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DEPARTMENT OF FOOD AND RESOURCE ECONOMICS
UNIVERSITY OF COPENHAGEN

IFRO Report

The economic consequences for the Danish fishery following the United Kingdom's decision to leave the European Union

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I Foreword, introduction and data

Foreword

The Department of Food and Resource Economics (IFRO), University of Copenhagen, agreed with a funded contract (MFVM Id nr.: 2703310) to undertake an analysis regarding the consequences for the Danish fishery following the United Kingdom's (UK) decision to leave the European Union (EU) (in Danish: Analyse af konsekvenserne for fiskeriet ved Storbritanniens udtræden af EU).

The contract entered into force by the 1st January 2017 with finalisation in June 2017.

The following from IFRO has been a part of the work: Professor Peder Andersen, Associate Professor Jesper Levring Andersen, Senior Researcher Ayoe Hoff and Scientific Assistant Lisa Ståhl. Associate professor emeritus Hans Staby Frost has participated in discussions about the approach to modelling.

At the beginning of the project period, a meeting was held with The Danish Fishermen's Association, The Danish Pelagic Producers Organization, Marine Ingredients Denmark, and Danish Seafood Association.

Introduction

The government of the UK officially announced the 29th March 2017 that UK would follow the outcome of the referendum vote to leave the European Union. A process, also referred to as "Brexit", has been initiated implying that UK will not be a member of the European Union by April 2019.

Fisheries will be an important part of the Brexit EU negotiation process, not only because of its macroeconomic importance, but because of its status as a sector, which supports livelihoods in many regions and in regions with few alternative employment possibilities.

In order to get the best possible foundation for discussing how to divide fisheries in the future between the EU and UK, an array of aspects is relevant to have knowledge about beforehand.

The purpose of this report is to describe some of these aspects in form of the primary interactions between the Danish fishing sector and UK with focus on the following:

1) The activity of Danish fishing vessels in the UK Economic Exclusive Zone (EEZ)
2) The activity of fishing vessels from the UK in EU waters
3) Quota interactions between the Danish and UK authorities
4) Export and import of fish products between Denmark and UK

Other aspects could also become a part of and influence these discussions, including for instance market access, trade agreements and control and enforcement.

The first part of the report gives a picture of the importance of the access to UK fishing waters for the Danish fishing vessels and the importance of import and export of fish products for the Danish processing industry. Based on the description, the second part of the report estimates the potential economic consequences of Brexit for the Danish fisheries (including a regional focus), the processing industry (downstream services), and the onshore services (upstream services). The analyses are presented for different scenarios regarding Danish vessels' future quotas and access to UK fishing grounds.

Data, information and definitions

The present analysis is based on several data sources.

The Danish Agrifish Agency hosts several databases with detailed information about the activity undertaken by Danish vessels. By combining the information from the logbook, sales notes, and vessel registers, it is possible to provide a comprehensive description of which vessels conduct the activity of interest, what they do and where the vessels land. The descriptions cover landings in live weight as well as in value.

Furthermore, the cost structures of the relevant vessels are obtained from the Danish Account Statistics for Fishery provided by Statistics Denmark. A range of other information is also used and referred to in the text, when relevant.

When undertaking the description and analysis in the following, it is important to highlight the distinction between zones. Thus, when referring to the economic exclusive zone of UK, it is referred to as UK-EEZ. Following Brexit, the remaining member states in the European Union will have a reduced fishing area under their jurisdiction. This area will be called NEW-EU-EEZ.

In order to separate landings from the UK-EEZ and other zones, primarily NEW-EU-EEZ and Norwegian zone, the International Council for the Exploration of the Sea (ICES) statistical rectangles are used. A range of these rectangles will be overlapping between the UK-EEZ and other zones. In these cases, landings are distributed evenly between the UK-EEZ and the relevant other zones.

Maps showing the ICES statistical rectangles, subdivisions, economic exclusive zones and countries are included in Annex 1 and Annex 2.

II Description of the Danish and United Kingdom fishing sector and interactions between them

In order to provide a context and starting point for the analysis, the following section describes the Danish fishery sector's dependency on Danish fishing vessels' access to UK fishing grounds, quota exchanges, import/export of fishing products, including UK vessels' landings in Danish ports and the importance for the Danish processing industry and the onshore service industry.

Danish fishing vessels fishing in UK zone

The Danish fisheries' dependence on the UK-EEZ in recent years is described in the following section. Of the total landings by Danish vessels, 27-34 % of the value and 31-45 % of live weight came from the UK-EEZ for the period 2012-2016. It was primarily larger vessels which landed fish from the UK-EEZ. Depending on the year, between 66 and 85 vessels were active in the UK-EEZ. For these vessels, the average importance of the UK-EEZ ranged between 43-57 % of their total landings value and 43-63 % of their total live weight landings. Analysing the activity in the UK-EEZ in more detail, 33-43 vessels depended on this EEZ for more than 15 % of their total landings value. These "15%-vessels" landed 98 % of the total Danish value and live weight from the UK-EEZ. They caught mostly herring and mackerel and landed their catches primarily in Skagen, Hirtshals, Thyborøn, and Hanstholm. Minor shares were landed in UK harbours. The description in this report thus focuses on these 15%-vessels since they could potentially be the most impacted by Brexit.

As a starting point for the analysis of the fishing activity in the UK-EEZ, the number of vessels actually having activity in the zone is identified. Table II.1 below therefore shows on a yearly basis the number of Danish fishing vessels having fished in the UK-EEZ from 2012 to 2016. Vessels are included in the table no matter how much they land from the UK-EEZ. Thus in 2012, 85 vessels fished in the UK-EEZ, while in 2016 this number was reduced to 66 vessels and it was primarily large vessels above 24 meters.

Table II.1 Number of Danish fishing vessels fishing in UK-EEZ

	2012		2013		2014		2015		2016	
<12m	1	1%	.	.	.	.	1	1%	.	.
12-15m	2	2%	2	2%	1	1%	1	1%		.
15-18m	8	9%	8	10%	6	8%	3	4%	1	2%
18-24m	18	21%	17	21%	14	19%	15	19%	10	15%
24-40m	26	31%	26	32%	26	35%	28	36%	25	38%
>40m	27	32%	28	35%	28	37%	28	36%	29	44%
Licensed fisheries	3	4%		0%		0%	1	1%	1	2%
Total	**85**	**100%**	**81**	**100%**	**75**	**100%**	**77**	**100%**	**66**	**100%**

Source: The Danish Agrifish Agency Vessel Register, Logbook and Sales Notes Register 14th Feb. 2017.

For the years 2012-2016, table II.2 shows total yearly landings by Danish vessels, the landings by Danish vessels having fished in the UK-EEZ and the latter vessels' dependency on the UK-EEZ, the NEW-EU-EEZ, the Norwegian zone and other zones.

The importance of the UK-EEZ at the overall level for Danish fishery is that on average 29% of the landings value comes from fishing in this area, while it for live weight is 36%. In the period, 27-34% of the landings value comes from fishing in this area, while it for live weight is 31-45% with a reducing share.

Comparing the total landings by vessels having had landings from the UK-EEZ to these vessels' landings from that zone, the importance is on average 49% in the period, being between 43-57% of landings value. For landings in live weight, the importance of the UK-EEZ is 49% on average, being between 41-63% with the smallest shares in the most recent years.

Table II.2 Landings by Danish vessels, their dependency on UK-EEZ and UK-EEZ active vessels' landings on areas

Landings value (1,000 DKK)												
Zone	2012		2013		2014		2015		2016		Average 2012-2016	
UK-EEZ by UK-EEZ active vessels	901,059	31%	1,015,159	34%	773,462	27%	910,904	27%	1,017,511	28%	923,619	29%
NEW-EU-EEZ by UK-EEZ active vessels	402,191	14%	431,512	14%	618,324	21%	772,433	23%	672,589	18%	579,410	18%
Norwegian by UK-EEZ active vessels	360,188	12%	326,054	11%	232,541	8%	387,566	11%	420,105	11%	345,291	11%
Other by UK-EEZ active vessels	5,766	0%		0%	75,682	3%	58,965	2%	24,338	1%	41,188	1%
Total by UK-EEZ vessels	1,669,203	57%	1,772,725	59%	1,700,009	58%	2,129,868	63%	2,134,543	58%	1,881,270	59%
Total by all Danish vessels	2,947,787	100%	3,026,654	100%	2,918,495	100%	3,404,765	100%	3,653,240	100%	3,190,188	100%
Landings live weight (tonnes)												
Zone	2012		2013		2014		2015		2016		Average 2012-2016	
UK-EEZ by UK-EEZ active vessels	199,693	40%	302,468	45%	237,337	32%	291,638	33%	208,625	31%	247,952	36%
NEW-EU-EEZ by UK-EEZ active vessels	102,828	20%	144,284	22%	263,813	35%	334,131	38%	248,964	37%	218,804	32%
Norwegian by UK-EEZ active vessels	34,942	7%	34,593	5%	16,090	2%	37,872	4%	40,901	6%	32,880	5%
Other by UK-EEZ active vessels	875	0%		0%	21,057	3%	11,635	1%	6,539	1%	10,027	1%
Total by UK-EEZ vessels	338,337	67%	481,345	72%	538,297	72%	675,276	77%	505,029	75%	507,657	73%
Total by all Danish vessels	502,702	100%	669,678	100%	745,139	100%	875,022	100%	674,283	100%	693,365	100%

Source: The Danish Agrifish Agency Vessel Register, Logbook and Sales Notes Register 14th Feb. 2017.

Having described the number of vessels fishing in the UK-EEZ and the overall dependency of the UK-EEZ for the Danish fishery, the next step is to focus on the vessels having high shares of landings from the UK-EEZ, and which will thus potentially experience substantial economic impacts, depending on the outcome of the Brexit negotiations.

In the following, the activity by vessels having more than 15% of their landings value from the UK-EEZ will therefore be described in detail. The 15%-vessels cover 98% of the total landings value from the UK-EEZ. The threshold of 15% is considered an appropriate level for concluding that if the accessibility to the UK-EEZ changes, it will negatively impact the economic performance of these vessels at a level which cannot directly be compensated via activity in other areas. Such compensation possibilities are considered more likely for the vessels below the 15%-dependency.

Table II.3 shows how many vessels have more than 15% of their total landings value in the UK-EEZ. Comparing to Table II.1, around 50% of the vessels fishing in the UK-EEZ fall under this threshold.

Table II.3 Number of Danish fishing vessels fishing in UK-EEZ with 15%-dependency

	2012		2013		2014		2015		2016	
18-24m	4	11%	5	12%	3	8%	3	7%	1	3%
24-40m	7	19%	10	23%	9	24%	10	24%	9	27%
>40m	25	68%	28	65%	25	68%	28	68%	23	70%
Licensed fisheries	1	3%		0%		0%		0%		0%
Total	**37**	**100%**	**43**	**100%**	**37**	**100%**	**41**	**100%**	**33**	**100%**

Source: The Danish Agrifish Agency Vessel Register, Logbook and Sales Notes Register 14th Feb. 2017.

Focusing only on these 15%-vessels of course implies that some landings from the UK-EEZ will not be included in the forthcoming analysis. Table II.4 displays the magnitude of this concentrated focus.

Table II.4 Landings distributed on UK-EEZ 15%-vessels and non-15%-vessels

Landings value (1,000 DKK)										
	2012		2013		2014		2015		2016	
Total UK-EEZ 15%-vessels	879,011	98%	999,671	98%	751,409	97%	887,162	97%	982,276	97%
Total UK-EEZ non-15%-vessels	22,048	2%	15,487	2%	22,053	3%	23,742	3%	35,235	3%
Total	**901,059**	**100%**	**1,015,158**	**100%**	**773,462**	**100%**	**910,904**	**100%**	**1,017,511**	**100%**
Landings live weight (tonnes)										
	2012		2013		2014		2015		2016	
Total UK-EEZ 15%-vessels	195,645	98%	301,201	100%	231,264	97%	287,543	99%	200,759	96%
Total UK-EEZ non-15%-vessels	4,048	2%	1,267	0%	6,073	3%	4,095	1%	7,865	4%
Total	**199,693**	**100%**	**302,468**	**100%**	**237,337**	**100%**	**291,638**	**100%**	**208,624**	**100%**

Source: The Danish Agrifish Agency Vessel Register, Logbook and Sales Notes Register 14th Feb. 2017.

Thus, the 15%-vessels accounts for more than 96% of the value and live weight from UK-EEZ landings over the period.

Table II.5 shows the dependency of the UK-EEZ for the 15%-vessels. 53-71% of the landings value is from the UK-EEZ with smaller shares in the latest years, while 68-47% of the live weight landings is from the UK-EEZ also with smaller shares in years that are more recent. The 15 %-vessels' specific catches by species are shown in Table II.6 below.

Table II.5 Landings by the 15%-vessels distributed on zones

Landings value (1,000 DKK)										
Zone	2012		2013		2014		2015		2016	
UK-EEZ	879,011	69%	999,671	71%	751,409	60%	887,162	53%	982,276	60%
NEW-EU-EEZ	205,662	16%	271,247	19%	352,331	28%	581,338	35%	394,190	24%
Norwegian zone	175,598	14%	144,085	10%	68,130	5%	157,220	9%	236,517	14%
Other zones	5,766	0%		0%	75,682	6%	54,530	3%	24,240	1%
Total UK-EEZ 15%-vessels	**1,266,037**	**100%**	**1,415,004**	**100%**	**1,247,552**	**100%**	**1,680,249**	**100%**	**1,637,223**	**100%**
Landings live weight (tonnes)										
Zone	2012		2013		2014		2015		2016	
UK-EEZ	195,645	66%	301,201	68%	231,264	54%	287,543	47%	200,759	51%
NEW-EU-EEZ	75,371	25%	119,767	27%	173,470	40%	294,285	48%	162,674	41%
Norwegian zone	24,191	8%	22,600	5%	5,656	1%	23,846	4%	30,156	8%
Other zones	875	0%		0%	21,057	5%	11,384	2%	3,320	1%
Total UK-EEZ 15%-vessels	**296,082**	**100%**	**443,568**	**100%**	**431,446**	**100%**	**617,058**	**100%**	**396,909**	**100%**

Source: The Danish Agrifish Agency Vessel Register, Logbook and Sales Notes Register 14th Feb. 2017.

The composition of species caught in the UK-EEZ by the 15%-vessels is shown in Table II.6 together with their share of the vessels' landings from the UK-EEZ as shown in Table II.5. In this period, herring and mackerel are the most important species landed from the UK-EEZ. Sandeel is also important, but fluctuates between the years. The importance of demersal species such as cod and hake in the UK-EEZ, although important species in the Danish fishery in general, is low and varies over the years.

Table II.6 Landings of top 10 species in 2016 from the UK-EEZ by the 15%-vessels, measured by value, and share of total landings from the UK-EEZ by the 15%-vessels in table II.5

Landings value (1,000 DKK)										
Species	2012		2013		2014		2015		2016	
Herring	431,808	49%	374,979	38%	327,891	44%	326,280	37%	494,697	50%
Mackerel	261,860	30%	253,041	25%	250,238	33%	216,613	24%	257,266	26%
Blue whiting	5	0%	2,754	0%	27,192	4%	13,780	2%	49,162	5%
Norway pout	60,328	7%	43,039	4%	41,550	6%	20,191	2%	44,940	5%
Sandeel	63,158	7%	281,594	28%	58,814	8%	222,302	25%	26,459	3%
Cod	4,837	1%	5,156	1%	6,754	1%	9,550	1%	25,224	3%
Hake	1,544	0%	3,266	0%	1,694	0%	12,744	1%	24,837	3%
Horse mackerel	7,773	1%	14,042	1%	9,000	1%	20,291	2%	16,100	2%
Monkfish	3,145	0%	2,091	0%	3,788	1%	4,576	1%	14,642	1%
Saithe	2,670	0%	3,232	0%	4,357	1%	4,709	1%	8,876	1%
Total	**879,011**	**95%**	**999,671**	**98%**	**751,409**	**97%**	**887,162**	**96%**	**982,276**	**98%**

Table II.6, continued

Landing live weight (tonnes)										
Species	2012		2013		2014		2015		2016	
Herring	86,062	44%	103,184	34%	102,155	44%	81,785	28%	96,652	48%
Mackerel	35,672	18%	30,972	10%	34,826	15%	35,314	12%	34,484	17%
Blue whiting	15	0%	923	0%	16,567	7%	7,917	3%	20,876	10%
Norway pout	25,145	13%	30,036	10%	27,296	12%	10,850	4%	23,743	12%
Sandeel	32,414	17%	128,350	43%	41,394	18%	131,684	46%	13,284	7%
Cod	235	0%	256	0%	333	0%	429	0%	1,114	1%
Hake	121	0%	231	0%	138	0%	849	0%	1,560	1%
Horse mackerel	1,240	1%	2,327	1%	1,434	1%	3,155	1%	2,674	1%
Monkfish	111	0%	62	0%	112	0%	128	0%	473	0%
Saithe	244	0%	326	0%	417	0%	397	0%	772	0%
Total	**195,645**	**93%**	**301,201**	**98%**	**231,264**	**97%**	**287,543**	**95%**	**200,759**	**97%**

Source: The Danish Agrifish Agency Vessel Register, Logbook and Sales Notes Register 14th Feb. 2017.

Given that the UK-EEZ covers a vast fishing area with different distances for the Danish vessels, Table II.7 shows which ICES subdivisions are the most important for the 15%-vessels. It is mainly North Sea fishing areas, which are important to these vessels.

