

## 2 Demersal Stocks in the Faroe Area (Division Vb and Subdivision IIa4)

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### 2.1 Overview

#### 2.1.1 Fisheries

The main fisheries in Faroese waters are mixed-species, demersal fisheries and single species pelagic fisheries. The demersal fisheries are mainly conducted by Faroese vessels, whereas the pelagic fisheries are conducted both by Faroese vessels and by foreign vessels licensed through bilateral and multilateral fisheries agreements. The usual picture has changed since 2011, however, since no mutual agreement has been possible between the Faroe Islands and the EU and Norway, respectively, due to the dispute regarding the share of mackerel.

**Pelagic Fisheries.** Three main species of pelagic fish are fished in Faroese waters: blue whiting, herring and mackerel; several nations participate. The Faroese pelagic fisheries are conducted by purse seiners, larger purse seiners also equipped for pelagic trawling and trawlers otherwise performing demersal fisheries. The pelagic fishery by Russian vessels is conducted by large factory trawlers. Other countries use purse seiners and factory trawlers. Due to the dispute on the mackerel share, only vessels from the Faroes and Iceland have participated in the fishery since 2011.

**Demersal Fisheries.** Although they are conducted by a variety of vessels, the demersal fisheries can be grouped into fleets of vessels operating in a similar manner. Some vessels change between longlining, jigging and trawling, and they therefore can appear in different fleets. The following describes the Faroese fleets first followed by the fleets of foreign nations. The number of licenses can be found in Table 2.3. In the management scheme, the vessels have been grouped differently, see section 2.1.3.

**Open boats.** These vessels are below 5 GRT. They use longline and to some extent automatic, jigging engines and operate mainly on a day-to-day basis, targeting cod, haddock and to a lesser degree saithe. A majority of open boats participating in the fisheries are operated by part-time fishermen.

**Smaller vessels using hook and line.** This category includes all the smaller vessels, between 5 and 110 GRT operating mainly on a day-to-day basis, although the larger vessels behave almost like the larger longliners above 110 GRT with automatic baiting systems and longer trips. The area fished is mainly nearshore, using longline and to some extent automatic jigging engines. The target species are cod and haddock. During summer they also make a few trips to Icelandic waters.

**Longliners > 110 GRT.** This group refers to vessels with automatic baiting systems. The main species fished are cod, haddock, ling and tusk. The target species at any one time is dependent on season, availability and market price. In general, they fish mainly for cod and haddock from autumn to spring and for ling and tusk during the summer. The spatial distribution is concentrated mainly around the areas closed to trawling (Figure 2.1). On average 92% of their catch is taken within the permanent exclusion zone for trawlers. During summer they also make a few trips to Icelandic waters.

**Otter board trawlers < 500 HP.** This refers to smaller fishing vessels with engine powers up to 500 Hp. The main areas fished are on the banks outside the areas closed for trawling. They mainly target cod and haddock. Some of the vessels are licensed

during the summer to fish within the twelve nautical miles territorial fishing limit, targeting lemon sole and plaice.

Otter board trawlers > 500 HP. Traditionally this group, also called the deep-water trawlers, have targeted several deep-water fish species, especially redfish, blue ling, Greenland halibut, grenadier and black scabbard fish. Saithe is also a target species with by-catches of cod and haddock on the Faroe Plateau. The distribution of hauls by this fleet in 2010-2011 is shown in Figure 2.1. Since 2011 this fleet has been included in the fishing days regulation and most of the vessels have changed to pairtrawling.

Pair trawlers <1000 HP. The few vessels in this group fish mainly for saithe, however, they also have a significant by-catch of cod and haddock. The main areas fished are the deeper parts of the Faroe Plateau and the banks to the southwest of the islands.

Pair trawlers >1000 HP. This category targets mainly saithe, but their by-catch of cod and haddock is important to their profit margin. In addition, some of these vessels during the summers have special licenses to fish in deep water for greater silver smelt. The areas fished by these vessels are the deeper parts of the Faroe Plateau and the banks to the southwest of the islands (Figure 2.1).

Gill netting vessels. This category refers to vessels fishing mainly Greenland halibut and monkfish. They operate in deep waters off the Faroe Plateau, Faroe Bank, Bill Bailey's Bank, Lousy Bank and the Faroe-Iceland Ridge. This fishery is regulated by the number of licensed vessels and technical measures like depth and gear specifications. The areas fished by these vessels can be seen in Figure 2.1.

