%	38.8%	95.0%
VI	Haddock 6A	0.0%	7.3%	28.1%	28.1%	7.3%	28.1%
VI	Haddock 6B	0.0%	7.3%	28.1%	28.1%	7.3%	28.1%
VI	Cod 6A	0.0%	66.7%	95.0%	95.0%	66.7%	95.0%
VI	Cod 6B	0.0%	66.7%	95.0%	95.0%	66.7%	95.0%
VI	Whiting	0.0%	46.2%	96.9%	96.9%	46.2%	96.9%
VI	Saithe	0.0%	26.4%	95.0%	95.0%	26.4%	95.0%
VI	Plaice	0.0%	30.7%	95.0%	95.0%	30.7%	95.0%
VI	Hake	0.0%	55.7%	93.5%	93.5%	55.7%	93.5%
VI	Anglerfish	0.0%	1.5%	6.5%	6.5%	1.5%	6.5%
VI	Megrim	0.0%	60.2%	65.7%	65.7%	60.2%	65.7%
VI	Nephrops	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
VI	Ling	0.0%	25.3%	95.0%	95.0%	25.3%	95.0%
VI	Boarfish	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
VI	Sole	0.0%	0.0%	95.0%	95.0%	0.0%	95.0%
VI	Pollack	0.0%	0.0%	95.0%	95.0%	0.0%	95.0%
VII	Cod 7A	4.1%	2.7%	0.0%	66.0%	2.7%	0.0%
VII	Cod 7D	4.1%	2.7%	0.0%	0.0%	2.7%	0.0%
VII	Whiting 7A	31.7%	16.7%	95.0%	98.0%	16.7%	95.0%
VII	Whiting 7B-K	31.7%	16.7%	95.0%	55.1%	16.7%	95.0%
VII	Haddock 7A	14.1%	19.7%	0.0%	58.0%	19.7%	0.0%
VII	Haddock 7B-K	14.1%	19.7%	0.0%	0.0%	19.7%	0.0%
VII	Anglerfish	0.0%	0.0%	0.0%	4.0%	0.0%	0.0%
VII	Megrim	9.2%	3.6%	0.0%	0.0%	3.6%	0.0%
VII	Nephrops	74.0%	0.0%	2.8%	14.0%	0.0%	2.8%
VII	Pollack	0.0%	2.3%	0.0%	0.0%	2.3%	0.0%
VII	Saithe	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
VII	Plaice 7A	18.3%	45.6%	85.0%	90.0%	45.6%	85.0%
VII	Plaice 7DE	18.3%	45.6%	85.0%	85.0%	45.6%	85.0%
VII	Plaice 7FG	18.3%	45.6%	85.0%	85.0%	45.6%	85.0%
VII	Plaice 7HJK	18.3%	45.6%	85.0%	85.0%	45.6%	85.0%
VII	Sole 7A	0.3%	1.5%	0.0%	12.0%	1.5%	0.0%
VII	Sole 7D	0.3%	1.5%	0.0%	0.0%	1.5%	0.0%
VII	Sole 7E	0.3%	1.5%	0.0%	0.0%	1.5%	0.0%
VII	Sole 7FG	0.3%	1.5%	0.0%	0.0%	1.5%	0.0%
VII	Sole 7HJK	0.3%	1.5%	0.0%	0.0%	1.5%	0.0%

Table B1: Discard rates used in the bioeconomic model for each fleet segment

Discard rates are from 2013 and were supplied by CEFAS, Marine Scotland and AFBI. For stocks where discard rates are not available the proxy assumptions developed for the choke analysis were used. Where recorded discard rates are 100% this has been replaced with 95% for modelling purposes.