Table II.7 Landings distributed on ICES subdivisions by the 15%-vessels

Landings value (1,000 DKK)										
Sub-division	2012		2013		2014		2015		2016	
2A		0%	1,371	0%	10,679	1%	1,662	0%		0%
4A	542,014	62%	588,594	59%	418,120	56%	488,106	55%	686,773	70%
4B	313,894	36%	378,519	38%	<173,077	23%	335,706	38%	121,367	12%
4C	593	0%	2,532	0%	144	0%	15,948	2%	1,429	0%
5B					2	0%	145	0%	2,306	0%
6A			14,708	1%	139,485	19%	35,500	4%	154,590	16%
6B							4,400	0%	12,858	1%
7B							2,105	0%		
7D	5,779	1%	5,336	1%	2,420	0%	2,749	0%	286	0%
7E	2,656	0%	2,817	0%	2,339	0%	841	0%	2,431	0%
7G					671	0%				
7H	5,585	1%	4,057	0%	3,172	0%	1	0%	238	0%
7J	8,490	1%	1,738	0%	1,299	0%				
Total	**879,011**	**100%**	**999,672**	**100%**	**751,408**	**100%**	**887,163**	**100%**	**982,278**	**100%**

Table II.7, continued

Landings live weight (tonnes)										
Sub-division	2012		2013		2014		2015		2016	
2A		0%	144	0%	1,753	1%	238	0%		0%
4A	101,131	52%	137,204	46%	119,200	52%	103,964	36%	123,172	61%
4B	85,596	44%	156,632	52%	76,118	33%	161,069	56%	35,984	18%
4C	207	0%	1,388	0%	81	0%	9,068	3%	726	0%
5B		0%		0%	1	0%	83	0%	973	0%
6A		0%	2,795	1%	29,455	13%	8,396	3%	32,923	16%
6B		0%		0%		0%	2,500	1%	5,550	3%
7B		0%		0%		0%	1,243	0%		0%
7D	933	0%	929	0%	505	0%	587	0%	140	0%
7E	416	0%	496	0%	878	0%	395	0%	1,181	1%
7G		0%		0%	200	0%		0%		0%
7H	2,888	1%	845	0%	2,152	1%		0%	111	0%
7J	4,473	2%	769	0%	920	0%		0%		0%
Total	**195,644**	**100%**	**301,202**	**100%**	**231,263**	**100%**	**287,543**	**100%**	**200,760**	**100%**

Source: The Danish Agrifish Agency Vessel Register, Logbook and Sales Notes Register 14th Feb. 2017.
Note: See Annex 2 for geographical location of the ICES-subdivisions.

Four Danish harbours receive landings of fish from the UK-EEZ by the 15%-vessels as shown in Table II.8. Skagen receives the most of these landings, more than three times the amount landed in Hanstholm. Herring is the primary species landed in Skagen together with some species for reduction used for the production of fishmeal and oil (sandeel and blue whiting). Herring and mackerel are the most important species in Hirtshals, species for reduction, a bit of herring and minor amounts of demersal species are landed in Thyborøn, while landings of demersal species primarily occur in Hanstholm.

Table II.8 Landings from the UK-EEZ to Danish harbours by the 15%-vessels

Landings value (1,000 DKK)										
Harbour	2012		2013		2014		2015		2016	
Skagen	168,669	35%	235,594	39%	141,814	42%	210,150	38%	244,565	43%
Hirtshals	189,427	39%	119,419	20%	80,599	24%	90,640	16%	161,114	28%
Thyborøn	100,628	21%	172,453	29%	67,048	20%	170,615	31%	96,521	17%
Hanstholm	28,520	6%	76,621	13%	46,926	14%	78,768	14%	72,174	13%
Esbjerg		0%	201	0%		0%	6	0%		0%
Hvide Sande	1,639	0%		0%	1,411	0%	483	0%		0%
Total	**488,883**	**100%**	**604,288**	**100%**	**337,798**	**100%**	**550,662**	**100%**	**574,374**	**100%**
Landings live weight (tonnes)										
Harbour	2012		2013		2014		2015		2016	
Skagen	42,409	34%	80,451	36%	58,719	41%	72,918	33%	58,677	44%
Hirtshals	28,098	23%	25,347	11%	20,550	14%	21,014	10%	27,776	21%
Thyborøn	43,649	35%	88,653	40%	43,381	30%	93,520	43%	38,719	29%
Hanstholm	9,021	7%	29,175	13%	20,478	14%	31,528	14%	8,784	7%
Esbjerg		0%	88	0%		0%	3	0%		0%
Hvide Sande	39	0%		0%	996	1%	315	0%		0%
Total	**123,216**	**100%**	**223,714**	**100%**	**144,124**	**100%**	**219,298**	**100%**	**133,956**	**100%**

Source: The Danish Agrifish Agency Vessel Register, Logbook and Sales Notes Register 14th Feb. 2017.

The 15%-vessels also land some of their landings in UK harbours, cf. Table II.9. A minor amount of landings caught in other zones than the UK-EEZ is landed in UK harbours. Overall, the share of landings in UK harbours is low and between 2-9 % of value and 0-6 % of live weight.

Table II.9 Landings to UK harbours by the 15%-vessels and percentage of total landings by the 15%-vessels

Landings value (1,000 DKK)										
	2012		2013		2014		2015		2016	
Landings in UK harbours from non UK-EEZ	1,250	0%	6,611	0%	23,124	2%	10,301	1%	10,831	1%
Landings in UK harbours from UK-EEZ	107,536	8%	94,293	7%	72,379	6%	15,504	1%	60,607	4%
Total landings in UK harbours	108,785	9%	100,904	7%	95,503	8%	25,806	2%	71,438	4%
Total landings by 15%-vessels	**1,265,700**	**100%**	**1,415,004**	**100%**	**1,247,552**	**100%**	**1,680,249**	**100%**	**1,637,223**	**100%**
Landings live weight (tonnes)										
	2012		2013		2014		2015		2016	
Landings in UK harbours from non UK-EEZ	157	0%	779	0%	2,787	1%	1,418	0%	1,591	0%
Landings in UK harbours from UK-EEZ	18,323	6%	14,658	3%	12,382	3%	3,033	0%	10,115	3%
Total landings in UK harbours	18,480	6%	15,438	3%	15,168	4%	4,451	1%	11,707	3%
Total landings by 15%-vessels	**295,908**	**100%**	**443,568**	**100%**	**431,446**	**100%**	**617,058**	**100%**	**396,909**	**100%**

Source: The Danish Agrifish Agency Vessel Register, Logbook and Sales Notes Register 14th Feb. 2017.

Below, Table II.10 displays which UK harbours receive the landings, while Table II.11 shows which species are landed. The largest shares are landed in Lerwick and Peterhead, while the most landed species are mackerel and herring. As seen in Table II.11, the share of mackerel and herring landings by 15%-vessels in UK harbours is small compared to the total landings by these vessels.

Table II.10 Landings to specified UK harbours by the 15%-vessels and percentage of the landings to UK harbours

Landings value (1,000 DKK)										
Harbour	2012		2013		2014		2015		2016	
Lerwick	23,798	22%	68,048	67%	73,846	77%	22,060	85%	40,312	56%
Peterhead	79,208	73%	27,738	27%	18,166	19%		0%	27,905	39%
Fraserbourgh	1,982	2%	1,360	1%	449	0%		0%	2,924	4%
Grimsby	3,798	3%	3,758	4%	3,042	3%	3,746	15%	297	0%
Total	**108,786**	**100%**	**100,904**	**100%**	**95,503**	**100%**	**25,806**	**100%**	**71,438**	**100%**
Landings live weight (tonnes)										
Harbour	2012		2013		2014		2015		2016	
Lerwick	3,879	21%	9,260	60%	9,379	62%	4,111	92%	6,206	53%
Peterhead	13,921	75%	5,646	37%	5,205	34%		0%	4,865	42%
Fraserbourgh	395	2%	190	1%	280	2%		0%	610	5%
Grimsby	285	2%	342	2%	305	2%	339	8%	25	0%
Total	**18,480**	**100%**	**15,438**	**100%**	**15,169**	**100%**	**4,450**	**100%**	**11,706**	**100%**

Source: The Danish Agrifish Agency Vessel Register, Logbook and Sales Notes Register 14th Feb. 2017.

Table II.11 Landings to UK harbours specified by species by the 15%-vessels, top 5 species in 2016 measured by value, and percentage of total landings by 15%-vessels

Landings value (1,000 DKK)										
Species	2012		2013		2014		2015		2016	
Mackerel	28,927	2%	86,683	6%	77,836	6%	15,260	1%	37,481	2%
Herring	74,025	6%	8,801	1%	12,225	1%	6,340	0%	31,795	2%
Horse mackerel	9	0%		0%	13	0%		0%	1,262	0%
Norway pout	131	0%	1,662	0%	963	0%	453	0%	588	0%
Plaice	3,777	0%	3,719	0%	3,033	0%	3,734	0%	297	0%
Landings live weight (tonnes)										
Species	2012		2013		2014		2015		2016	
Mackerel	4,366	1%	10,838	2%	9,903	2%	2,250	0%	5,043	1%
Herring	13,705	5%	3,044	1%	4,210	1%	1,610	0%	6,116	2%
Horse mackerel	4	0%		0%	2	0%		0%	203	0%
Norway pout	50	0%	1,214	0%	657	0%	250	0%	311	0%
Plaice	284	0%	339	0%	305	0%	339	0%	25	0%

Source: The Danish Agrifish Agency Vessel Register, Logbook and Sales Notes Register 14th Feb. 2017.

Fishing in the ICES statistical rectangles divided between the UK-EEZ and NEW-EU-EEZ

The International Council for the Exploration of the Seas (ICES) has for statistical analysis standardized the division of sea areas into statistical rectangles measuring 30 times 30 nautical miles each. These rectangles have been used to divide the fishery activity between the UK-EEZ and NEW-EU-EEZ. However, in some circumstances a statistical rectangle cannot solely be allocated to the UK-EEZ or NEW-EU-EEZ. In this analysis, the fishing activity in these statistical rectangles has been divided to the UK-EEZ and NEW-EU-EEZ based on how much of the area is in each of these EEZs.

It can be argued that the fishery in these boarder rectangles takes place with some coincidence. It is thus relevant to consider how much fishing actually takes place within the divided rectangles. Table II.12 shows the distribution of landings value between the UK-EZZ and NEW-EU-EEZ for the divided rectangles, including the species caught.

Table II.12 Landings value divided between UK-EEZ and NEW-EU-EEZ within divided rectangles by the 15%-vessels (1,000 DKK)

	UK-EEZ					NEW-EU-EEZ				
	2012	2013	2014	2015	2016	2012	2013	2014	2015	2016
Herring	23,108	84,322	52,423	40,394	55,848	7,786	12,027	9,036	11,058	15,105
Sprat	10,050	2,175	2,033	12,952	5,405	15,646	9,505	17,237	53,466	23,373
Mackerel	46,050	19,141	17,794	16,314	9,731	418	2,936	1,366	656	2,658
Sandeel	1,653	15,585	5,716	6,017		419	11,151	1,548	6,762	
Horse mackerel	6,509	9,870	2,545	3,865	328	4,700	12,441	2,047	4,121	208
Boarfish	13,739	2,198	3,881	1	238	8,785	2,417	1,990	2	203
European hake	775	1,175	577	6,704	8,589	48	52	10	1,497	1,899
Norway pout		3,338	5,315	5,445	4,924		399	257	242	252
Cod	1,854	1,428	2,242	3,999	7,352	177	21	64	330	764
Plaice	1,642	2,451	2,794	2,705	2,591	1,024	602	1,578	782	312
Other species	4,815	3,082	10,409	10,523	15,135	1,249	170	1,058	3,257	3,585
Total divided rectangles	**110,195**	**144,766**	**105,729**	**108,918**	**110,140**	**40,252**	**51,722**	**36,192**	**82,173**	**48,358**
Total from EEZ	**879,011**	**999,671**	**751,409**	**887,162**	**982,276**	**205,662**	**271,247**	**352,331**	**581,338**	**394,190**

Source: The Danish Agrifish Agency Vessel Register, Logbook and Sales Notes Register 14th Feb. 2017.

In comparison to the total landings value, the landings value originating from the divided rectangles in the UK-EEZ and NEW-EU-EEZ respectively accounts for approximately 13% of the total landings value on average. Given the magnitude of the fishing activity in the divided rectangles, and the possible coincidence of this fishery, makes it relevant to consider in the analysis to come, what the impacts are if the landings from the UK-EEZ divided rectangles can be caught in the NEW-EU-EEZ instead.

Danish quota exchanges with UK

Every year, Denmark undertakes a range of quota exchanges with other countries, including the UK. There are several reasons for undertaking these exchanges. Generally, the countries involved must be expected to obtain a benefit from making an exchange. However, the actual background for the exchange can be driven by a range of reasons.

One reason for an exchange could be that the quotas are based on historical catch patterns. Therefore, the quotas are not adjusted to account for the actual situation for the individual countries. Thus, it happens regularly that a country ends up in a situation, in which some quotas are constraining and others are not. Therefore, in order to continue fishing, exchanges are made with countries, where this constraint is not a problem.

Another reason for exchanges could be better use of the various countries' fleet technology and activity distribution. Thus, instead of moving vessels around, it might be better to concentrate the activity in certain areas. This reduces expenses in relation to transportation time, but also the costs of shifting gear, if necessary.

In Table II.13, the total numbers of Danish quota exchanges in the period from 2012 to 2016 are shown, including the number specifically with UK. During the period, around 25% of all the Danish quota exchanges are made with UK, peaking in 2016.

Table II.13 Danish quota exchanges

	2012	2013	2014	2015	2016
Total number of quota exchanges with UK	23	33	31	30	47
Total number of quota exchanges overall	120	135	131	127	148
Share of UK exchanges (%)	19	24	24	24	32

Source: The Danish Agrifish Agency and the Fishery Data Exchange System (FIDES)-database.

The total Danish quotas by the end of the year for the period 2012-2016 were on average a bit below 900,000 tonnes. Measured in live weight, Table II.14 shows how much Denmark has transferred to other countries in total and to the UK specifically. On average, 9% of the transfers from Denmark have been to the UK, while the transfers from the UK to Denmark on average amount to 15%.

Table II.14 Danish quota exchanges in live weight (1,000 tonnes)

	2012	2013	2014	2015	2016	Total
Transfers from DK to UK	3,827	9,186	12,956	7,551	14,257	47,777
Total transfers from DK	76,849	147,007	105,704	102,755	77,946	510,260
Share of UK transfers (%)	5	6	12	7	18	9
Transfers from UK to DK	3,056	9,412	15,294	13,650	22,911	64,322
Total transfers to DK	65,228	98,763	103,872	84,249	84,549	436,661
Share of UK transfers (%)	5	10	15	16	27	15

Source: The Danish Agrifish Agency and the Fishery Data Exchange System (FIDES)-database.

Table II.15 and Table II.16 provide a more detailed view of the 10 most transferred quotas between Denmark and UK and vice versa. Measured in live weight, mackerel quota is the most transferred species, followed by sprat, where Denmark receives a larger amount than handed over to the UK. However, most of the transfers are in packages including several quotas, which are not necessarily the same. For instance, sprat is not necessarily exchanged with sprat, but with other quotas.

Table II.15 Danish quota transfers to the UK, 10 most important species in live weight (1,000 tonnes)

Species	2012	2013	2014	2015	2016	Total
Mackerel	344	872	6,280	3,700	7,350	18,546
Sprat	1,318	1,018	1,900	750	750	5,736
Horse mackerel	1,000	1,952	1,037	675	175	4,839
European hake	279	667	1,349	1,084	1,413	4,792
Blue whiting	390	1,730	1,490			3,610
Haddock	364	896	597	50		1,907
Herring				125	1,573	1,698
Norway Pout				4	1,632	1,636
Sandeel		1,472				1,472
Monk				514	811	1,324

Source: The Danish Agrifish Agency and the Fishery Data Exchange System (FIDES)-database.

Table II.16 UK quota transfers to Denmark, 10 most important species live weight (1,000 tonnes)

Species	2012	2013	2014	2015	2016	Total
Mackerel			4,550	7,610	11,388	23,548
Sprat	1,000	2,500	4,700	2,828	7,751	18,779
Sandeel	171	3,066	2,481	622	460	6,800
Saithe	3	983	1,628	763	875	4,252
Blue whiting	340	1,490	1,490		638	3,958
Herring	775	775		250	328	2,128
Horse mackerel	300			725	350	1,375
Monk	6			358	586	950
Cod	138	141	60	78	262	679
Haddock	170	170	25	25	3	393

Source: The Danish Agrifish Agency and the Fishery Data Exchange System (FIDES)-database.

Throughout the years, Denmark and the UK have exchanged quotas frequently. On many occasions, their fishing fleets operate in the same waters (primarily the North Sea), and this gives a range of reasons for exchanging quotas. At the overall level, Denmark receives more quota from the UK than vice versa, measured in live weight. However, despite mackerel being the most exchanged quota, many of the exchanges are for quotas of low value species primarily for reduction (sprat, horse mackerel, sandeel). Not being able to undertake such quota exchanges in the future can have an economic impact for the 15%-vessels especially, because these most exchanged species are also the most important species for their fishery.

Quota exchanges with the UK are to this extent important, given that on average, 9% of the Danish transfers goes to the UK, while 15% of the transfers to Denmark come from UK. However, the primary part of the exchanges is undertaken for species which are also primarily caught in the UK-EEZ. Thus, the future importance of exchanges for these species will to a high degree depend on the possibility for Danish vessels to fish in the UK-EEZ at all.

Having described the fishing activities taking place in relation to Danish and UK vessels, fishing area, and harbour interactions, the following sections describe the imports and exports of fish and fish products to and from Denmark in relation to the UK. Although this information does not feed into the economic analysis in the following chapter, it provides further contexts of the amounts and values of fish and fish products moving between the two countries.