Jiggers. This category consist of a mixed group of smaller and larger vessels using automatic jigging equipment. The target species are saithe and cod. Depending on availability, weather and season, these vessels operate throughout the entire Faroese region. They can change to longlines.

Foreign longliners. These are mainly Norwegian vessels of the same type as the Faroese longliners larger than 110 GRT. They target mainly ling and tusk with by-catches of cod, haddock and blue ling. Normally Norway has had a bilateral fishery agreement with the Faroes for a total quota of these species while the number of vessels can vary from year to year; as said elsewhere in the report, however, since 2011 no such agreement has been in place.

Foreign trawlers. These are mainly otter board trawlers of the same type as the Faroese otter board trawlers larger than 1 000 HP. Participating nations are normally United Kingdom, France, Germany and Greenland. The smaller vessels, mainly from the United Kingdom and Greenland, target cod, haddock and saithe, whereas the larger vessels, mainly French and German trawlers, target saithe and deep-sea species like redfish, blue ling, grenadier and black scabbardfish. As for the foreign longliners, the different nations have in their bilateral fishery agreement with the Faroes, i.e., a total quota of these species while the number of vessels can vary from year to year. Due to the dispute on mackerel, only Greenland is allowed to fish at present.

### **2.1.2 Fisheries and management measures**

The fishery around the Faroe Islands has for centuries been an almost free international fishery involving several countries. Apart from a local fishery with small wooden boats, the Faroese offshore fishery started in the late 19<sup>th</sup> century. The Faroese fleet had to compete with other fleets, especially from the United Kingdom with

the result that a large part of the Faroese fishing fleet became specialised in fishing in other areas. So except for a small local fleet most of the Faroese fleet were fishing around Iceland, at Rockall, in the North Sea and in more distant waters like the Grand Bank, Flemish Cap, Greenland, the Barents Sea and Svalbard.

Up to 1959, all vessels were allowed to fish around the Faroes outside the 3 nm zone. During the 1960s, the fisheries zone was gradually expanded, and in 1977 an EEZ of 200 nm was introduced in the Faroe area. The demersal fishery by foreign nations has since decreased and Faroese vessels now take most of the catches. The fishery may be considered a multi-fleet and multi-species fishery as described below.

During the 1980s and 1990s the Faroese authorities have regulated the fishery and the investment in fishing vessels. In 1987 a system of fishing licenses was introduced. The demersal fishery at the Faroe Islands has been regulated by technical measures (minimum mesh sizes and closed areas). In order to protect juveniles and young fish, fishing is temporarily prohibited in areas where the number of small cod, haddock and saithe exceeds 30% (in numbers) of the catches; after 1–2 weeks, sometimes longer, the areas are again opened for fishing. A reduction of effort has been attempted through banning of new licenses and buy-back of old licenses.

A quota system, based on individual quotas, was introduced in 1994. The fishing year started on 1 September and ended on 31 August the following year. The aim of the quota system was, through restrictive TACs for the period 1994–1998, to increase the SSBs of Faroe Plateau cod and haddock to 52 000 t and 40 000 t, respectively. The TAC for saithe was set higher than recommended scientifically. It should be noted that especially cod and haddock but also saithe are caught in a mixed fishery and any management measure should account for this. Species under the quota system were Faroe Plateau cod, haddock, saithe, redfish and Faroe Bank cod.

The catch quota management system introduced in the Faroese fisheries in 1994 was met with considerable criticism and resulted in discarding and in misreporting of substantial portions of the catches. Reorganisation of enforcement and control did not solve the problems. As a result of the dissatisfaction with the catch quota management system, the Faroese Parliament discontinued the system as from 31 May 1996. In close cooperation with the fishing industry, the Faroese government has developed a new system based on individual transferable effort quotas in days within fleet categories. The new system entered into force on 1 June 1996. The fishing year from 1 September to 31 August, as introduced under the catch quota system, has been maintained.

The individual transferable effort quotas apply to 1) the longliners less than 110 GRT, the jiggers, and the single trawlers less than 400 HP (Groups 4,5), 2) the pair trawlers (Group 2) and 3) the longliners greater than 110 GRT (Group 3). The single trawlers greater than 400 HP were in 2011 included into the fishing days system and were allocated a number of fishing days (Tables 1 and 2). They are not allowed to fish within the 12 nautical mile limit and the areas closed to them, as well as to the pair trawlers, have increased in area and time. Their catch of cod and haddock was before 2011 limited by maximum by-catch allocation. This fleet has now started to pair-trawl, and since the fiscal year 2011/12, merged with the pair-trawlers group. The single trawlers less than 400 HP are given special licenses to target flatfishes inside 12 nautical miles with a by-catch allocation of 30% cod and 10% haddock. In addition, they are obliged to use sorting devices in their trawls in order to minimize their by-catches. One fishing day by longliners less than 110 GRT is considered equivalent to two fishing days for jiggers in the same gear category. Longliners less than 110 GRT could therefore