Imports of fish to Denmark

In 2011-2015, Denmark on average imported 1,185 thousand tonnes of fish at a value of DKK 15.5 billion. By quantity, the most imported fish products were reduction species, fishmeal/oil, and whole saltwater fish. By value, the most important products were prepared/conserved products and whole saltwater fish. Of the fish imports to Denmark, 3 % of both quantity and value was imported from the UK, corresponding to 37 thousand tonnes with a value of 457 million DKK.

The total value of Danish fish imports was on average 15.5 billion DKK in the period 2011-2015. Of this, prepared or conserved fish made up 20% on average, followed by whole saltwater fish which made up 19% of the total import value, see Table II.17 (The Danish Agrifish Agency, 2017a).

Considering import quantities in Table II.17 below, total Danish imports were on average 1,185 tonnes in the years 2011-2015. Reduction fish made up the largest part (37%), followed by fishmeal, oil, etc. (19%), and whole saltwater fish (19%) (The Danish Agrifish Agency, 2017a).

Table II.17 Denmark's import of fish by category, 2011-2015, and as % of total Danish fish imports

Import value (1,000 DKK)												
Type	2011		2012		2013		2014		2015		Average 2011-2015	
Fresh water fish	1,859,207	13%	1,769,361	12%	2,223,547	14%	2,545,264	16%	2,499,619	14%	2,179,400	14%
Filet	1,948,590	14%	1,824,555	13%	2,128,838	14%	2,341,343	14%	2,235,740	13%	2,095,813	14%
Fishmeal, oil, etc,	2,048,550	15%	2,845,145	20%	2,035,841	13%	1,928,050	12%	1,955,881	11%	2,162,693	14%
Whole saltwater fish	2,423,858	18%	2,495,340	17%	2,926,984	19%	3,095,244	19%	3,598,405	21%	2,907,966	19%
Reduction fish	640,018	5%	478,919	3%	777,262	5%	869,014	5%	850,762	5%	723,195	5%
Crustaceans and molluscs	1,504,848	11%	1,553,813	11%	1,707,997	11%	1,881,574	11%	1,818,191	10%	1,693,284	11%
Salted, dried, smoked	487,757	4%	531,825	4%	657,233	4%	600,618	4%	899,583	5%	635,403	4%
Prepared or conserved	2,860,740	21%	2,963,046	20%	3,004,004	19%	3,127,471	19%	3,601,441	21%	3,111,340	20%
Total	**13,773,568**	**100%**	**14,462,004**	**100%**	**15,461,705**	**100%**	**16,388,577**	**100%**	**17,459,621**	**100%**	**15,509,095**	**100%**
Import quantity (1,000 tonnes)												
Type	2011		2012		2013		2014		2015		Average 2011-2015	
Fresh water fish	59	5%	63	6%	59	5%	69	6%	70	6%	64	5%
Filet	60	5%	55	5%	61	5%	63	5%	59	5%	59	5%
Fishmeal, oil, etc,	242	20%	321	29%	207	19%	211	17%	180	15%	232	20%
Whole saltwater fish	201	16%	181	17%	242	22%	230	18%	252	20%	221	19%
Reduction fish	505	41%	308	28%	368	33%	517	41%	525	42%	444	37%
Crustaceans and molluscs	64	5%	62	6%	64	6%	65	5%	55	4%	62	5%
Salted, dried, smoked	18	1%	20	2%	26	2%	21	2%	28	2%	23	2%
Prepared or conserved	84	7%	80	7%	83	7%	78	6%	71	6%	79	7%
Total	**1,233**	**100%**	**1,089**	**100%**	**1,109**	**100%**	**1,255**	**100%**	**1,240**	**100%**	**1,185**	**100%**

Source: The Danish AgriFish Agency database February 24th 2017 (The Danish AgriFish Agency, 2017a)

Table II.18 below show the value and quantity of Danish fish imports from the UK, based on The Danish Agrifish Agency (2017a). As seen in the table, of the total imports of fish to Denmark, fish from the UK made up 3% of the import value and quantity in 2011-2015.

The table also shows the imports of different categories of fish to Denmark from the UK. Denmark imported 37 thousand tonnes of fish from the UK on average in the years 2011-2015 with an average value of 457 million DKK. It is seen that in terms of both value and quantity, whole saltwater fish is the most imported fish category from the UK to Denmark. The import of whole saltwater fish from the UK had an average yearly value of 188 million DKK in the same time period. This corresponds to 6% of the total Danish imports of whole saltwater fish and 1.2% of overall fish imports to Denmark

in 2011-2015. Denmark imported on average 19 thousand tonnes whole saltwater fish yearly in 2011-2015. Whole saltwater fish from the UK thereby made up on average 9% of the total whole saltwater fish imports to Denmark and 1.6% of the total fish imports to Denmark in the years 2011-2015. Mackerel was also imported in the form of filets and in prepared/conserved form. Mackerel filets from the UK made up around half of imports of mackerel filets to Denmark and 0.1 % of the overall import value (The Danish Agrifish Agency, 2017a).

Table II.18 Denmark's import of fish from the UK, 2011-2015, and % of overall Danish imports of fish type (as shown in Table II.17)

Import value (1,000 DKK)												
Type	2011		2012		2013		2014		2015		Average 2011-2015	
Fresh water fish	21,393	1%	66,593	4%	102,131	5%	34,853	1%	37,454	1%	52,485	2%
Filet	37,639	2%	29,449	2%	47,695	2%	47,926	2%	40,855	2%	40,713	2%
Fishmeal, oil, etc.	46,475	2%	48,721	2%	9,311	0%	46,693	2%	9,536	0%	32,147	1%
Whole saltwater fish	159,111	7%	121,121	5%	185,217	6%	212,320	7%	262,885	7%	188,131	6%
Reduction fish	8,990	1%	4,680	1%	5,683	1%	46,503	5%	19,972	2%	17,165	2%
Crustaceans and molluscs	41,164	3%	35,233	2%	39,563	2%	26,285	1%	29,910	2%	34,431	2%
Salted, dried, smoked	5,322	1%	4,007	1%	7,054	1%	4,167	1%	4,233	0%	4,956	1%
Prepared or conserved	84,991	3%	67,067	2%	123,953	4%	82,626	3%	77,285	2%	87,184	3%
Total, from the UK	**405,085**	**3%**	**376,872**	**3%**	**520,606**	**3%**	**501,372**	**3%**	**482,129**	**3%**	**457,213**	**3%**
Import quantity (1,000 tonnes)												
Type	2011		2012		2013		2014		2015		Average 2011-2015	
Fresh water fish	1	1%	2	4%	3	5%	1	1%	1	1%	1	2%
Filet	2	4%	1	2%	2	3%	2	3%	2	3%	2	3%
Fishmeal, oil, etc.	4	2%	4	1%	0	0%	3	1%	0	0%	2	1%
Whole saltwater fish	12	6%	12	7%	17	7%	25	11%	30	12%	19	9%
Reduction fish	2	0%	2	1%	3	1%	27	5%	12	2%	9	2%
Crustaceans and molluscs	1	1%	1	1%	1	1%	0	1%	0	1%	1	1%
Salted, dried, smoked	0	0%	0	0%	0	1%	0	1%	0	0%	0	0%
Prepared or conserved	2	3%	2	3%	3	4%	2	3%	1	2%	2	3%
Total, from the UK	**24**	**2%**	**24**	**2%**	**28**	**3%**	**61**	**5%**	**46**	**4%**	**37**	**3%**

Source: The Danish AgriFish Agency database February 24th 2017 (The Danish AgriFish Agency, 2017a)

Table II.19 provides a more detailed overview of the saltwater fish category from the UK to Denmark. Whole UK mackerel make up the majority of imports of whole mackerel to Denmark. This import represents on average 66% of the total import value of whole mackerel to Denmark in the years 2011-2015 and 0.7% of the overall Danish fish imports. In terms of quantities, whole mackerel from the UK make up on average 70% of the total, whole, mackerel quantity imported to Denmark in 2011-2015 and 1.0% of the overall Danish fish imports. Besides as whole fish, mackerel was also imported as filet or as prepared/conserved mackerel products (The Danish Agrifish Agency, 2017a).

Table II.19 Whole saltwater fish import from UK, 2011-2015, and % of overall Danish import of fish species

Import value (1,000 DKK)												
Species	2011		2012		2013		2014		2015		Average 2011-2015	
Other fish	7,480	2%	7,302	3%	7,654	2%	5,931	2%	29,422	9%	11,558	4%
Other codfish	1,939	6%	1,238	3%	5,072	10%	7,312	13%	17,399	22%	6,592	13%
Flatfish	416	0%	743	0%	1,155	0%	2,204	0%	3,725	0%	1,648	0%
Haddock	774	1%	690	1%	16,722	13%	3,213	2%	3,984	3%	5,077	5%
Mackerel	111,389	61%	87,830	64%	95,482	60%	144,173	81%	107,103	60%	109,195	65%
Saithe	27,045	15%	14,724	9%	16,088	9%	14,722	9%	31,086	13%	20,733	11%
Herring	4,266	2%	6,672	3%	1,912	1%	2,797	1%	37,043	14%	10,538	5%
Cod	5,801	1%	1,922	0%	41,133	5%	31,967	3%	33,124	3%	22,789	3%
Total, saltwater fish from the UK	**159,111**	**7%**	**121,121**	**5%**	**185,217**	**6%**	**212,320**	**7%**	**262,885**	**7%**	**188,131**	**6%**
Import quantity (1,000 tonnes)												
Species	2011		2012		2013		2014		2015		Average 2011-2015	
Other fish	0.4	1%	0.1	0%	0.6	1%	0.3	1%	0.34	1%	0.4	1%
Other codfish	0.1	6%	0.1	3%	0.3	6%	0.4	12%	1.10	21%	0.4	11%
Flatfish	0.0	0%	0.1	0%	0.1	0%	0.2	1%	0.24	1%	0.1	0%
Haddock	0.0	1%	0.1	1%	1.1	12%	0.3	3%	0.34	4%	0.4	5%
Mackerel	8.2	60%	8.9	68%	10.0	65%	20.0	88%	15.08	64%	12.4	70%
Saithe	2.2	15%	1.2	9%	1.4	8%	1.2	8%	2.33	12%	1.7	11%
Herring	1.1	3%	1.3	3%	0.5	1%	0.8	1%	8.94	13%	2.5	5%
Cod	0.3	1%	0.1	0%	2.9	6%	1.8	3%	1.44	2%	1.3	3%
Total, saltwater fish from the UK	**12.4**	**6%**	**11.8**	**7%**	**17.1**	**7%**	**25.0**	**11%**	**29.80**	**12%**	**19.2**	**9%**

Source: The Danish AgriFish Agency database February 24th 2017 (The Danish AgriFish Agency, 2017a)

Of the overall imported quantities of fish products to Denmark of 1,185 thousand tonnes on average, the main type of fish products imported to Denmark were reduction fish, fishmeal/oil, and whole saltwater fish in 2011-2015. The total import value was 15.5 billion DKK on average. The most important fish imports by value were prepared/conserved fish products followed by whole saltwater fish. In this time period, Denmark imported on average 37 thousand tonnes of fish and fish products from the UK with an average value of 457 million DKK. The import to Denmark from the UK consisted primarily of whole saltwater fish. This quantity represented 9% of the total import of whole saltwater fish to Denmark and 6% of the value of imported whole saltwater fish on average. Of the overall import value and quantity to Denmark, the import of whole saltwater fish from the UK represented 1.2 and 2 % on average respectively. Of whole saltwater fish imported from the UK, mackerel was the most important one, making up 70% of the total imported quantity of whole mackerel to Denmark and 65% of the value of whole mackerel imports. Besides as whole fish, mackerel was also imported as filet or as prepared/conserved mackerel products. Other important whole saltwater fish from the UK in terms of quantity were herring, saithe, and cod while in terms of value they were cod, saithe, and herring (The Danish AgriFish Agency, 2017a).

Exports of fish from Denmark

In 2011-2015, Denmark on average exported 993 thousand tonnes of fish and fish products with a value of 21.5 billon DKK. Of this, 9 % of the quantity and 8 % of the value was exported to the UK. This corresponded to 87 thousand tonnes with a value of 1.7 billion DKK. By value, it was primarily fish in the form of prepared/conserved products, fishmeal/oil and whole saltwater fish that were important fish exports to the UK.

As seen in Table II.20 below (The Danish Agrifish Agency,2017a), Denmark's export of fish had an average yearly value of 21.5 billion DKK in the period 2011-2015. The categories of fish products most important in terms of value were prepared/conserved fish, whole saltwater fish, and fishmeal/oil with average fish export value shares of 20%, 20%, and 16% respectively. The average yearly volume exported from Denmark was 993 thousand tonnes. The most important fish categories in terms of quantity were fishmeal/oil, whole saltwater fish, and prepared/conserved fish with average export quantity shares of 34%, 27% and 11%, respectively (The Danish Agrifish Agency, 2017a).

Table II.20 Denmark's export of fish 2011-2015, and % of total Danish fish exports

Export value (1,000 DKK)												
Type	2011		2012		2013		2014		2015		Average 2011-2015	
Fresh water fish	1,488,068	8%	1,388,734	7%	1,532,293	7%	1,915,912	9%	2,058,534	8%	1,676,708	8%
Filet	3,012,112	15%	2,848,522	14%	3,072,790	14%	2,975,310	13%	3,161,022	13%	3,013,951	14%
Fishmeal, oil, etc.	3,301,938	17%	3,191,391	16%	3,456,111	16%	3,271,969	15%	3,912,376	16%	3,426,757	16%
Whole saltwater fish	3,524,853	18%	3,514,701	18%	4,212,290	20%	4,619,347	21%	5,245,623	22%	4,223,363	20%
Reduction fish	100,169	1%	38,631	0%	67,177	0%	50,569	0%	81,499	0%	67,609	0%
Crustaceans and molluscs	2,421,056	12%	2,780,735	14%	2,942,589	14%	3,038,757	14%	3,256,333	13%	2,887,894	13%
Salted, dried, smoked	1,739,566	9%	1,783,836	9%	1,978,640	9%	1,923,590	9%	2,030,503	8%	1,891,227	9%
Prepared or conserved	4,196,458	21%	4,265,068	22%	4,275,196	20%	4,314,144	20%	4,576,381	19%	4,325,449	20%
Total	**19,784,219**	**100%**	**19,811,618**	**100%**	**21,537,086**	**100%**	**22,109,599**	**100%**	**24,322,270**	**100%**	**21,512,959**	**100%**

Table II.20, continued

Export quantity (1,000 tonnes)												
Type	2011		2012		2013		2014		2015		Average 2011-2015	
Fresh water fish	43	5%	46	5%	44	4%	56	6%	59	6%	49	5%
Filet	73	8%	73	8%	76	7%	73	7%	73	7%	73	7%
Fishmeal, oil, etc.	386	40%	338	37%	316	30%	317	31%	327	32%	337	34%
Whole saltwater fish	198	21%	233	25%	298	28%	317	31%	312	31%	272	27%
Reduction fish	34	3%	9	1%	77	7%	14	1%	24	2%	31	3%
Crustaceans and molluscs	87	9%	87	9%	100	9%	88	9%	85	8%	89	9%
Salted, dried, smoked	29	3%	32	3%	40	4%	37	4%	39	4%	35	4%
Prepared or conserved	111	12%	101	11%	105	10%	109	11%	104	10%	106	11%
Total	**961**	**100%**	**917**	**100%**	**1.055**	**100%**	**1.010**	**100%**	**1.022**	**100%**	**993**	**100%**

Source: The Danish AgriFish Agency database February 24th 2017(The Danish AgriFish Agency, 2017a)

Table II.21 below provides an overview of Danish fish exports to the UK in 2011-2015. The value of fish products exported from Denmark to the UK was 1.7 billion DKK on average per year, while the exported quantity was 87 thousand tonnes on average. Fish exports to the UK thus represented 8% of the total Danish fish exports in terms of value and 9% in terms of volume.

In relation to the total exports from Denmark to the UK, prepared/conserved fish was the most important followed by fishmeal/oil and saltwater fish, both in terms of value and quantity (The Danish Agrifish Agency, 2017a). Exports of prepared/conserved shrimp to the UK made up 23% of the total Danish export value of prepared/conserved shrimp products and 2.1% of the total Danish fish export value, while prepared/conserved mackerel products to the UK made up 43% of the total Danish export value of prepared/conserved mackerel products and 0.8% of the total fish export value. In the 'whole saltwater fish' category, haddock and mackerel made up the largest parts. Exports of whole haddock to the UK thus made up both 58 % of export value and quantity of Danish haddock exports while it corresponded to 0.4 % of the total Danish fish export value. Whole mackerel to the UK corresponded to 23 % of the Danish export value of whole mackerel and 0.3 % of the value of the total Danish fish exports (The Danish Agrifish Agency, 2017a).

When comparing overall imports and exports, Danish exports to the UK were on average in 2011-2015 about 2 times larger than imports from the UK in terms of quantity and almost 4 times higher in terms of value. Mackerel was primarily imported from the UK in the form of whole mackerels and to a lesser extent as filets and prepared/conserved products. About two-thirds of the mackerel export to the UK was whole mackerel and about a third was prepared/conserved mackerel.

Table II.21 Denmark's export of fish to the UK, 2011-2015, and % of total Danish fish exports (as shown in Table II.20)

Export value (1,000 DKK)												
Type	2011		2012		2013		2014		2015		Average 2011-2015	
Fresh water fish	36,351	2%	41,501	3%	51,627	3%	28,382	1%	34,917	2%	38,556	2%
Filet	61,480	2%	126,085	4%	183,105	6%	73,265	2%	93,806	3%	107,548	4%
Fishmeal, oil, etc.	578,123	18%	273,998	9%	325,316	9%	331,022	10%	340,916	9%	369,875	11%
Whole saltwater fish	209,016	6%	249,854	7%	292,250	7%	327,827	7%	291,845	6%	274,158	6%
Reduction fish	1,289	1%	51	0%	1,977	3%	916	2%	4,279	5%	1,703	3%
Crustaceans and molluscs	46,112	2%	92,674	3%	47,011	2%	72,322	2%	206,160	6%	92,856	3%
Salted, dried, smoked	16,303	1%	14,864	1%	14,698	1%	17,792	1%	5,723	0%	13,876	1%
Prepared or conserved	810,147	19%	817,768	19%	830,118	19%	851,914	20%	910,624	20%	844,114	20%
Total	**1,758,821**	**9%**	**1,616,796**	**8%**	**1,746,100**	**8%**	**1,703,439**	**8%**	**1,888,271**	**8%**	**1,742,685**	**8%**
Export quantity (1,000 tonnes)												
Type	2011		2012		2013		2014		2015		Average 2011-2015	
Fresh water fish	1	2%	1	2%	1	3%	1	1%	1	2%	1	2%
Filet	2	2%	3	4%	4	5%	2	3%	2	3%	3	3%
Fishmeal, oil, etc.	73	19%	29	9%	29	9%	31	10%	26	8%	38	11%
Whole saltwater fish	19	10%	30	13%	26	9%	27	9%	16	5%	24	9%
Reduction fish	0	0%	0	0%	1	2%	0	0%	1	4%	1	2%
Crustaceans and molluscs	1	2%	2	2%	1	1%	2	2%	3	4%	2	2%
Salted, dried, smoked	0	1%	0	1%	0	1%	1	2%	0	0%	0	1%
Prepared or conserved	20	18%	17	17%	19	19%	18	17%	17	17%	19	18%
Total	**118**	**12%**	**83**	**9%**	**83**	**8%**	**82**	**8%**	**67**	**7%**	**87**	**9%**

Source: The Danish AgriFish Agency database February 24th 2017 (The Danish AgriFish Agency, 2017a)

In summary, Denmark on average exported 993 thousand tonnes of fish and fish products at a value of 21.5 billion DKK yearly in 2011-2015. The most exported fish products in terms of quantity were fishmeal/oil, whole saltwater fish, and prepared/conserved fish. The most important fish exports in terms of quantity were prepared/conserved fish, whole saltwater fish, and fishmeal/oil (The Danish AgriFish Agency, 2017a).

Exports from Denmark to the UK were in the same time period on average 87 thousand tonnes at a value of 1.7 billion DKK. This corresponds to 9% of the total Danish fish exports in terms of quantity and 8% in terms of value. The most important export to the UK in terms of quantity was fishmeal/oil, whole saltwater fish, and prepared/conserved fish. In terms of value, the most important exports to the UK were prepared/conserved fish, fishmeal/oil and whole saltwater fish exports from Denmark to the UK were about 2 times larger than imports from the UK in terms of quantity and almost 4 times higher in terms of value. (The Danish AgriFish Agency, 2017a).

Landings in Denmark

In Table II.22, the total yearly landing quantities and values in Danish harbours during 2011-2015 are shown. The average yearly landings in 2011-2015 in Denmark, regardless of fishing grounds, were 889 thousand tonnes in live weight with a landings value of 3.4 billion DKK (The Danish AgriFish Agency, 2017b).

On average, UK vessels landed 27 thousand tonnes live weight in Danish harbours per year, corresponding to an average of 3% of the total live weight landed in Denmark. The value of UK vessels' landings in Denmark was on average 156 million DKK yearly in 2011-2015 corresponding to 5% of the overall average landings in Danish harbours in that period (The Danish AgriFish Agency, 2017b). From a technical perspective, these are statistically also registered as import, while Danish vessels' landings in UK harbours are registered as Danish exports.

Considering the fish species landed by UK vessels in Danish harbours, mackerel make up the largest proportion during the period in terms of quantity with 10 thousand tonnes live weight landed yearly on average with a value of 70 million DKK on average in 2011-2015. On average, these make up 39% of the landed quantities by UK vessels in Denmark. After mackerel, blue whiting and herring was the most landed species in terms of quantity (The Danish AgriFish Agency, 2017b).

Table II.22 All vessels' and UK's vessels landings in Denmark, average 2011-2015 and UK vessels' landings of top 3 species by quantity

	2011	2012	2013	2014	2015	Average 2011-2015
Total landings in live weight Denmark, 1,000 tonnes	895	598	835	978	1139	889
of which by UK vessels	24	16	16	41	39	27
- Mackerel	7	6	7	18	13	10
- Blue whiting	0	0	0	14	10	5
- Herring	2	1	1	7	9	4
UK's share of total landing quantity	3%	3%	2%	4%	3%	3%
Total landings in Denmark, million DKK	3,523	2,975	3,292	3,201	3,826	3,363
of which by UK vessels	161	92	115	200	210	156
- Mackerel	86	50	0	124	89	70
- Blue whiting	0	0	0	19	17	7
- Herring	8	6	2	18	35	14
UK's share of total landing value	5%	3%	3%	6%	5%	5%

Source: The Danish AgriFish Agency's database, June 6th 2017 (The Danish AgriFish Agency, 2017b)

Geographic distribution of UK landings in Denmark

According to The Danish AgriFish Agency (2017b), and as seen above, UK vessels landed on average 27 thousand tonnes of fish worth 156 million DKK in Danish harbours yearly in 2011-2015. In this period, 2015 showed the highest value of landed fish while the largest amounts where landed in 2014, cf. Table II.23. Throughout the period, Hirtshals has seen the largest landings of fish by UK vessels, both in terms of value and volume. The value of landings in Hirtshals represented 56% of the total average landings by UK vessels in Denmark in 2011-2015. The volumes landed in Hirtshals

represented 41% of the total landings by UK vessels. Hanstholm is the second most important harbour for UK vessels landing in Denmark in the period (The Danish AgriFish Agency, 2017b). As seen above, the landings by 15%-vessels in Denmark mostly take place in Skagen and Hirtshals. The volumes landed by UK vessels in Danish harbours are in 2012 and 2013 about the same level as the volumes landed by the 15%-vessels in UK harbours. In 2014 and 2015, UK vessels landed about 3 and 9 times more in Danish harbours than the 15%-vessels landed in UK harbours.

Table II.23 Landings by UK vessels by harbour in Denmark

Landings value (1,000 DKK)												
Harbour	2011		2012		2013		2014		2015		Average 2011-2015	
Esbjerg	3,197	2%	1,563	2%	199	0%	1,225	1%	0	0%	1,237	1%
Hanstholm	29,885	19%	17,832	19%	29,584	26%	32,795	16%	66,507	32%	35,321	23%
Hirtshals	89,532	55%	49,489	54%	70,897	62%	124,221	62%	100,853	48%	86,998	56%
Hvide Sande	55	0%	195	0%	64	0%	885	0%	803	0%	401	0%
Skagen	5,220	3%	13,571	15%	4,527	4%	37,531	19%	37,638	18%	19,697	13%
Thyborøn	33,520	21%	9,543	10%	9,449	8%	3,707	2%	3,731	2%	11,990	8%
Total	**161,410**	**100%**	**92,192**	**100%**	**114,720**	**100%**	**200,364**	**100%**	**209,532**	**100%**	**155,643**	**100%**
Landings live weight (1,000 tonnes)												
Harbour	2011		2012		2013		2014		2015		Average 2011-2015	
Esbjerg	0	1%	0	1%	0	0%	0	0%	0	0%	0	0%
Hanstholm	3	11%	2	10%	2	16%	2	6%	6	16%	3	11%
Hirtshals	8	32%	7	42%	7	48%	18	44%	16	42%	11	41%
Hvide Sande	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%
Skagen	2	7%	5	29%	2	12%	20	49%	14	37%	8	31%
Thyborøn	12	49%	3	17%	4	25%	0	1%	2	5%	4	15%
Total	**24**	**100%**	**16**	**100%**	**16**	**100%**	**41**	**100%**	**39**	**100%**	**27**	**100%**

Source: The Danish AgriFish Agency's database May 8th 2017 (The Danish AgriFish Agency, 2017b)

Landings by UK and EU vessels from UK-EEZ

Below, Table II.25 shows the yearly landings from the UK-EEZ as estimated by Napier (2016). According to Napier (2016a), the estimated total landings originating from waters in the UK-EEZ was 1.1 million tonnes per year in 2012-2014 with a value of 8.6 billion DKK. Landings by EU vessels (without the UK) in the UK-EEZ were estimated to be 58% of all landings by weight and 43% of the landings value, corresponding to 650 thousand tonnes and 3.7 billion DKK. Landings by UK vessels were an estimated 42% of the landings weight and 57% of landings value on average per year in the same period, corresponding to 476 thousand tonnes and almost 5 billion DKK (Napier, 2016).

Table II.24 Estimated average yearly landings 2012-2014 from the UK-EEZ by area

	UK vessels				EU vessels (excl. UK)				Total			
	Landings (1,000 tonnes)		Value (1,000 DKK*)		Landings (1,000 tonnes)		Value (1,000 DKK*)		Landings (1,000 tonnes)		Value (1,000 DKK*)	
ICES area 4	260	55%	2,459,700	50%	412	63%	1,648,910	44%	671	60%	4,108,610	48%
ICES area 6	136	29%	1,402,940	28%	117	18%	747,020	20%	254	23%	2,149,960	25%
ICES area 7	79	17%	1,047,650	21%	116	18%	1,275,400	34%	195	17%	2,323,050	27%
Others	2	0%	18,220	0%	5	1%	45,550	1%	7	1%	63,770	1%
Total	**476**	**100%**	**4,928,510**	**100%**	**650**	**100%**	**3,716,880**	**100%**	**1,127**	**100%**	**8,645,390**	**100%**

*Converted using the Danish National Bank's average currency for 2016 of 9.11 DKK/GPB (available here: http://www.nationalbanken.dk/da/statistik/valutakurs/Sider/Default.aspx)
Note: Due to rounding, the totals column may differ from totals of UK and EU vessels
Note: See Annex 2 for geographical location of the ICES-subdivisions.
Source: Napier (2016)

In the meantime, Napier (2017) estimated UK vessels' average yearly landings in 2011-2015 for landings from the Northeast Atlantic, which represented 98 % of total UK landings (Napier, 2017). These estimates are from a more recent report and are averages for a larger time range. The UK's total landings from the UK-EEZ are therefore not directly comparable to the ones in Table II.24 above. In the Northeast Atlantic, UK vessels on average caught 647 thousand tonnes per year in 2011-2015 with a value of approximately 7.2 billion DKK. Of these, the large majority (81 %), corresponding to 527 thousand tonnes, was caught within the UK-EEZ, and 14% of UK vessels' landings, corresponding to 92 thousand tonnes, were caught in the EU-EEZ outside the UK (Napier, 2017).

According to Napier (2017) the UK's landings of demersal species from the Northeast Atlantic made up an estimated 158 thousand tonnes of which 18%, corresponding to almost 28 thousand tonnes, was caught in EU waters outside the UK-EEZ. Further, the UK's landings of pelagic species have been estimated to 332 thousand tonnes. 16% of these landings, corresponding to 53 thousand tonnes, were caught in EU waters outside the UK-EEZ. Furthermore, the UK vessels' landings of reduction fish species were estimated to be on average 11 thousand tonnes per year with 90 % being landed from the UK-EEZ (Napier, 2017).

Table II.25 Estimated average yearly landings by UK vessels, average 2011-2015

	Landings (1,000 tonnes)		Value (1,000 DKK*)	
Total UK vessels landings	647	100%	7,166,837	100%
Landings from UK-EEZ	527	81%	5,875,039	82%
Landings from EU-waters excl. UK-EEZ	92	14%	997,545	14%
Landings from outside EU	28	4%	294,253	4%

*Converted using the Danish National Bank's average currency for 2016 of 9.11 DKK/GPB (available here: http://www.nationalbanken.dk/da/statistik/valutakurs/Sider/Default.aspx)
Source: Napier (2017)

To sum up, the total landings in Denmark were on average 889 thousand tonnes yearly between 2011-2015 with a value of 3.4 billion DKK. UK vessels landed 27 thousand tonnes in Denmark on average per year with a value of 156 million DKK. This corresponded to 3% of the landed quantity in

Denmark and 5% of the landed value. The most landed species were mackerel, blue whiting, and herring. On average in 2011-2015, UK vessels landed the largest quantities in Hirtshals, followed by Skagen, Thyborøn, and Hanstholm. In terms of value, the largest values were landed in Hirtshals, followed by Hanstholm, Skagen, and Thyborøn (The Danish AgriFish Agency, 2017b).

Yearly landings in the UK-EEZ in 2012-2014 were estimated by Napier (2016) to an average of 1,127 thousand tonnes with a value of 8.6 billion DKK. Of these, UK vessels landed 42% of the landed quantity and 57% of the landing value. EU vessels, which were not from the UK, landed 58% of the quantities and 43% of the value (Napier 2016).

UK vessels landed most of their catch, 81% of the quantity, from waters in the UK-EEZ, while a smaller proportion (14%) was landed from EU waters outside the UK-EEZ (Napier, 2017).

The fish processing industry in Denmark

Nielsen (2016) provides an assessment of the economic situation of the fish processing industry in Denmark in recent years, both overall and by fish processing segment. On this basis of this, this section provides an overview of the processing industry and the role of processing herring and mackerel and fishmeal. Table II.26 below provides a summary of the relevant numbers in the text.

There were 103 fish processing companies in 2013 accounting for 3,019 full time positions. The number of companies processing herring and mackerel was nine with 426 full time positions. There were five fishmeal factories employing 356 full time positions (Nielsen, 2016).

The total production in the processing industry was 449,356 tonnes of fish and shellfish in 2015. Excluding reduction species, the total production of fish and fish products for consumption was 167,605 tonnes. Of this, herring represented almost 30% and mackerel almost 7%. The production by the companies processing herring and mackerel was almost 58,000 tonnes, which corresponded to 34% of the production of fish for consumption (169,995 tonnes) and 13% of the total production (449,361 tonnes incl. production by fishmeal companies). Fishmeal factories produced 279,361 tonnes, representing 62% of the total (Nielsen, 2016).

In 2013, herring and mackerel processing companies' gross revenue of 1,575 million DKK represented 11% of the processing industry's total gross revenue of 14,071 million DKK, incl. the production of fishmeal. With 4,469 million DKK in gross revenue, fishmeal represented 32% of the total. Of the total revenue excl. fishmeal, herring and mackerel processing represented 9,062 million DKK corresponding to 16% (Nielsen, 2016).

The industry's total costs were 12,381 million DKK in 2013, of which herring and mackerel processing companies made up almost 10% with 1,224 million DKK in costs. Fishmeal production made up 35% of the costs with 4,348 million DKK. Excluding fishmeal production, the costs were 8,033 million DKK, of which the herring and mackerel companies represented 15% (Nielsen, 2016).

The large majority of the total industry's earnings were made by processing companies dealing with fish products for consumption. Here, the earnings were 1,569 million DKK in 2013, compared to the

total earnings of 1,690 million DKK, including the production of fishmeal. Fishmeal factories had 121 million DKK in earnings, corresponding to 7% of the total earnings. Herring and mackerel processing had earnings of 350 million DKK, representing almost 22% of total earnings in the whole processing industry and 22% of the consumption processing earnings (Nielsen, 2016).

The net profits of the processing industry were 335 million DKK in 2013. The companies processing fish for consumption had net profits of 458 million DKK, of which herring and mackerel represented 23% with 106 million DKK in earnings. Companies producing fishmeal had negative profits of 122 million DKK in 2013, although being positive in 2012 and 2011 (Nielsen, 2016).

Table II.26 Overview of the fish processing industry in Denmark in 2013 or 2015 and herring and mackerel as well as fishmeal's relative part

	Unit	Value
Total no. of companies, 2013		103
- herring and mackerel	No.	9
- fishmeal		5
Total no. of employees (full-time), 2013		3,019
- herring and mackerel	No.	426
- fishmeal		356
Total production (incl. fishmeal), 2015		449,356
- herring and mackerel	Tonnes	57,903
- fishmeal		279,361
Total gross revenue (incl. fishmeal), 2013		14,071
- herring and mackerel	Million DKK	1,575
- fishmeal		4,469
Total costs (incl. fishmeal), 2013		12,381
- herring and mackerel	Million DKK	1,224
- fishmeal		4,348
Total earnings (incl. fishmeal), 2013		1,690
- herring and mackerel	Million DKK	350
- fishmeal		121
Total net profits (incl. fishmeal), 2013		355
- herring and mackerel	Million DKK	106
- fishmeal		-122

Source: Nielsen (2016)

The Danish processing industry employed 3,019 full time positions in 2013, of which 426 were employed by companies processing herring and mackerel. The industry as whole produced about 450 thousand tonnes in 2015. Of this, 167 thousand tonnes were for consumption purposes of which herring represented almost 30%. About a third of the production for consumption was made up by herring and mackerel while these species made up 13% of the overall production in the processing industry. The production of fishmeal made up 62% of the total production by the processing industry (Nielsen, 2016).

The gross revenue of the industry as a whole was 14 billion DKK in 2013, of which herring and mackerel companies represented 11% and fishmeal companies 32%. Earnings were 1.7 billion DKK of which companies processing fish for consumption made up the large majority with 1.6 billion DKK. Earnings by companies processing fishmeal and oil were 121 million DKK. Net profits for the whole industry were 335 million DKK. Companies processing herring and mackerel had net profits

of 106 million DKK while companies processing fishmeal and oil had negative profits of 122 million DKK in 2013, although being positive in 2011 and 2012 (Nielsen, 2016).

Onshore service industry

Besides the processing industry, the fishery generates activity in the local harbours and communities not just through the income they generate to the crew, which they then use for private consumption in the local town or region, but also through buying supplies, maintaining the vessels and gears etc.