double their allocation by converting to jigging. Table 2.1 shows the allocated number of fishing days by fleet group since the fiscal year 1996/1997 and in Table 2.2 is a comparison between number of allocated days and number of actually used fishing days. From Table 1 it can be seen that since 1996/1997, the number of days allocated has been reduced considerable and is now 50% of the originally allocated days. Despite this, there still are many unused days in the system (Table 2.2).

Holders of individual transferable effort quotas who fish outside the thick line on Figure 2.2 can fish for 3 days for each day allocated inside the line. Trawlers are generally not allowed to fish inside the 12 nautical mile limit. Inside the innermost thick line only longliners less than 110 GRT and jiggers less than 110 GRT are allowed to fish. The Faroe Bank shallower than 200 m is closed to trawling. Due to the serious decline of the Faroe Bank cod, the Bank has been closed since 1 January 2009 for all gears except for a minor jigging fishery during summer time.

The fleet segmentation used to regulate the demersal fisheries in the Faroe Islands and the regulations applied are summarized in Table 2.3.

The effort quotas are transferable within gear categories. The allocations of number of fishing days by fleet categories was made such that together with other regulations of the fishery they should result in average fishing mortalities on each of the 3 stocks of 0.45, corresponding to average annual catches of 33% of the exploitable stocks in numbers. Built into the system is also an assumption that the day system is self-regulatory, because the fishery will move between stocks according to the relative availability of each of them and no stock will be overexploited. These target fishing mortalities have been evaluated during the 2005 and 2006 NWWG meetings. The realized fishing mortalities have been substantially higher than the target for cod, appear to have exceeded the target for saithe in recent years, while for haddock, fishing mortality remains below the target.

In addition to the number of days allocated in the law, it is also stated in the law what percentage of total catches of cod, haddock, saithe and redfish, each fleet category on average is expected to fish. These percentages are as follows:

Fleet category	Cod	Haddock	Saithe	Redfish
Longliners < 110GRT, jiggers, single trawl. < 400HP	51 %	58 %	17.5 %	1 %
Longliners > 110GRT	23 %	28 %		
Pairtrawlers	21 %	10.25 %	69 %	8.5 %
Single trawlers > 400 HP	4 %	1.75 %	13 %	90.5 %
Others	1 %	2 %	0.5 %	0.5 %

The technical measures as mentioned above are still in effect. An additional measure to reduce the fishing mortality on cod and haddock and to especially reduce the mortality on the youngest age groups has been introduced (See the 2013 NWWG report, Figure 2.3) in July 2011, but was terminated in August 2013.

### 2.1.3 The marine environment and potential indicators

The waters around the Faroe Islands are in the upper 500 m dominated by the North Atlantic current, which to the north of the islands meets the East Icelandic current. Clockwise current systems create retention areas on the Faroe Plateau (Faroe shelf) and on the Faroe Bank. In deeper waters to the north and east and in the Faroe Bank

channel there is deep Norwegian Sea water, and to the south and west is Atlantic water. From the late 1980s the intensity of the North Atlantic current passing the Faroe area decreased, but it has increased again in the most recent years. The productivity of the Faroese waters was very low in the late 1980s and early 1990s. This applies also to the recruitment of many fish stocks, and the growth of the fish was poor as well. Since then, there have been several periods with high or low productivity, which has been reflected in the fish landings a couple of years afterwards.

There has been observed a clear relationship, from primary production to the higher trophic levels (including fish and seabirds), in the Faroe shelf ecosystem, and all trophic levels seem to respond quickly to variability in primary production in the ecosystem (Gaard, E. et al. 2002). There is a positive relationship between primary production and the cod and haddock individual fish growth and recruitment ½-2 years later. The primary production index has been below average since 2002 except for 2004 and 2008-2010 when it was above average (Figure 2.3). The estimate of primary production in 2014 will not be available until July. The primary production index could therefore be a candidate ecosystem and stock indicator. Another potential indicator candidate is the so-called Sub-polar Gyre Index, which is an index for the primary production in the outer areas (Figure 2.3).