A reduced activity level in the fishery will necessarily result in a reduced level of activity for shipyards, oil bunkers, gear producers, provision suppliers etc. Depending on the level of this activity reduction, some of these industries will be flexible enough to either reduce their cost level or find alternative ways of counteracting these developments. Unfortunately, no data is available for the onshore service industry, which in isolation shows the importance of the fishing activity in contrast to their other activities.

However, a few indicators are available in order to reflect where the economic impact on the onshore service industry will most likely happen.

The first indicator is the homeport of each vessel. A vessel will most likely undertake some of their onshore services in their homeport in form of repairs and various supplies. Table II.27 shows the homeport for the 15%-vessels have. Thyborøn is homeport for around 50% of all these vessels, while the remaining ports are primarily Skagen, Esbjerg, Hanstholm and Hirtshals. Thus, it will be the onshore service industry on the west coast part of Northern Jutland that are expected to be affected the most following the Brexit, but the magnitude is dependent on the likely outcome of the negotiations.

Table II.27 Number of 15%-vessels distributed by homeport

Homeport	2012	2013	2014	2015	2016
Skagen	5	6	5	6	3
Østerby, Læsø		1	1		
Frederikshavn		1	1		
Grenå		1	1	2	
Esbjerg	4	4	4	4	4
Hvide Sande	2	1	1		
Thyborøn	16	18	15	20	16
Hanstholm	2	4	3	2	4
Hirtshals	7	6	5	6	5
Christiansø	1	1	1	1	1
Total	**37**	**43**	**37**	**41**	**33**

Source: The Danish Agrifish Agency Vessel Register and Sales Notes Register 14th February 2017.

Although a vessel does not always land its landings in its homeport, the distribution of total landings value on homeport gives some added information compared to the distribution of vessels by homeport. For instance, it is observed from Table II.28 that a larger share of the total landings value

of the 15%-vessels is by vessels with homeport in Skagen. This thus indicates that these vessels have larger activity on average, and the onshore service industry will therefore expectedly be impacted higher than what was noted from Table II.27.

Table II.28 Landings value of 15%-vessels distributed by homeport (1,000 DKK)

Homeport	2012	2013	2014	2015	2016
Skagen	251,284	145,602	223,022	472,028	421,877
Østerby, Læsø		10,256	12,962		
Frederikshavn		4,152	4,363		
Grenå		19,942	11,582	46,794	
Esbjerg	195,676	200,373	166,511	185,281	182,577
Hvide Sande	9,167	1,121	1,449		
Thyborøn	226,986	258,853	208,913	382,917	295,863
Hanstholm	29,438	58,184	61,399	51,606	117,303
Hirtshals	545,052	703,657	548,635	524,912	609,289
Christiansø	8,434	12,864	8,716	16,712	10,314
Total	**1,266,037**	**1,415,004**	**1,247,552**	**1,680,249**	**1,637,223**

Source: The Danish Agrifish Agency Vessel Register and Sales Notes Register 14th February 2017.

Furthermore, the total landings value can be used as indicator for the crew payments, and thus be used as a proxy for the effects on private consumption, if it is assumed that the crew lives in the area around the homeport of the vessel they work on.

III Analysis and results

Scenarios

Depending on the expected outcome of the Brexit negotiations between EU and UK, various scenarios can be relevant to analyse. However, at the time of this analysis there are no indications of the negotiation range, and the analysis is therefore based on assumptions about a few potential outcomes.

The consequences for Danish vessels will for instance be influenced by the level of access to the UK-EEZ, the quotas available and the possibility for vessels to reallocate their activity from the UK-EEZ to the NEW-EU-EEZ.

To determine some boundaries for the expected outcome and to assess the consequences of Brexit, two stylized/limiting scenarios with clear and transparent assumptions will be used to set the boundaries of the possible outcome for Danish fisheries of Brexit:

1) The negotiations end up with unchanged access to the UK-EEZ, i.e. a continuation of the current CFP (i.e. quota distribution, technical rules, capacity restrictions etc.) and a baseline for the following scenarios.

2) All Danish (and other EU) vessels are excluded from fishing in the UK-EEZ, without possibility to take some of the catches previously taken in UK-EEZ in the NEW-EU-EEZ after Brexit.

The UK-EEZ and NEW-EU-EEZ does not strictly follow the ICES-rectangles, thus some of the current fishing activity takes place in rectangles, which in the future will be divided between UK and EU. In the scenarios above, the fishery is allocated to each part of the divided rectangle based on the geographical size of the rectangles belonging to UK and EU. A third scenario, lying between scenario 1 and scenario 2 will therefore consider the potential effects of assuming that the landings from these divided rectangles can still be caught. Thus, it is in scenario 3 assumed that:

3) As in scenario 2, all Danish (and other EU) vessels are excluded from fishing in the purely UK-EEZ rectangles but the fishing activity taking place in the UK part of the divided rectangles can take place in the NEW-EU-EEZ, assuming this geographical move of fishing effort in itself does not imply additional costs.

Building on top of the latter scenario, a fourth scenario is defined.

4) Catches taken in UK-EEZ before Brexit can to a varying degree be caught in the NEW-EU-EEZ, depending on historical catch patterns of the different species.

A basic assumption is that vessels' current allocation of their activity is based on economic considerations about where to obtain the highest profit. If the Danish fishing vessels are excluded from the UK-EEZ, their future behaviour and thus fishing activity will be based on the possibility to obtain a profit from fishing in another area, where they are allowed to fish. The vessels will

reallocate their fishing effort to the best available alternative. Their considerations in relation to such a decision are based on the availability of fish and quota, the landings value, and the costs related to undertake this change in activity. If the value of the landings is below the operating costs (variable costs), fishing will be stopped. However, no matter where and how much they eventually decide to fish, this will give rise to a lower profit than when they fished in the previous UK-EEZ zone.

It is of central importance to consider whether it is possible to catch the fish previously caught in UK-EEZ in a new area, i.e. the question asked in scenario 4. For instance, is it possible to catch the entire or parts of the current mackerel landings from the UK-EEZ in the NEW-EU-EEZ? And if so, is it profitable?

Optimally, this type of analysis makes use of very detailed information about the biological situation and possibilities in different areas, together with earnings and costs information in order to determine in which new areas it will be economically attractive to fish, if it is no longer possible to fish in the UK-EEZ. However, such detailed information on especially the biological side is not available, and it has therefore been necessary to approach the analysis in a more simplistic and stylized way, as explained in detail below.

Approach to analysis

The analysis is based on data covering 2014, 2015 and 2016. These three years are considered to be representative for the situation in the Danish fishery leading up to Brexit negotiations regarding fishing rights, with regard to negative as well as positive fluctuations in quotas, prices, and costs between various years.

The calculation is static-comparative and addresses the question of what would have happened in each of the three years in each of the considered scenarios, if Brexit had been in place in those years. The models is thus not a dynamic model, which is able to account for changed fishing behaviour, stock developments, fleet adjustments, price changes in landings and costs etc. Thus, the analysis is not a prediction of the future situation since this would require knowledge on future stock abundance, quotas, prices, costs, and behavioural changes.

Distribution of landings weight, landings value, and fishing effort is obtained from the databases of the Danish Agrifish Agency covering information at vessel and trip level for the Danish fishery. Cost information, based on a representative sample of the Danish fishing fleet, is obtained from Statistics Denmark, covering the years 2014 and 2015, while costs for 2016 are estimated using the data for previous years.

Given that the earnings and cost information from Statistics Denmark represent an average vessel within a specific fleet, it is necessary to adjust these to reflect the earnings and costs of the vessels fishing specifically in the UK-EEZ. From the Agrifish Agency database, average earnings are available for the vessels fishing in the UK-EEZ zone, and assuming the same proportional distribution, relative to earnings, of the various cost components for these vessels as the average Danish vessel, costs for

the UK-EEZ vessels are adjusted with the proportion between their earnings and the earnings of an average Danish vessel.

The cost components are divided into variable and fixed costs. Of the former, fuel costs and costs for provisions and ice/chilled sea water are considered dependent on the number of days at sea, while sales costs and crew payments are dependent on the landings value. Fixed costs cover insurance costs, maintenance costs, various other costs, and capital costs. These are all considered to be fixed and independent on the level of activity. As such, these costs can only be avoided if the vessel is scrapped (which can potentially also come with a cost, if the scrap value is lower than the remaining debt in the vessel) or sold.

Thus, in scenarios 2-4, where the activity is lower than in scenario 1 where nothing is changed, the costs for fuel, provisions, and ice is reduced proportionally with the reduction in number of days at sea, while sales costs and crew payments are reduced proportionally with the reduction in landings value. However, the fixed costs are not reduced as the number of vessels is assumed constant in each year.

In scenario 2, the fishing effort previously used strictly in UK-EEZ, including the part of UK-EEZ lying on the UK side of the divided rectangles is assumed not to be applied elsewhere. Thus, the only fishing effort applied is the effort previously applied in the NEW-EU-EEZ, leading to a reduction in landings value (relative to scenario 1). In this situation, the landing values only include the previously obtained landings values in the NEW-EU-EEZ. Variable costs are reduced according to the reduction in effort.

In scenario 3, it is assumed that the effort previously applied on the UK side in the dividing rectangles is still applied and the corresponding landings values previously obtained on the UK side of the dividing rectangles are still obtained. In rectangles on the UK side outside the dividing rectangles no effort is applied, and this effort is not moved to the NEW-EU-EEZ. Thus, effort and the obtained landings value are slightly higher than in scenario 2, and the costs are adjusted accordingly.

In scenario 4, which builds upon scenario 3, the focus is on the up to five economically most important species caught in the UK-EEZ by each of the fleets in 2014-2016, and on to which degree the fraction of these species previously caught in UK-EEZ outside the dividing rectangles can be caught in NEW-EU-EEZ. A number of assumptions are applied when asking this question:

1) Catches of a given species can only be moved within an ICES area, i.e. if a fleet has caught herring in the UK-EEZ part of ICES area 4A, it is assumed that this herring catch can only be taken in the NEW-EU-EEZ part of ICES area 4A, and not in any other areas.
2) There is only the possibility for a given fleet to move catches of a given species from the UK-EEZ part of an ICES area to the NEW-EU-EEZ part of the ICES area, if the fleet has previously caught that species in the NEW-EU-EEZ part of the ICES area. I.e. relating to the example given in point 1 above, it is only allowed that the herring previously caught in the UK part of area 4A is caught in the NEW-EU-EEZ part of 4A, if scenario 1 shows that the fleet has caught herring in this area.

3) For a species previously caught in UK-EEZ, the effort needed in NEW-EU-EEZ to take this catch (or part of it) is based on historical catch per effort in NEW-EU-EEZ of this species. I.e. if the historical catches per effort of a given species is lower in NEW-EU-EEZ than it was in UK-EEZ it will demand more effort, and thus cost more to catch this species in NEW-EU-EEZ.
4) The effort used to catch a given species in NEW-EU-EEZ must not exceed the effort used to catch that species in UK-EEZ. This assumption is made to avoid that any fleet suddenly operates beyond what is physically possible when moving catches. Thus, if the effort needed to catch a given species is higher in NEW-EU-EEZ than in UK-EEZ, only the effort originally applied in UK-EEZ to catch the species will be applied, and less will be caught in NEW-EU-EEZ, although at the same cost.
5) If the historical catch of a given species taken by a given fleet in the NEW-EU-EEZ part an ICES area is less than 5% of the historical catch of that species taken by the fleet in the UK-EEZ part of the ICES area, it is assumed that it is not possible to move any of the catch taken in the UK-EEZ part of that area. Thus, it is assumed that if a given species is taken mainly in UK-EEZ, then the catch taken in the NEW-EU-EEZ is accidental and/or noise in catch recordings, and that it is therefore unrealistic that the UK-EEZ part of the catch can be taken elsewhere.
6) If the historical catch of a given species taken by a given fleet in the NEW-EU-EEZ part of an ICES area is between 5% and 25% of the historical catch of that species taken by the fleet in the UK-EEZ part of the ICES area, it is assumed that the maximum amount of that species that can be moved is equal to the amount previously taken in NEW-EU-EEZ. As in point 5, this assumption is made to avoid that the calculations predict an unrealistic large catch of a given species in NEW-EU-EEZ, compared with historical catch patterns.
7) When the historical catch of a given species taken by a given fleet in the NEW-EU-EEZ part of an ICES area is above 25% of the historical catch of that species taken by the fleet in the UK-EEZ part of the ICES area, the catch of that species moved from the UK-EEZ to the NEW-EU-EEZ part of the ICES area is evaluated using points 1-4 above.

Given these assumptions, scenario 4 will build further onto scenario 3 by analysing the economic consequences, if the entire or parts of the catches previously taken in UK-EEZ can be taken in NEW-EU-EEZ following the assumptions described above.

Table III.1 below shows the up to five economically most important species taken by each fleet in UK-EEZ during the period 2014-2016. The number of species varies between the fleets depending on their fishing pattern in the UK-EEZ. For instance for Danish seine 18-24m, plaice is the by far most important species caught in the UK-EEZ, while five species are to a varying degree economically very important for the reduction trawlers above 40m.

Table III.1 Key species from the UK-EEZ based on landing value

		Species #1	Species #2	Species #3	Species #4	Species #5
18-24m	Danish seine	Plaice				
24-40m	Trawl reduction	Norway pout	Sandeel			
	Trawl consumption	Cod	Hake	Monk	Saithe	
>40m	Purse seine	Herring	Mackerel	Sandeel		
	Trawl reduction	Herring	Mackerel	Sandeel	Blue whiting	Horse mac.
	Trawl mixed	Sandeel	Norway pout	Herring	Sprat	

Note: Reduction vessels are vessels, where at least 80% of their yearly landings value consist of reduction species, Consumption vessels are vessels, where at least 80% of their yearly landings value consist of species for human consumption, Mixed vessels are vessels in between the above.

Within scenario 4, a sub-scenario will be analysed for each key species individually and furthermore a sub-scenario assuming that the landings of all these key species can be moved to the NEW-EU-EEZ.

With this array of scenarios, it is possible to address a range of potential outcomes following Brexit. The results are of course dependent on the assumptions made, but they are informative for further discussion and potential analysis.

The analysis is solely undertaken for the active 15%-vessels, i.e. vessels having caught at least 15% of the landings value in the UK-EEZ in a year and still active by the end of the year. As described in Section I, these vessels undertake almost the entire Danish fishery in the UK-EEZ.

Economic effects for the fishing fleets

This section will present and comment on the economic (financial) effects for the fishing fleets obtained from each scenario described above. The first part will focus on scenario 1-3, while scenario 4 and the accompanied sub-scenarios are addressed afterwards.

The presentation will focus on three economic measures:

1) Landings value
2) Gross profit defined as landings value minus operating (variable) costs
3) Net profit defined as gross profit minus crew payments

Gross profit provides a measure for profit, which is left to pay for labour and capital, and the net profits illustrate the amount left to pay for capital and any excess payments to the owner.

Each table will show the outcomes of each measure as a three-year average for 2014-2016, but more detailed information is provided in the annexes referred in each table. The tables include the total value for each fleet as well as the average value per vessel.

The development in landings value in scenario 1 to 3 is shown in Table III.2. In scenario 1, the total landings value 2014-16 would have been 1.4 billion DKK with the current CFP. In the case that Danish vessels are not allowed to fish in the UK-EEZ, the total landings value would be reduced by 57% to

0.6 billion DKK. Assuming that the landings from the shared ICES-squares can be caught in the NEW-EU-EEZ, this implies a reduction of 50% compared to scenario 1.

It is especially the vessels above 40m which are affected. These vessels catch large volumes of mackerel and herring in the UK-EEZ. The Danish seines' landings values are reduced significantly due to large landings of plaice caught in the English Channel, but a lot of this is caught in divided ICES-squares, thus in scenario 3, the reduction is only 12%.

Table III.2 Landings value 2014-16-average for scenario 1-3 (1,000 DKK)

			Scenario 1 Given the current CFP	**Scenario 2** No landings from UK-EEZ		**Scenario 3** Landings from shared ICES-squares between UK-EEZ and NEW-EU-EEZ	
Total	18-24m	Danish seine	5,232	1,949	-63%	4,425	-15%
	24-40m	Trawl reduction	39,022	20,182	-48%	22,700	-42%
		Trawl consumption	138,217	90,187	-35%	107,036	-23%
	>40m	Purse seine	372,858	127,311	-66%	153,102	-59%
		Trawl reduction	215,666	149,840	-31%	157,883	-27%
		Trawl mixed	633,245	211,789	-67%	256,654	-59%
	Total		1,404,240	601,258	-57%	701,800	-50%
	18-24m	Danish seine	2,346	739	-69%	2,061	-12%
	24-40m	Trawl reduction	11,535	6,101	-47%	6,801	-41%
		Trawl consumption	22,488	14,880	-34%	17,558	-22%
	>40m	Purse seine	103,860	35,012	-66%	42,074	-59%
		Trawl reduction	16,255	11,226	-31%	11,836	-27%
		Trawl mixed	69,748	23,382	-66%	28,369	-59%

Source: Own calculations
Note: Please see Annex 3 for a detailed table

The effects on gross profits are shown in Table III.3 below. Gross profit is thus also reduced despite that some of the activity reduction will imply lower variable costs. Total gross profit in scenario 1 is 956 million DKK, reduced to 243 million DKK in scenario 2 and in scenario 3, it is 328 million DKK in total.

At the vessel level, gross profit is in scenario 2 reduced by more than 80% for the mixed trawlers above 40m and reduction trawlers 24-40m. In scenario 3, purse seiners above 40m together with the two fleets previously mentioned see a reduction in gross profit above 70%. The amounts left to handle expenditures for labour and capital is thereby reduced considerably.