Recent work (Steingrund *et al.*, 2012) shows that there is a moderate positive correlation between primary production on the Faroe Shelf and the subsequent production of cod (Steingrund and Gaard, 2005). There is also a moderate positive correlation for haddock and saithe. However, if all three species are combined, the positive correlation becomes very strong (Figure 2.4). This indicates that a nearly fixed portion of the energy produced by the primary production goes to predatory demersal fish on the Faroe Plateau, but that the portion to each of the fish stocks (to cod, haddock or saithe) may vary much between years. As an example, the last period of high productivity (2008-2010) did not lead to any marked increase in the stock size of cod/haddock, but only in saithe. Sandeels seem to be an important trophic link between the primary production and fish.

#### **2.1.4 Summary of the 2014 assessment of Faroe Plateau cod, haddock and saithe**

A summary of selected parameters from the 2014 assessment of Faroe Plateau cod, Faroe haddock and Faroe saithe is shown in Figure 2.5. As mentioned in previous reports of this WG, landings of cod, haddock and saithe on the Faroes appear to be closely linked with the total biomass of the stocks. For cod, the exploitation ratio and fishing mortality have remained relatively stable over time, although they have been more fluctuating in recent years. For haddock, the exploitation rate was decreasing from the 1950s and 1960s, while it have been fluctuating since the mid 1970s. For saithe, there is a suggestion that the exploitation rate was increasing at the beginning of the period, it decreased from the early 1990s to 1998 and has increased close to the highest values observed in 2009. It has since declined again.

Another main feature of the plots of landings, biomasses, mortalities and recruitment is the apparent periodicity during the time series with cod and haddock showing almost the same fluctuations and time-trends.

#### **2.1.5 Reference points for Faroese stocks**

As explained elsewhere in this report, MSY reference points have recently been estimated for cod, haddock and saithe in addition to the already existing PA reference

points. These reference points are all estimated based on single-species models. Multi-species models may give very different perception of  $F_{MSY}$  reference points than single-species models, and for the Faroe area this could be extra true, since there is a close relationship between the environment and the fish stocks and between fish stocks (see section 2.1.3). Therefore, studies have been made recently to construct ecological models for the area. A long-term simulation was performed in the 2011 report to evaluate MSY reference points for cod, haddock and saithe, all in the same ecological model (see working document 22 in the 2011 report). The model settings and the results were presented in the 2011 Overview section for the Faroese stocks.

Recent work (Steingrund *et al.*, 2012), however, indicates that another ecological model including fish production and zooplankton may be more appropriate (see section 2.1.3). The results from the ecological modelling are presently, however, to be regarded as very preliminary, but it is hoped that the ecological model work can be included in future NWWG reports.

### 2.1.6 Management plan

In 2011 the Faroese minister of fisheries established a group of experts to formulate a management plan for cod, haddock and saithe including a harvest control rule and a recovery plan. The group consisted of scientists from the Faroe Marine Research Institute and the Faroese University, of 1 representative from the industry (trawlers) and 1 from the Ministry of Fisheries. The results of this work was delivered to the Minister of Fisheries in the spring 2012 but the outcome has not been approved by the authorities so far and not been implemented. Basically, the plan builds on the MSY framework developed by ICES.

### 2.1.7 References:

- Gaard, E., Hansen, B., Olsen, B and Reinert, J. 2001. Ecological features and recent trends in physical environment, plankton, fish stocks and sea birds in the Faroe plateau ecosystem. In: K- Sherman and H-R Skjoldal (eds). Changing states of the Large Marine Ecosystems of the North Atlantic.
- Steingrund, P., and Gaard, E. 2005. Relationship between phytoplankton production and cod production on the Faroe Shelf. ICES Journal of Marine Science, 62: 163-176.
- Steingrund, P., and Hátún, H. 2008. Relationship between the North Atlantic subpolar gyre and fluctuations of the saithe stock in Faroese waters. NWWG 2008 Working Document 20.
- Steingrund, P., Gaard, E., Reinert, J., Olsen, B., Homrum, E., and Eliassen, K. 2012. Trophic relationships on the Faroe Shelf ecosystem and potential ecosystem states. In: Homrum, E., 2012. The effects of climate and ocean currents on Faroe Saithe. PhD-thesis, 2012.



Table 2.1. Number of allocated days since the fiscal year 1996/97.

Tillutaðir dagar sambært lögtingslógir:													Tøkir	
Bólkur	Smb. Ll.:	Serlig viðm.	1 ytri	1 innaru	2 ytri	2 innari	3	4 A	4 B	4 D	4 T	5 (at ráða yvir)	Dagar tils.	
1996/97	(50 20/5-96)	(12/15 mdr!)				8225	3040	4700	3080	1540		22000	1000	43585
1996/97	(84 6/6-97)	(12/15 mdr!)				8225	3040	5600	3410	1650		27000	660	49585
1997/98	(133 9/8-97)	12 mdr!				7199	2660	4696	4632			23625	577	43389
1998/99	(69 18/8-98)					6839	2527	4461	4400			22444	548	41219
1999/2000	(80 17/8-99)					6839	2527	4461	4400			22444	548	41219
2000/2001	(104 17/8-00)					6839	2527	4461	4400			22,444	548	41219
2001/2002	(115 15/8-01)					6839	2527	4461	4400			22444	0	40671
2002/2003	(76 13/8-02)					6771	2502	4416	4356			22220	0	40265
2003/2004	(100 8/8-03)					6636	2452	4328	4269			21776	0	39461
2004/2005	(49 18/8-04)					6536	2415	4263	4205			21449	0	38868
2005/2006	(98 19/8-05)					5752	3578	1770	2067		1766	21235	0	36168
2006/2007	(81 17/8-06)					5752	3471	1717	2005		1713	20598	0	35256
2007/2008	(80 20/8-07)					5637	3402	1683	1965		1679	20186	0	34552
2008/2009	(76 15/8-08)					5073	3062	1515	1769		1511	18167	0	31097
2008/2009	(62 25/5-09)					4638	3095	1393	1848		1621	18167	0	30762
2009/2010	(106 17/8-09)					4406	2940	1323	1756		1540	17259	0	29224
2010/2011	(87 18/8-10)		1700	900		4274	2852	1323	1756		1540	13259	0	25004
2010/2011	sama -		1700	900		4274	2852	1323	1756		1540	13259	0	27604
2011/12	(105 18/8-11) (112 2/9-11)				1530	4657	2567	1058	1405		1386	10607		23210
2012/13	(89 17/8-12)				1530	4626	2567	1011	1533		1386	10607		23260
2013/14	(109 16/8-13)				1530	4441	2387	1011	1533		1386	9865		22153

Table 2.2. Number of days allocated and the number actually used since the fiscal year 2010/2011

Variabul - JM: Meting 03-06. april 2014 (dagført):										pr. 03-06. april 2014 (7 mdr.)		
Fleet segment	Allocated days 2010/11	Used days 2010/11	% used days 2010/11	Allocated days 2011/12	Used days 2011/12	% used days 2011/12	Allocated days 2012/13	Used days 2012/13	% used days 012/13	Allocated days 2013/14	Used days pr. Dato	% used days
Reference:	LI87 18/8-10(JV)			LI105 18/8-11 og LI112 2/9-11(JD)			LI105 18/8-11 og LI112 2/9-11(JD)			LI105 18/8-11 og LI112 2/9-11(JD)		
Group 1 - innaru leiðir	900	552.39	61%									
Group 1 - ytri leiðir	1700	785.3	46%									
Group 2 - (innaru leiði	4274	3883.23	91%	4657	4758.02	102%	4626	3952.52	85%	4441	2559.15	58%
Group 2 - ytri leiðir				1530	894.94	58%	1530	878.57	57%	1530	624.81	41%
Group 3	2852	2071.16	73%	2567	1985.90	77%	2567	1205.23	47%	2387	750.94	31%
Group 4A	1323	405.36	31%	1058	259.5	25%	1011	270.72	27%	1011	167.41	17%
Group 4B	1756	1015.65	58%	1405	656.61	47%	1533	687.73	45%	1533	167.41	11%
Group 4T	1540	1411.98	92%	1386	1313.14	95%	1386	1165.71	84%	1386	409.06	30%
Group 5A	5304	2856	54%	5060	1834	36%	4730	1410	30%	4311	662	15%
Group 5B	7955	4525	57%	5547	3160	57%	5877	2845	48%	5554	1358	24%
Total	27604	17506.07	63%	23210	14862.11	64%	23260	12415.48	53%	22153	6698.78	30%

**Table 2.3. Main regulatory measures by fleet in the Faroese fisheries in Vb. The fleet capacity is fixed, based on among other things no. of licenses. Number of licenses within each group (by May 2006) are as follows: 1: 12; 2:29; 3:25; 4A: 25; 4B: 21; 4T: 19; 5A:140; 5B: 453; 6: 8. These licenses have been fixed in 1997, but in group 5B a large number of additional licenses can be issued upon request.**