Table III.3 Gross profit 2014-16-average for scenario 1-3 (1,000 DKK)

			Scenario 1 Given the current CFP	**Scenario 2** No landings from UK-EEZ		**Scenario 3** Landings from shared ICES-squares between UK-EEZ and NEW-EU-EEZ	
Total	18-24m	Danish seine	2,584	90	-97%	1,977	-23%
	24-40m	Trawl reduction	17,391	3,037	-83%	4,880	-72%
		Trawl consumption	82,664	45,487	-45%	58,608	-29%
	>40m	Purse seine	291,567	66,517	-77%	89,626	-69%
		Trawl reduction	94,335	43,531	-54%	49,578	-47%
		Trawl mixed	467,498	84,840	-82%	123,507	-74%
	Total		**956,039**	**243,502**	**-75%**	**328,175**	**-66%**
	18-24m	Danish seine	1,209	-25	-102%	995	-18%
	24-40m	Trawl reduction	5,035	943	-81%	1,442	-71%
		Trawl consumption	13,296	7,445	-44%	9,519	-28%
	>40m	Purse seine	81,698	18,430	-77%	24,767	-70%
		Trawl reduction	7,017	3,187	-55%	3,637	-48%
		Trawl mixed	51,254	9,211	-82%	13,511	-74%

Source: Own calculations
Note: Please see Annex 4 for a detailed table

After having settled the payments to the crew, net profits show what is left to pay the invested capital and any extra payments to the owners. Table III.4 shows that in scenario 2, net profit is in total reduced by 82% from 700 million DKK to 127 million DKK. All fleets are influenced significantly, and despite that scenario 3 shows a small improvement compared to scenario 2, the reduction is still 72%.

Table III.4 Net profit 2014-16 -average for scenario 1-3 (1,000 DKK)

			Scenario 1 Given the current CFP	**Scenario 2** No landings from UK-EEZ		**Scenario 3** Landings from shared ICES-squares between UK-EEZ and NEW-EU-EEZ	
Total	18-24m	Danish seine	695	-612	-188%	377	-46%
	24-40m	Trawl reduction	8,976	-1,330	-115%	-26	-100%
		Trawl consumption	43,595	20,003	-54%	28,373	-35%
	>40m	Purse seine	235,691	47,278	-80%	66,604	-72%
		Trawl reduction	49,172	12,250	-75%	16,590	-66%
		Trawl mixed	361,620	49,474	-86%	80,628	-78%
	Total		**699,750**	**127,063**	**-82%**	**192,546**	**-72%**
	18-24m	Danish seine	356	-292	-182%	245	-31%
	24-40m	Trawl reduction	2,507	-401	-116%	-53	-102%
		Trawl consumption	6,941	3,239	-53%	4,559	-34%
	>40m	Purse seine	66,155	13,149	-80%	18,450	-72%
		Trawl reduction	3,571	815	-77%	1,134	-68%
		Trawl mixed	39,574	5,301	-87%	8,763	-78%

Source: Own calculations
Note: Please see Annex 5 for a detailed table

Turning to scenario 4 and its sub-scenarios, Table III.5 gives a summary of the aggregated economic effect of scenarios 1-3 and the version of sub-scenario 4, where increased landings of all of the up to five most important species in the UK-EEZ for each fleet is assumed to take place. In these sub-scenarios 4, it is assumed that more effort than previously used in the UK-EEZ cannot be applied in the NEW-EU-EEZ and that landings from the NEW-EU-EEZ cannot be higher than the landings previously obtained in the UK-EEZ, given the assumptions previously described.

Thus, given the assumptions about the possibility and restrictions to transfer landings from UK-EEZ to NEW-EU-EEZ for all top 5-species will naturally result in an improved economic situation for the fishery compared to scenario 2 and scenario 3, but it is still far from scenario 1.

Table III.5 Aggregated landings value, gross profit and net profit, average of 2014-16 -scenario 1-3 and scenario 4 with increased landings of top-5 species (1,000 DKK)

	Scenario 1 Given the current CFP	**Scenario 2** No landings from UK-EEZ		**Scenario 3** Landings from shared ICES-squares between UK-EEZ and NEW-EU-EEZ		**Scenario 4** All landings of top 5 species transferred from UK-EEZ to NEW-EU-EEZ, if possible	
Landings value	1,404,240	601,258	-57%	701,800	-50%	772,963	-45%
Gross profit	956,039	243,502	-75%	328,175	-66%	386,711	-60%
Net profit	699,750	127,063	-82%	192,546	-72%	238,824	-66%

Source: Own calculations

In order to describe which species contribute the most to the improvement in the economic measures, Table III.6, Table III.7, and Table III.8 show detailed economic effects of allowing increased landings of the up to five most important species in the UK-EEZ for each fleet.

Take for instance the landings value in Table III.6 for purse seiners, where three important species are identified. The analysis shows that it is primarily transfers of mackerel which increases the landings value, while sandeel and herring increases landings value to a minor extent. Furthermore, the figures for purse seiners show that given the assumptions made, the landings value is still only around half of the level in scenario 1.

For some of the species, no change is observed at all, for instance Trawl reduction 24-40m and Norway pout. Specifically, for this example, the no change result is due to the fact that despite that Norway Pout is caught in 4A of the NEW-EU-EEZ, the amounts are so small that it is not considered possible to transfer any of the amounts caught in 4A UK-EEZ, cf. assumption 5. Other factors could be that the species caught in the UK-EEZ is not caught at all in the corresponding ICES-subdivision in the NEW-EU-EEZ.

Table III.6 Landings value following transfer of landings from UK-EEZ to NEW-EU-EEZ 2014-16-average (1,000 DKK)

				Scenario 1 Given the current CFP	**Scenario 2** No landings from UK-EEZ	**Scenario 3** Landings from shared areas	**Scenario 4** Transferred landings
Total	18-24m	Danish seine	Plaice	5,232	1,949	4,425	5,133
			All Above				5,133
	24-40m	Trawl reduction	Norway pout	39,022	20,182	22,700	22,700
			Sandeel				25,645
			All Above				25,645
		Trawl consumption	Cod	138,217	90,187	107,036	107,302
			Hake				108,228
			Monkfish				107,153
			Saithe				107,184
			All Above				108,760
	>40m	Purse seine	Herring	372,858	127,311	153,102	156,779
			Mackerel				168,084
			Sandeel				157,555
			All Above				176,213
		Trawl reduction	Sandeel	215,666	149,840	157,883	166,442
			Norway pout				157,883
			Herring				159,558
			Sprat				159,755
			All Above				169,990
		Trawl mixed	Herring	633,245	211,789	256,654	269,315
			Mackerel				258,400
			Sandeel				264,979
			Blue whiting				258,632
			Horse mac.				262,510
			All Above				287,222
Per Vessel	18-24m	Danish seine	Plaice	2,346	739	2,061	2,312
			All Above				2,312
	24-40m	Trawl reduction	Norway pout	11,535	6,101	6,801	6,801
			Sandeel				7,568
			All Above				7,568
		Trawl consumption	Cod	22,488	14,880	17,558	17,602
			Hake				17,741
			Monkfish				17,579
			Saithe				17,584
			All Above				17,833
	>40m	Purse seine	Herring	103,860	35,012	42,074	43,050
			Mackerel				46,115
			Sandeel				43,187
			All Above				48,205
		Trawl reduction	Sandeel	16,255	11,226	11,836	12,465
			Norway pout				11,836
			Herring				11,964
			Sprat				11,955
			All Above				12,713
		Trawl mixed	Herring	69,748	23,382	28,369	29,725
			Mackerel				28,545
			Sandeel				29,310
			Blue whiting				28,588
			Horse mac.				28,978
			All Above				31,668

Source: Own calculations
Note: Please see Annex 6 for a detailed table

Table III.7 Gross profit following transfer of landings from UK-EEZ to NEW-EU-EEZ 2014-16-average (1,000 DKK)

				Scenario 1 Given the current CFP	**Scenario 2** No landings from UK-EEZ	**Scenario 3** Landings from shared areas	**Scenario 4** Transferred landings
Total	18-24m	Danish seine	Plaice	2,584	90	1,977	2,502
			All Above				2,502
	24-40m	Trawl reduction	Norway pout	17,391	3,037	4,880	4,880
			Sandeel				6,995
			All Above				6,995
		Trawl consumption	Cod	82,664	45,487	58,608	58,813
			Hake				59,571
			Monkfish				58,690
			Saithe				58,716
			All Above				59,967
	>40m	Purse seine	Herring	291,567	66,517	89,626	92,708
			Mackerel				103,967
			Sandeel				92,668
			All Above				110,092
		Trawl reduction	Sandeel	94,335	43,531	49,578	55,784
			Norway pout				49,578
			Herring				50,979
			Sprat				51,140
			All Above				58,747
		Trawl mixed	Herring	467,498	84,840	123,507	134,810
			Mackerel				125,162
			Sandeel				128,455
			Blue whiting				125,258
			Horse mac.				128,753
			All Above				148,409
Per Vessel	18-24m	Danish seine	Plaice	1,209	-25	995	1,181
			All Above				1,181
	24-40m	Trawl reduction	Norway pout	5,035	943	1,442	1,442
			Sandeel				1,994
			All Above				1,994
		Trawl consumption	Cod	13,296	7,445	9,519	9,553
			Hake				9,667
			Monkfish				9,533
			Saithe				9,538
			All Above				9,735
	>40m	Purse seine	Herring	81,698	18,430	24,767	25,582
			Mackerel				28,638
			Sandeel				25,528
			All Above				30,213
		Trawl reduction	Sandeel	7,017	3,187	3,637	4,093
			Norway pout				3,637
			Herring				3,743
			Sprat				3,737
			All Above				4,299
		Trawl mixed	Herring	51,254	9,211	13,511	14,716
			Mackerel				13,677
			Sandeel				14,071
			Blue whiting				13,704
			Horse mac.				14,053
			All Above				16,178

Source: Own calculations
Note: Please see Annex 6 for a detailed table

Table III.8 Net profit following transfer of landings from UK-EEZ to NEW-EU-EEZ 2014-16-average (1,000 DKK)

				Scenario 1 Given the current CFP	**Scenario 2** No landings from UK-EEZ	**Scenario 3** Landings from shared areas	**Scenario 4** Transferred landings
Total	18-24m	Danish seine	Plaice	695	-612	377	649
			All Above				649
	24-40m	Trawl reduction	Norway pout	8,976	-1,330	-26	-26
			Sandeel				1,465
			All Above				1,465
		Trawl consumption	Cod	43,595	20,003	28,373	28,506
			Hake				29,003
			Monkfish				28,423
			Saithe				28,441
			All Above				29,252
	>40m	Purse seine	Herring	235,691	47,278	66,604	69,115
			Mackerel				78,830
			Sandeel				69,092
			All Above				83,828
		Trawl reduction	Sandeel	49,172	12,250	16,590	20,954
			Norway pout				16,590
			Herring				17,628
			Sprat				17,785
			All Above				23,187
		Trawl mixed	Herring	361,620	49,474	80,628	89,856
			Mackerel				81,999
			Sandeel				84,135
			Blue whiting				82,045
			Horse mac.				84,919
			All Above				100,444
Per Vessel	18-24m	Danish seine	Plaice	356	-292	245	341
			All Above				341
	24-40m	Trawl reduction	Norway pout	2,507	-401	-53	-53
			Sandeel				335
			All Above				335
		Trawl consumption	Cod	6,941	3,239	4,559	4,581
			Hake				4,656
			Monkfish				4,568
			Saithe				4,571
			All Above				4,699
	>40m	Purse seine	Herring	66,155	13,149	18,450	19,114
			Mackerel				21,748
			Sandeel				19,072
			All Above				23,033
		Trawl reduction	Sandeel	3,571	815	1,134	1,452
			Norway pout				1,134
			Herring				1,212
			Sprat				1,210
			All Above				1,607
		Trawl mixed	Herring	39,574	5,301	8,763	9,746
			Mackerel				8,901
			Sandeel				9,161
			Blue whiting				8,919
			Horse mac.				9,206
			All Above				10,881

Source: Own calculations
Note: Please see Annex 6 for a detailed table

Economic effects for the processing sector

For the processing industry, the future possible supplies from the fleet are of key interest. Large reductions will most likely result in changes in the production capacity, unless other suppliers can be attracted, for instance from UK vessels catching species which Danish vessels previously have caught.

The total supplies landed in various Danish harbours, harbours in UK (UK) and harbours not located in either Denmark or UK (xDKUK) for the four scenarios are presented in Table III.9 for reduction species, Table III.10 for pelagic consumption species and Table III.11 for demersal consumption species.

Large potential reductions in the supply of the reduction species (blue whiting and sandeel) and the pelagic consumption species (mackerel and herring) are observed, but only minor changes for sprat. However, the figures also indicate that some of the reduced landings in Danish harbours of mackerel and herring could potentially be offset by attracting landings of these species currently landed in UK harbours or other foreign harbours.

Table III.9 Total supplies of reduction species to harbours 2014-16-average (tonnes)

Species	Harbour	**Scenario 1** Given the current CFP	**Scenario 2** No landings from UK-EEZ	**Scenario 3** Landings from shared areas	**Scenario 4** Transferred landings
Blue whiting	Hanstholm	3,907	2,640	2,640	2,640
	Skagen	26,082	15,017	16,182	17,206
	xDKUK	2,268	794	794	949
Horse mackerel	xDKUK	4,980	2,995	3,192	4,022
Sandeel	Hanstholm	16,526	3,290	3,500	6,947
	Skagen	18,836	4,444	5,319	9,028
	Hirtshals	1,091	34	34	49
	Thyborøn	48,317	19,042	20,484	29,422
	Hvide sande	397	30	30	86
Sprat	Hanstholm	22,107	21,099	21,863	22,081
	Skagen	11,177	11,083	11,158	11,158
	Thyborøn	93,501	89,500	92,130	92,903
	Hvide sande	997	996	997	997
	Grenå	3,211	3,211	3,211	3,211
	xDKUK	6,903	6,806	6,895	6,895
Total		**260,300**	**180,981**	**188,429**	**207,594**

Source: Own calculations
Note: Please see Annex 7 for a detailed table
xDKUK refers to landings in harbours not located in Denmark or UK
UK refers to landings in harbours located in UK

Table III.10 Total supplies of pelagic consumption species to harbours 2014-16-average (tonnes)

Species	Harbour	**Scenario 1** Given the current CFP	**Scenario 2** No landings from UK-EEZ	**Scenario 3** Landings from shared areas	**Scenario 4** Transferred landings
Herring	Hanstholm	900	517	552	561
	Skagen	37,835	6,636	10,212	11,847
	Hirtshals	21,206	4,847	7,235	8,055
	Thyborøn	2,950	1,719	1,905	2,154
	xDKUK	45,544	11,917	15,781	17,247
	UK	3,929	36	688	863
Mackerel	Skagen	142	33	39	47
	Hirtshals	5,566	332	561	797
	xDKUK	24,899	4,393	5,968	7,450
	UK	5,732	1,827	2,164	2,755
Total		**148,703**	**32,257**	**45,105**	**51,776**

Source: Own calculations
Note: Please see Annex 7 for a detailed table
xDKUK refers to landings in harbours not located in Denmark or UK
UK refers to landings in harbours located in UK

Table III.11 Total supplies of demersal consumption species to harbours 2014-16-average (tonnes)

Species	Harbour	**Scenario 1** Given the current CFP	**Scenario 2** No landings from UK-EEZ	**Scenario 3** Landings from shared areas	**Scenario 4** Transferred landings
Cod	Hanstholm	1,381	839	1,014	1,024
	Thyborøn	348	273	299	300
	xDKUK	211	210	211	211
Hake	Hanstholm	915	526	648	686
	Thyborøn	772	319	530	564
Monk	Hanstholm	558	332	411	414
Plaice	Thyborøn	88	55	78	87
	xDKUK	130	25	115	129
	UK	223	48	170	217
Saithe	Hanstholm	1,443	952	1,102	1,114
Total		**6,069**	**3,579**	**4,578**	**4,746**

Source: Own calculations
Note: Please see Annex 7 for a detailed table
xDKUK refers to landings in harbours not located in Denmark or UK
UK refers to landings in harbours located in UK

IV Summary and perspectives

The decision by the UK about leaving the European Union causes a range of negotiations about the future collaboration between the remaining EU Member States and the UK. Fisheries are one of the areas that will be a part of these negotiations.

Importance of the UK-EEZ to Danish fisheries

Overall, the Danish fisheries obtained a substantial part of its landings from the UK Exclusive Economic zone (UK-EEZ) in 2012-2016, cf. Table IV.1 below. The volume of landings from the UK-EEZ has varied between 200-300 thousand tonnes, with a landings value between 0.7-1.0 billion DKK. Given that the total landings by Danish vessels has been between 500-875 thousand tonnes, corresponding to a value of 2.9-3.4 billion DKK, the landings from the UK-EEZ thus correspond to 27-34% of Danish landings value and 31-45% of landings measured in live weight.

Table IV.1 Landings by Danish vessels, their dependency on UK-EEZ and UK-EEZ active vessels' landings on areas

Landings value (1,000 DKK)												
Zone	2012		2013		2014		2015		2016		Average 2012-2016	
UK-EEZ by UK-EEZ active vessels	901,059	31%	1,015,159	34%	773,462	27%	910,904	27%	1,017,511	28%	923,619	29%
NEW-EU-EEZ by UK-EEZ active vessels	402,191	14%	431,512	14%	618,324	21%	772,433	23%	672,589	18%	579,410	18%
Norwegian by UK-EEZ active vessels	360,188	12%	326,054	11%	232,541	8%	387,566	11%	420,105	11%	345,291	11%
Other by UK-EEZ active vessels	5,766	0%		0%	75,682	3%	58,965	2%	24,338	1%	41,188	1%
Total by UK-EEZ vessels	1,669,203	57%	1,772,725	59%	1,700,009	58%	2,129,868	63%	2,134,543	58%	1,881,270	59%
Total by all Danish vessels	2,947,787	100%	3,026,654	100%	2,918,495	100%	3,404,765	100%	3,653,240	100%	3,190,188	100%
Landings live weight (tonnes)												
Zone	2012		2013		2014		2015		2016		Average 2012-2016	
UK-EEZ by UK-EEZ active vessels	199,693	40%	302,468	45%	237,337	32%	291,638	33%	208,625	31%	247,952	36%
NEW-EU-EEZ by UK-EEZ active vessels	102,828	20%	144,284	22%	263,813	35%	334,131	38%	248,964	37%	218,804	32%
Norwegian by UK-EEZ active vessels	34,942	7%	34,593	5%	16,090	2%	37,872	4%	40,901	6%	32,880	5%
Other by UK-EEZ active vessels	875	0%		0%	21,057	3%	11,635	1%	6,539	1%	10,027	1%
Total by UK-EEZ vessels	338,337	67%	481,345	72%	538,297	72%	675,276	77%	505,029	75%	507,657	73%
Total by all Danish vessels	502,702	100%	669,678	100%	745,139	100%	875,022	100%	674,283	100%	693,365	100%

Source: The Danish Agrifish Agency Vessel Register, Logbook and Sales Notes Register 14th February 2017.

In total, 66 vessels fished in the UK-EEZ in 2016, but only 33 of these had more than 15% of their landings value from the UK-EEZ. However, these vessels (named 15%-vessels) are the larger Danish fishing vessels and are primarily above 24 meters in overall length. The 15%-vessels lands 98% of both landings value and weight from the UK-EEZ, and the analysis therefore focuses on these vessels.

The most important species for these vessels in the UK-EEZ are herring and mackerel, while sandeel and other species for reduction (fish meal and oil) in some years also are important species. They primarily catch these species in the North Sea, but the fishing waters west of Scotland has become of increasing importance. The vessels mainly land their catches in Skagen, Hirtshals, Thyborøn, and Hanstholm, while landings in UK harbours are around 5% out of the total landings made by the 15%-vessels.

In 2011-2015, UK vessels' landings in Denmark corresponded to on average 3 % of total landings weight in Denmark and 5% of the total landings value while the most landed species were mackerel, blue whiting, and herring. Of the landings by UK vessels in Denmark, most of the catch was landed in Hirtshals and Hanstholm.

In the same period, import of fish and fish products from the UK constituted 3 % of Danish fish import value as well as quantity on average. The export of fish and fish products to the UK was 8 % of the total Danish fish exports by value and 9% by quantity.

The processing industry in Denmark consisted of 103 companies and employed 3,019 full time positions in 2013. In the same year, the industry had revenue of 14.1 billion DKK, costs of 12.4 billion DKK, earnings of 1.7 billon DKK, and net profits of 355 million DKK. The production by this industry was 449 thousand tonnes in 2015, of which 58 thousand tonnes were by herring and mackerel companies and 279 thousand tonnes by fishmeal companies.

Consequences of Brexit for Danish fisheries

With this overall picture in mind, the analysis focuses on the vessels which may experience the largest consequences of Brexit, that is, vessels obtaining more than 15% of their landings value from the UK-EEZ. With focus on these vessels, the analysis considers 98% of Danish landings value and weight from UK-EEZ. Based on the landing and cost information for the 15%-vessels, an economic analysis has been undertaken in order to show the effects for the Danish fishing fleet following Brexit. The analysis is data demanding, and various assumptions have therefore been set up in order to define the possible effects following different scenarios. In total, four overall scenarios have been investigated:

1) The negotiations end up with unchanged access to the UK-EEZ, i.e. a continuation of the current CFP,

2) All Danish (and other EU) vessels are excluded from fishing in the UK-EEZ, without possibility to take some of the catches previously taken in UK-EEZ in the NEW-EU-EEZ after Brexit,

3) As in scenario 2, all Danish (and other EU) vessels are excluded from fishing in the purely UK-EEZ rectangles but the fishing activity taking place in the UK part of the divided ICES-statistical rectangles can take place in the NEW-EU-EEZ, assuming that this geographical move of fishing effort in itself does not imply additional costs,

4) Catches taken in UK-EEZ before Brexit can for the top-5 most important species to a varying degree be caught in the NEW-EU-EEZ, depending on historical catch patterns of the different species.

The analysis has been based on the years 2014, 2015 and 2016, and it shows what would potentially have happened if Brexit had been in place in those years. The analysis is thus a short run analysis, without taking for instance any capacity adjustments into consideration.

The results of these four scenarios are shown in Table IV.2 as an average of 2014-2016.

Table IV.2 Aggregated landings value, gross profit and net profit, average of 2014-16 (1,000 DKK) and %.

	Scenario 1 Given the current CFP	**Scenario 2** No landings from UK-EEZ		**Scenario 3** Landings from shared ICES-squares between UK-EEZ and NEW-EU-EEZ		**Scenario 4** All landings of top 5 species transferred from UK-EEZ to NEW-EU-EEZ, if possible	
Landings value	1,404,240	601,258	-57%	701,800	-50%	772,963	-45%
Gross profit	956,039	243,502	-75%	328,175	-66%	386,711	-60%
Net profit	699,750	127,063	-82%	192,546	-72%	238,824	-66%

Source: Own calculations

The overall picture is that the economic consequences for all fleets in all scenarios are severe. Unless the current CFP continues, Brexit will lead to a significant decline in landing values, gross profit, and net profit for the fleets involved. Despite the fact that gross profit and net profit for most fleets are still positive, the situation will require an adaption in the number of vessels to adjust to the changes in fishing opportunities due to significant fixed costs in the fisheries, if one of these scenarios becomes the outcome of the negotiations.

It must be noted that the scenarios are formulated within the current framework for the Danish fishery. The Danish vessels might change behaviour in a way, which has not been foreseen in the analysis, or other fishing opportunities might become possible, for instance in the Norwegian zone. However, the analysed scenarios are useful to set the scene, and if the negotiations result in improvements compared to this, the negative economic consequences of Brexit will, of course, consequently be reduced.

Furthermore, the analysis has not considered any price effects following any change in trade agreements and consequences in trade patterns between the EU and UK. Analyses of such outcomes are beyond the scope of this report. However, given that fish prices in Denmark are mainly determined by world prices, no major price effects can be expected of Brexit.

Looking at the Danish harbours and their landings from the 15%-vessels, they primarily locate and land their fish in the harbours on the west coast of Northern Jutland. Skagen receives mostly herring and some reduction species, Hirtshals mostly receives herring and mackerel, while Thyborøn receives reduction species and some amounts of herring and some landings of demersal species. Hanstholm mostly receives demersal species. Some of the landings from these vessels take place in the UK, where Lerwick and Peterhead are the most important harbours. It is mostly mackerel and herring being landed in the UK harbours, but these landings are relatively small compared to the overall landings by the vessels.

Given the results from the analysed scenarios, Brexit can potentially lead to significantly reduced supplies of especially mackerel, herring and various species for reduction, and this can have an effect on the economic situation for the processing industry. A modelling framework for undertaking a detailed economic analysis of the processing industry is not available. If it is not possible to find substitutions for the supplies from the Danish fishery, production capacity and thus the related employment will most likely have to be adapted to this new situation.

For instance, UK vessels could potentially start to catch increased amounts of the reduction species or pelagic consumption species, if they are not caught by the Danish vessels, and these landings could be used in the Danish processing industry, if the UK vessels are allowed to land in Danish harbours. However, if the access to the landings from the UK vessels does not become possible, the Danish processing industry would require other suppliers of fish in order to continue the current level of production. The possibilities for this and the derived effects thereof have not been investigated.

The potentially reduced activity for the Danish fishing fleet in primarily the Northern part of western Jutland will also influence the onshore service industry, which delivers maintenance and supplies for the vessels and the crew. However, besides basic information about where the Danish fishing vessels have their homeport and most of their activity, it is not possible to do a more detailed analysis of the potential effects locally following each of the presented scenarios.

Literature

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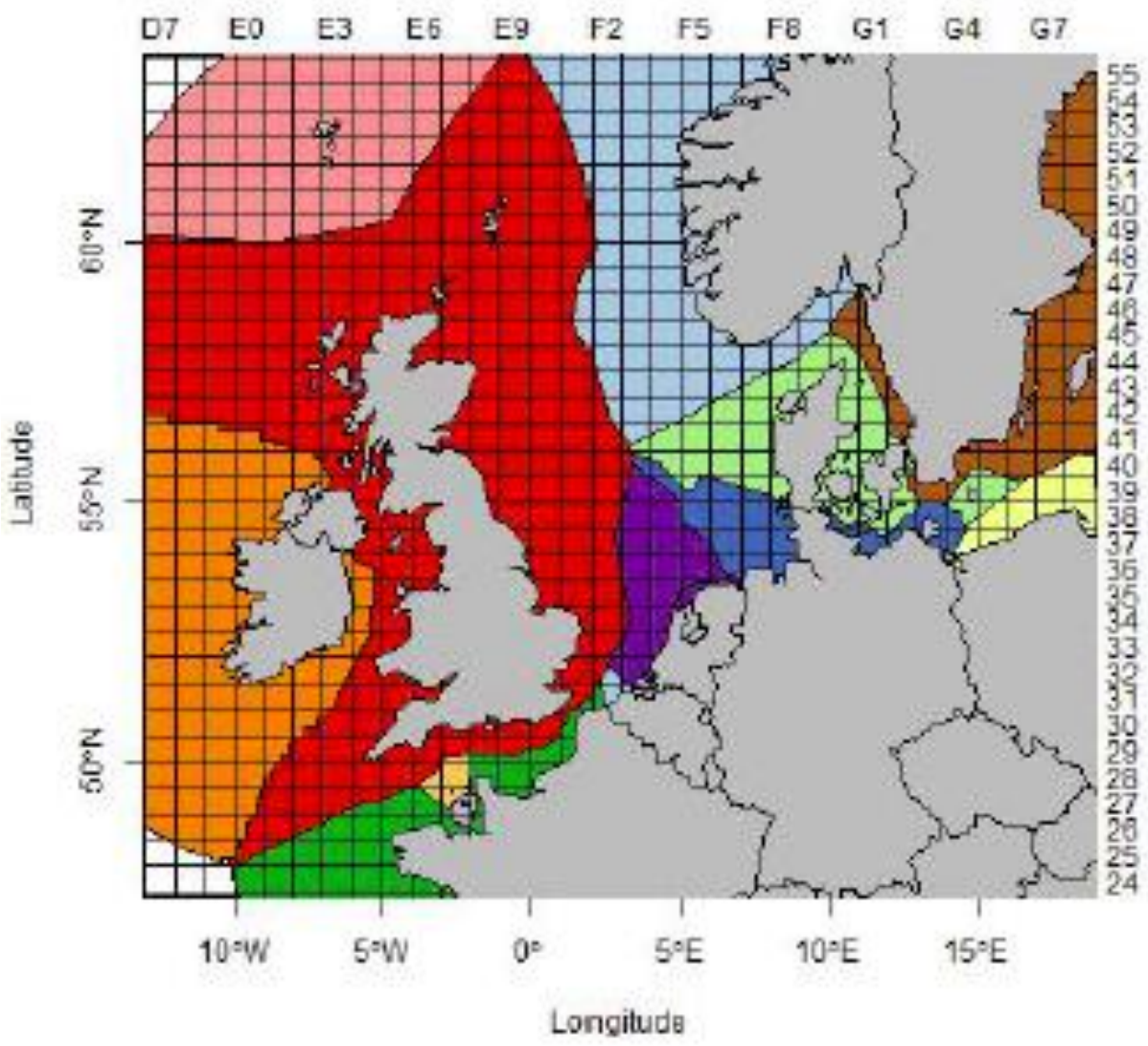
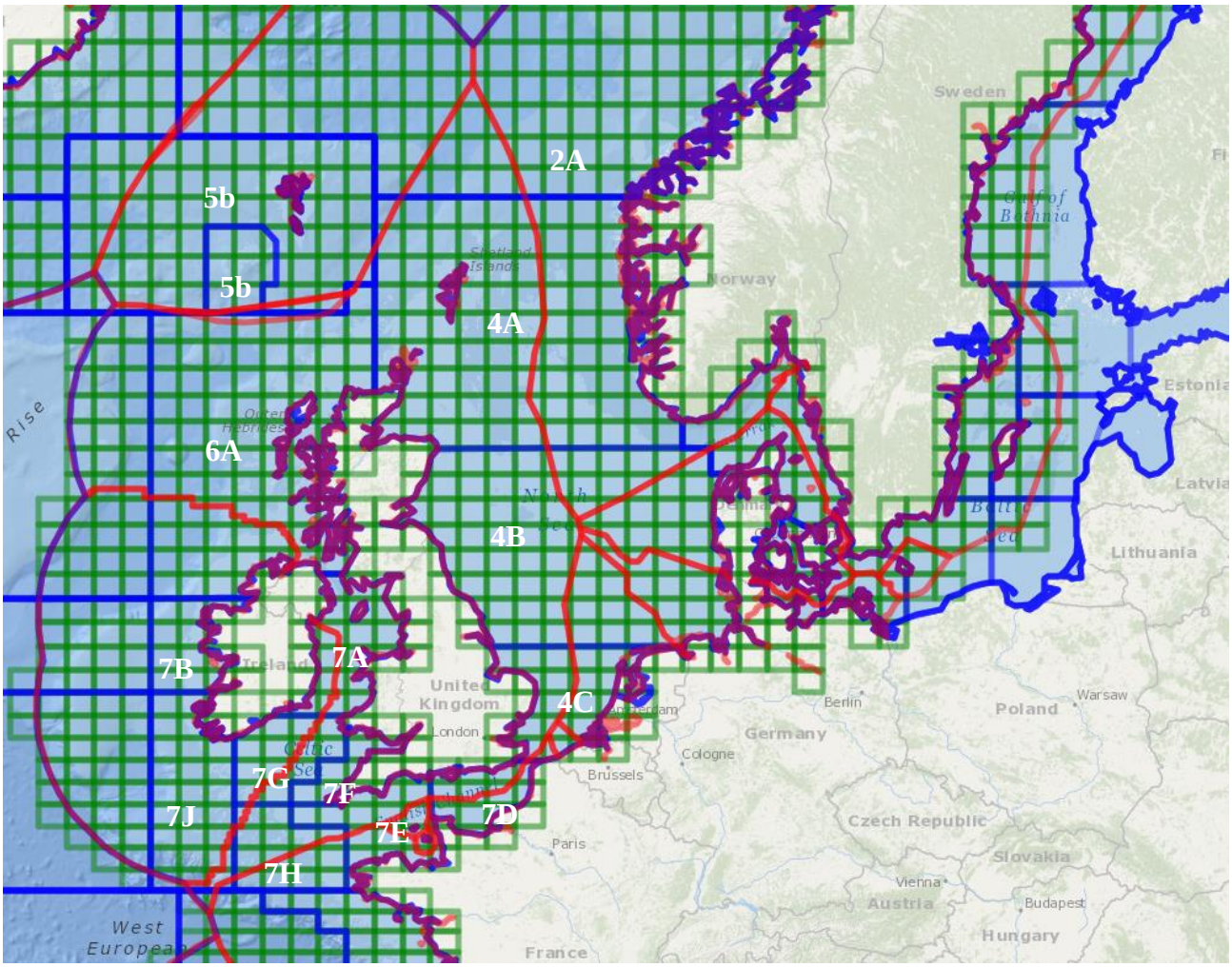
ANNEXES

Annex 1 ICES rectangles (square grid) and country EEZ (coloured areas)



Source: Beukhof, E. and van Gemert, R. (2017). Preparing for Brexit: A historical overview of the abundance and Danish catch distribution of North Sea herring and Northeast Atlantic mackerel. January 2017. DPPO headquarters, Copenhagen, Denmark.