<b>Fleet segment</b>	<b>Sub groups</b>		<b>Main regulation tools</b>
1 Single trawlers > 400 HP	none		Fishing days, have from 2011/12 been merged with the pair trawlers, area closures
2 Pair trawlers > 400 HP	none		Fishing days, area closures
3 Longliners > 110 GRT	none		Fishing days, area closures
4 Coastal vessels>15 GRT	4A	Trawlers 15-40 GRT	Fishing days
	4A	Longliners 15-40 GRT	Fishing days
	4B	Longliners>40 GRT	Fishing days
	4T	Trawlers>40 GRT	Fishing days
5 Coastal vessels <15 GRT	5A	Full-time fishers	Fishing days
	5B	Part-time fishers	Fishing days
6 Others	Gillnetters		Bycatch limitations, fishing depth, no. of nets
	Others		Bycatch limitations

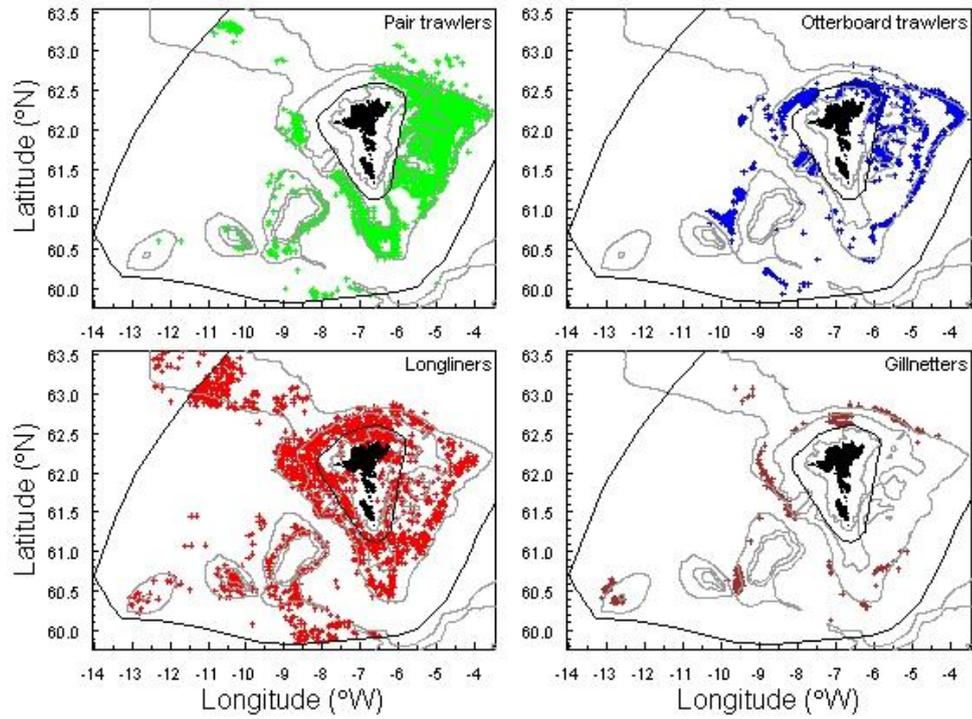
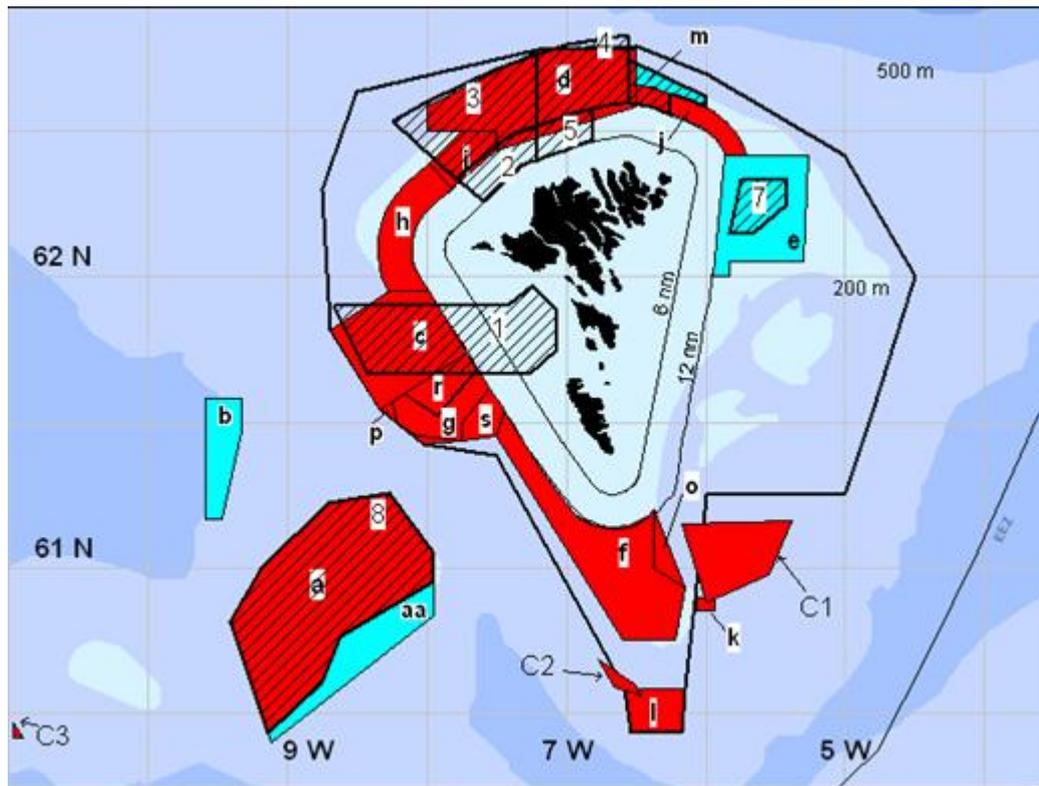