Annex 2 ICES statistical rectangles (square grid) FAO areas (blue bold lines) and country EEZ (red bold lines)



Source: Danish Agrifish Agency

Annex 3 Landings value for scenario 1-3 (1,000 DKK)

			Scenario 1 Continuation of the current CFP				Scenario 2 No landings from UK-EEZ				Scenario 3 Landings from shared ICES-squares between UK-EEZ and NEW-EU-EEZ			
			2014	2015	2016	3-year average	2014	2015	2016	3-year average	2014	2015	2016	3-year average
Total	18-24m	Danish seine	6,770	6,219	2,708	5,232	2,991	2,453	402	1,949	5,678	4,958	2,638	4,425
	24-40m	Trawl industrial	29,291	66,415	21,359	39,022	14,986	32,887	12,672	20,182	16,389	38,208	13,505	22,700
		Trawl consumption	93,986	120,000	200,664	138,217	71,065	81,001	118,495	90,187	78,187	97,986	144,934	107,036
	>40m	Purse seine	318,704	416,638	383,231	372,858	106,469	160,822	114,642	127,311	136,111	186,466	136,730	153,102
		Trawl industrial	132,978	365,838	148,182	215,666	87,177	261,881	100,463	149,840	93,995	274,402	105,251	157,883
		Trawl mixed	560,230	521,833	817,673	633,245	167,710	189,817	277,841	211,789	207,426	232,301	330,234	256,654
	Total		**1,141,958**	**1,496,943**	**1,573,818**	**1,404,240**	**450,397**	**728,861**	**624,516**	**601,258**	**537,786**	**834,320**	**733,292**	**701,800**
	18-24m	Danish seine	2,257	2,073	2,708	2,346	997	818	402	739	1,893	1,653	2,638	2,061
	24-40m	Trawl industrial	7,323	16,604	10,680	11,535	3,747	8,222	6,336	6,101	4,097	9,552	6,752	6,801
		Trawl consumption	18,797	20,000	28,666	22,488	14,213	13,500	16,928	14,880	15,637	16,331	20,705	17,558
	>40m	Purse seine	79,676	104,160	127,744	103,860	26,617	40,206	38,214	35,012	34,028	46,617	45,577	42,074
		Trawl industrial	11,081	22,865	14,818	16,255	7,265	16,368	10,046	11,226	7,833	17,150	10,525	11,836
		Trawl mixed	62,248	65,229	81,767	69,748	18,634	23,727	27,784	23,382	23,047	29,038	33,023	28,369

Source: Own calculations

Annex 4 Gross profit for scenario 1-3 (1,000 DKK)

			Scenario 1 Continuation of the current CFP				Scenario 2 No landings from UK-EEZ				Scenario 3 Landings from shared ICES-squares between UK-EEZ and NEW-EU-EEZ			
			2014	2015	2016	3-year average	2014	2015	2016	3-year average	2014	2015	2016	3-year average
Total	18-24m	Danish seine	3,631	2,557	1,563	2,584	839	-320	-249	90	2,826	1,593	1,511	1,977
	24-40m	Trawl industrial	15,663	28,259	8,251	17,391	5,114	1,793	2,203	3,037	6,055	5,914	2,670	4,880
		Trawl consumption	47,554	73,263	127,176	82,664	32,054	42,308	62,100	45,487	36,904	55,860	83,060	58,608
	>40m	Purse seine	238,977	318,689	317,036	291,567	47,080	87,638	64,831	66,517	73,729	110,161	84,987	89,626
		Trawl industrial	52,130	170,171	60,703	94,335	22,360	83,350	24,881	43,531	26,745	93,776	28,213	49,578
		Trawl mixed	393,712	365,521	643,262	467,498	51,877	64,239	138,405	84,840	81,699	102,866	185,957	123,507
	Total		**751,666**	**958,461**	**1,157,991**	**956,039**	**159,325**	**279,009**	**292,172**	**243,502**	**227,958**	**370,169**	**386,397**	**328,175**
	18-24m	Danish seine	1,210	852	1,563	1,209	280	-107	-249	-25	942	531	1,511	995
	24-40m	Trawl industrial	3,916	7,065	4,125	5,035	1,278	448	1,102	943	1,514	1,479	1,335	1,442
		Trawl consumption	9,511	12,210	18,168	13,296	6,411	7,051	8,871	7,445	7,381	9,310	11,866	9,519
	>40m	Purse seine	59,744	79,672	105,679	81,698	11,770	21,910	21,610	18,430	18,432	27,540	28,329	24,767
		Trawl industrial	4,344	10,636	6,070	7,017	1,863	5,209	2,488	3,187	2,229	5,861	2,821	3,637
		Trawl mixed	43,746	45,690	64,326	51,254	5,764	8,030	13,840	9,211	9,078	12,858	18,596	13,511

Source: Own calculations

Annex 5 Net profit for scenario 1-3 (1,000 DKK)

			Scenario 1 Continuation of the current CFP				Scenario 2 No landings from UK-EEZ				Scenario 3 Landings from shared ICES-squares between UK-EEZ and NEW-EU-EEZ			
			2014	2015	2016	3-year average	2014	2015	2016	3-year average	2014	2015	2016	3-year average
Total	18-24m	Danish seine	1,160	362	562	695	-252	-1,186	-398		754	-157	535	377
	24-40m	Trawl industrial	9,566	14,211	3,152	8,976	1,994	-5,163	-822	-1,330	2,644	-2,167	-554	-26
		Trawl consumption	20,536	40,530	69,719	43,595	11,626	20,213	28,171	20,003	14,428	29,132	41,560	28,373
	>40m	Purse seine	199,225	247,492	260,356	235,691	33,801	60,156	47,876	47,278	56,752	78,296	64,765	66,604
		Trawl industrial	20,038	98,764	28,715	49,172	1,322	32,234	3,195	12,250	4,060	40,216	5,493	16,590
		Trawl mixed	296,388	277,673	510,799	361,620	22,742	32,285	93,394	49,474	45,664	63,759	132,459	80,628
	Total		**546,914**	**679,033**	**873,303**	**699,750**	**71,233**	**138,539**	**171,416**	**127,063**	**124,303**	**209,079**	**244,257**	**192,546**
	18-24m	Danish seine	387	121	562	356	-84	-395	-398	-292	251	-52	535	245
	24-40m	Trawl industrial	2,391	3,553	1,576	2,507	499	-1,291	-411	-401	661	-542	-277	-53
		Trawl consumption	4,107	6,755	9,960	6,941	2,325	3,369	4,024	3,239	2,886	4,855	5,937	4,559
	>40m	Purse seine	49,806	61,873	86,785	66,155	8,450	15,039	15,959	13,149	14,188	19,574	21,588	18,450
		Trawl industrial	1,670	6,173	2,872	3,571	110	2,015	319	815	338	2,513	549	1,134
		Trawl mixed	32,932	34,709	51,080	39,574	2,527	4,036	9,339	5,301	5,074	7,970	13,246	8,763

Source: Own calculations

Annex 6 Total landings value, gross profit and net profit 2014, 2015 and 2016 for scenario 4 (1,000 DKK)

			Landings value				Gross profit defined as landings value minus operating costs				Net profit defined as earnings minus crew payments (bruttooverskud)			
			2014	2015	2016	3-year average	2014	2015	2016	3-year average	2014	2015	2016	3-year average
18-24m	Danish seine	Plaice	6,664	6,028	2,706	5,133	3,543	2,402	1,562	2,502	1,111	274	561	649
		All Above	6,664	6,028	2,706	5,133	3,543	2,402	1,562	2,502	1,111	274	561	649
24-40m	Trawl reduction	Norway pout	16,389	38,208	13,505	22,700	6,055	5,914	2,670	4,880	2,644	-2,167	-554	-26
		Sandeel	18,030	45,020	13,885	25,645	7,381	10,656	2,946	6,995	3,628	1,134	-369	1,465
		All Above	18,030	45,020	13,885	25,645	7,381	10,656	2,946	6,995	3,628	1,134	-369	1,465
	Trawl consumption	Cod	78,187	98,765	144,954	107,302	36,904	56,459	83,077	58,813	14,428	29,519	41,571	28,506
		Hake	78,187	99,627	146,869	108,228	36,904	57,192	84,618	59,571	14,428	30,017	42,565	29,003
		Monkfish	78,331	98,186	144,942	107,153	36,993	56,011	83,065	58,690	14,476	29,229	41,564	28,423
		Saithe	78,349	98,265	144,938	107,184	37,012	56,074	83,063	58,716	14,490	29,270	41,562	28,441
		All Above	78,493	100,884	146,902	108,760	37,101	58,156	84,644	59,967	14,537	30,638	42,581	29,252
>40m	Purse seine	Herring	138,769	192,779	138,790	156,779	75,901	115,636	86,587	92,708	58,593	82,693	66,060	69,115
		Mackerel	159,664	197,196	147,391	168,084	96,096	120,549	95,255	103,967	76,182	86,851	73,456	78,830
		Sandeel	149,468	186,466	136,730	157,555	82,857	110,161	84,987	92,668	64,214	78,296	64,765	69,092
		All Above	175,678	203,509	149,452	176,213	107,396	126,024	96,855	110,092	85,484	91,247	74,751	83,828
	Trawl reduction	Sandeel	104,284	287,951	107,092	166,442	34,482	103,505	29,364	55,784	9,315	47,301	6,246	20,954
		Norway pout	93,995	274,402	105,251	157,883	26,745	93,776	28,213	49,578	4,060	40,216	5,493	16,590
		Herring	96,011	276,697	105,966	159,558	28,411	95,737	28,788	50,979	5,240	41,729	5,913	17,628
		Sprat	93,995	279,829	105,441	159,755	26,745	98,302	28,372	51,140	4,060	43,682	5,611	17,785
		All Above	106,300	295,674	107,997	169,990	36,149	109,994	30,098	58,747	10,495	52,281	6,785	23,187
	Trawl mixed	Herring	207,426	243,001	357,517	269,315	81,699	111,908	210,822	134,810	45,664	71,000	152,904	89,856
		Mackerel	207,426	232,409	335,365	258,400	81,699	102,943	190,844	125,162	45,664	63,818	136,515	81,999
		Sandeel	229,106	235,597	330,234	264,979	94,196	105,213	185,957	128,455	54,395	65,551	132,459	84,135
		Blue whiting	209,988	233,652	332,257	258,632	83,853	104,062	187,858	125,258	47,373	64,728	134,033	82,045
		Horse mackerel	207,426	235,024	345,079	262,510	81,699	104,970	199,592	128,753	45,664	65,404	143,689	84,919
		All Above	231,668	250,482	379,515	287,222	96,350	117,633	231,244	148,409	56,104	75,466	169,763	100,444
Total			**616,833**	**901,595**	**800,457**	**772,962**	**287,920**	**424,865**	**447,349**	**386,711**	**171,360**	**251,040**	**294,073**	**238,824**

Annex 6, continued

			Landings value				Gross profit defined as landings value minus operating costs				Net profit defined as earnings minus crew payments (bruttooverskud)			
			2014	2015	2016	3-year average	2014	2015	2016	3-year average	2014	2015	2016	3-year average
18-24m	Danish seine	Plaice	2,221	2,009	2,706	2,312	1,181	801	1,562	1,181	370	91	561	341
		All Above	2,221	2,009	2,706	2,312	1,181	801	1,562	1,181	370	91	561	341
24-40m	Trawl reduction	Norway pout	4,097	9,552	6,752	6,801	1,514	1,479	1,335	1,442	661	-542	-277	-53
		Sandeel	4,507	11,255	6,942	7,568	1,845	2,664	1,473	1,994	907	284	-184	335
		All Above	4,507	11,255	6,942	7,568	1,845	2,664	1,473	1,994	907	284	-184	335
	Trawl consumption	Cod	15,637	16,461	20,708	17,602	7,381	9,410	11,868	9,553	2,886	4,920	5,939	4,581
		Hake	15,637	16,605	20,981	17,741	7,381	9,532	12,088	9,667	2,886	5,003	6,081	4,656
		Monkfish	15,666	16,364	20,706	17,579	7,399	9,335	11,866	9,533	2,895	4,871	5,938	4,568
		Saithe	15,670	16,377	20,705	17,584	7,402	9,346	11,866	9,538	2,898	4,878	5,937	4,571
		All Above	15,699	16,814	20,986	17,833	7,420	9,693	12,092	9,735	2,907	5,106	6,083	4,699
>40m	Purse seine	Herring	34,692	48,195	46,263	43,050	18,975	28,909	28,862	25,582	14,648	20,673	22,020	19,114
		Mackerel	39,916	49,299	49,130	46,115	24,024	30,137	31,752	28,638	19,045	21,713	24,485	21,748
		Sandeel	37,367	46,617	45,577	43,187	20,714	27,540	28,329	25,528	16,053	19,574	21,588	19,072
		All Above	43,920	50,877	49,817	48,205	26,849	31,506	32,285	30,213	21,371	22,812	24,917	23,033
	Trawl reduction	Sandeel	8,690	17,997	10,709	12,465	2,874	6,469	2,936	4,093	776	2,956	625	1,452
		Norway pout	7,833	17,150	10,525	11,836	2,229	5,861	2,821	3,637	338	2,513	549	1,134
		Herring	8,001	17,294	10,597	11,964	2,368	5,984	2,879	3,743	437	2,608	591	1,212
		Sprat	7,833	17,489	10,544	11,955	2,229	6,144	2,837	3,737	338	2,730	561	1,210
		All Above	8,858	18,480	10,800	12,713	3,012	6,875	3,010	4,299	875	3,268	678	1,607
	Trawl mixed	Herring	23,047	30,375	35,752	29,725	9,078	13,988	21,082	14,716	5,074	8,875	15,290	9,746
		Mackerel	23,047	29,051	33,536	28,545	9,078	12,868	19,084	13,677	5,074	7,977	13,652	8,901
		Sandeel	25,456	29,450	33,023	29,310	10,466	13,152	18,596	14,071	6,044	8,194	13,246	9,161
		Blue whiting	23,332	29,207	33,226	28,588	9,317	13,008	18,786	13,704	5,264	8,091	13,403	8,919
		Horse mackerel	23,047	29,378	34,508	28,978	9,078	13,121	19,959	14,053	5,074	8,176	14,369	9,206
		All Above	25,741	31,310	37,952	31,668	10,706	14,704	23,124	16,178	6,234	9,433	16,976	10,881

Source: Own calculations

Annex 7 Total supplies of reduction species, pelagic consumption species and demersal consumption species to harbours 2014-16-average (tonnes)

		Scenario 1				Scenario 2				Scenario 3				Scenario 4			
		2014	2015	2016	3-yr average	2014	2015	2016	3-yr average	2014	2015	2016	3-yr average	2014	2015	2016	3-yr average
Blue whiting	Hanstholm	5,250	6,470	0	3,907	2,650	5,270	0	2,640	2,650	5,270	0	2,640	2,650	5,270	0	2,640
	Skagen	22,600	22,930	32,716	26,082	11,655	19,654	13,743	15,017	13,750	20,080	14,716	16,182	15,656	20,430	15,530	17,206
	xDKUK	1,910	3,453	1,441	2,268	1,910	42	430	794	1,910	42	430	794	1,910	461	475	949
Sprat	Hanstholm	11,219	40,263	14,841	22,107	10,839	38,550	13,908	21,099	11,219	39,530	14,841	21,863	11,219	40,185	14,841	22,081
	Skagen	12,684	12,529	8,319	11,177	12,637	12,368	8,245	11,083	12,684	12,470	8,319	11,158	12,684	12,470	8,319	11,158
	Thyborøn	32,142	153,700	94,662	93,501	31,368	144,341	92,790	89,500	32,142	149,830	94,418	92,130	32,142	152,056	94,512	92,903
	Hvide Sande	614	2,378	0	997	614	2,374	0	996	614	2,378	0	997	614	2,378	0	997
	Grenå	1,365	8,269	0	3,211	1,365	8,269	0	3,211	1,365	8,269	0	3,211	1,365	8,269	0	3,211
	xDKUK	935	15,918	3,856	6,903	935	15,627	3,856	6,806	935	15,893	3,856	6,895	935	15,893	3,856	6,895
Horse mac	xDKUK	5,130	5,002	4,807	4,980	4,307	2,001	2,677	2,995	4,307	2,584	2,684	3,192	4,307	2,985	4,774	4,022
Sandeel	Hanstholm	20,058	27,144	2,376	16,526	8,837	904	128	3,290	9,242	1,132	128	3,500	18,734	1,978	128	6,947
	Skagen	24,054	31,804	650	18,836	12,013	1,318	0	4,444	14,293	1,665	0	5,319	24,054	3,030	0	9,028
	Hirtshals	101	3,173	0	1,091	101	0	0	34	101	0	0	34	101	47	0	49
	Thyborøn	59,360	73,249	12,343	48,317	44,046	10,483	2,597	19,042	45,373	13,481	2,597	20,484	59,190	25,364	3,712	29,422
	Hvide Sande	830	360	0	397	40	50	0	30	40	50	0	30	40	219	0	86
Herring	Hanstholm	1,645	599	457	900	759	562	231	517	844	574	237	552	844	579	261	561
	Skagen	33,695	28,091	51,718	37,835	3,842	2,606	13,460	6,636	7,686	4,890	18,059	10,212	7,863	6,823	20,855	11,847
	Hirtshals	17,782	15,828	30,007	21,206	870	5,471	8,200	4,847	4,392	7,002	10,310	7,235	4,915	7,568	11,681	8,055
	Thyborøn	1,727	2,274	4,848	2,950	405	1,646	3,105	1,719	830	1,675	3,210	1,905	1,296	1,736	3,430	2,154
	xDKUK	54,634	44,589	37,411	45,544	12,812	13,537	9,401	11,917	17,233	18,602	11,508	15,781	17,501	20,707	13,534	17,247
	UK	4,060	1,610	6,116	3,929	0	90	20	36	0	260	1,805	688	0	579	2,010	863
Mackerel	Skagen	44	235	146	142	34	46	20	33	38	58	23	39	39	72	31	47
	Hirtshals	2,732	7,705	6,261	5,566	74	582	341	332	330	621	732	561	422	866	1,102	797
	xDKUK	24,520	25,960	24,218	24,899	1,577	8,323	3,278	4,393	3,436	10,782	3,686	5,968	4,941	12,113	5,295	7,450
	UK	9,903	2,250	5,043	5,732	2,668	1,250	1,563	1,827	3,343	1,250	1,900	2,164	4,568	1,414	2,282	2,755
Cod	Hanstholm	908	1,128	2,108	1,381	589	753	1,174	839	692	913	1,439	1,014	692	942	1,439	1,024
	Thyborøn	233	365	446	348	233	312	274	273	233	332	331	299	233	337	331	300
	xDKUK	99	37	497	211	97	37	497	210	98	37	497	211	98	37	497	211
Hake	Hanstholm	642	913	1,190	915	522	511	545	526	563	666	716	648	563	726	769	686
	Thyborøn	45	810	1,462	772	45	362	551	319	45	637	907	530	45	679	970	564
Monk	Hanstholm	358	339	979	558	260	214	523	332	290	264	678	411	294	270	678	414
Plaice	Thyborøn	174	80	10	88	120	37	9	55	161	64	10	78	173	78	10	87
	xDKUK	155	39	195	130	52	3	21	25	116	39	189	115	153	39	195	129
	UK	305	339	25	223	64	78	3	48	243	240	25	170	302	324	25	217
Saithe	Hanstholm	1,397	1,317	1,614	1,443	1,012	956	889	952	1,151	1,079	1,075	1,102	1,166	1,100	1,076	1,114

Source: Own calculations