Figure 2.1. The 2012 distribution of fishing activities by some major fleets. The longline fleet below 15 GRT is not shown here since they are not obliged to keep logbooks.



Exclusion zones for trawling

Area	Period
a	1 jan - 31 des
aa	1 jun - 31 aug
b	20 jan - 1 mar
c	1 jan - 31 des
d	1 jan - 31 des
e	1 apr - 31 jan
f	1 jan - 31 des
g	1 jan - 31 des
h	1 jan - 31 des
i	1 jan - 31 des
j	1 jan - 31 des
k	1 jan - 31 des
l	1 jan - 31 des
m	1 feb - 1 jun
n	31 jan - 1 apr
o	1 jan - 31 des
p	1 jan - 31 des
r	1 jan - 31 des
s	1 jan - 31 des
C1	1 jan - 31 des
C2	1 jan - 31 des
C3	1 jan - 31 des

Spawning closures

Area	Period
1	15 feb - 31 mar
2	15 feb - 15 apr
3	15 feb - 15 apr
4	1 feb - 1 apr
5	15 jan - 15 mai
6	15 feb - 15 apr
7	15 feb - 15 apr
8	1 mar - 1 may

Figure 2.2. Fishing area regulations in Division Vb. Allocation of fishing days applies to the area inside the outer thick line on the Faroe Plateau. Holders of effort quotas who fish outside this line can triple their numbers of days. Longliners larger than 110 GRT are not allowed to fish inside the inner thick line on the Faroe Plateau. If longliners change from longline to jigging, they can double their number of days. The Faroe Bank shallower than 200 m depths (a, aa) is regulated separate from the Faroe Plateau. It is closed to trawling and the longline fishery is regulated by individual day quotas.

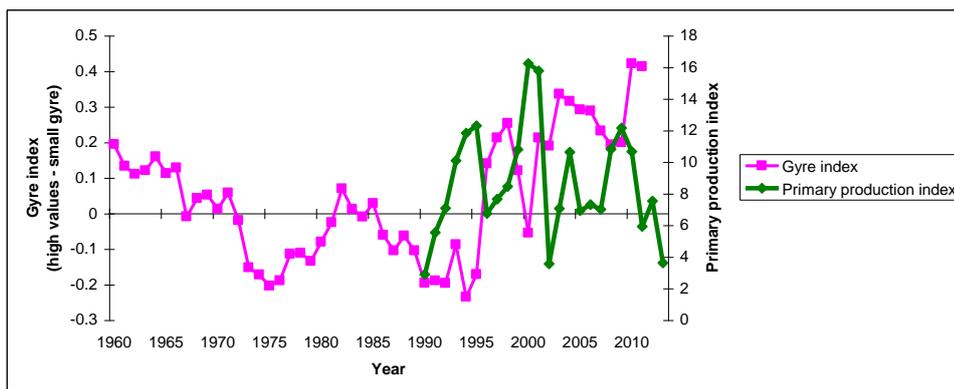


Figure 2.3. Temporal development of the phytoplankton index over the Faroe Shelf area (< 130 m) and the subpolar gyre index which indicates productivity in deeper waters.

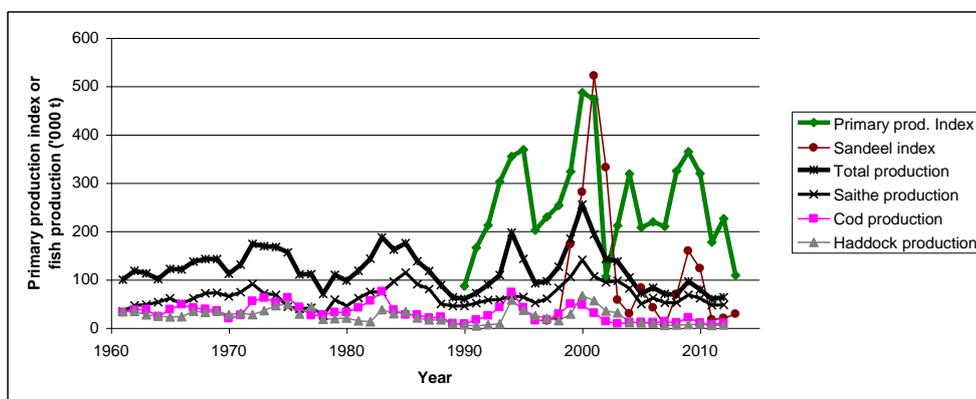


Figure 2.4. Relationship between primary production, a sandeel index (from stomach analyses), and production of cod, haddock and saithe.

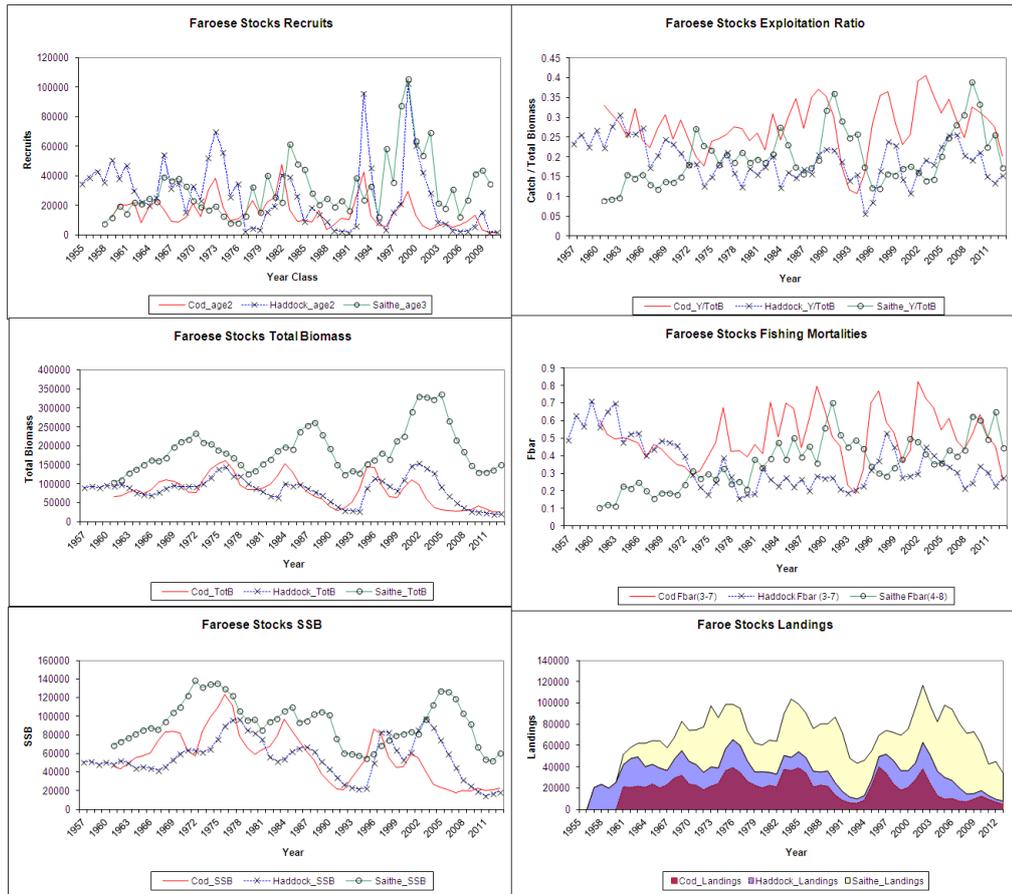


Figure 2.5. Faroe Plateau cod, Faroe haddock and Faroe saithe. 2014 stock summary.