2 Demersal Stocks in the Faroe Area (Division Vb and Sub-division IIA4)

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 fishermen, whereas the major part of the pelagic fisheries are conducted by foreign fishermen licensed through bilateral and multilateral fisheries agreements.

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 almost exclusively conducted by purse seiners and larger purse seiners also equipped for pelagic trawling. The pelagic fishery by Russian vessels is conducted by large factory trawlers. Other countries use purse seiners and factory trawlers.

Demersal Fisheries. Although they are conducted by a variety of different 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. In the following there is first a description of the Faroese fleets followed by the fleets of foreign nations. Number of licenses can be found in Table 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. The large number of open boats participating in the fisheries are often 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.

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 in the year around closed areas to trawling (Figure 2.1.0). 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 mile territorial fishing limit, targeting lemon sole and plaice.

Otter board trawlers 500-1000 HP. These vessels fish mainly for cod and haddock. They fish primarily in the deeper parts of the Faroe Plateau and the banks to the southwest of the islands.

Otter board trawlers >1000 HP. This group, also called the deep-water trawlers, target several deep-water fish species, especially redfish, blue ling, Greenland halibut, grenadier and black scabbard fish. Saithe is also a target species and in recent years they have been allocated

individual quotas for cod and haddock on the Faroe Plateau. The distribution of hauls by this fleet in 2000-2005 is shown in Figure 2.1.0.

Pair trawlers <1000 HP. These vessels 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 2.1.0).

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 (8) and technical measures like depth and gear specifications.

Jiggers. 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. Most of them can change to longlines and in recent years jigging effort has decreased as compared 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. Norway has in the bilateral fishery agreement with the Faroes achieved a total quota of these species; numbers of vessels can vary from year to year.

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 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-see 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 achieved a total quota of these species; numbers of vessels can vary from year to year

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 19th 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 licences 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 the catches; after 1–2 weeks the areas are again opened for fishing. A reduction of effort has been attempted through banning of new licences and buy-back of old licences.

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 cod, haddock and 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 misreportings 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 100 GRT, the jiggers, and the single trawlers less than 400 HP, 2) the pair trawlers and 3) the longliners greater than 100 GRT. The single trawlers greater than 400 HP do not have effort limitations, but 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 is limited by maximum by-catch allocation. The single trawlers less than 400 HP are given special licences to fish 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 cy-catches. One fishing day by longliners less than 100 GRT is considered equivalent to two fishing days for jiggers in the same gear category. Longliners less than 100 GRT could therefore double their allocation by converting to jigging. Table 2.1.1 shows the number of fishing days used by fleet category for 1985–1995 and 1998–2005 and Table 2.1.2 shows the number of allocated days inside the outer thick line (the “ring”) in Figure 2.1.1. Holders of individual transferable effort quotas who fish outside this line 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 100 GRT and jiggers less than 100 GRT are allowed to fish. The Faroe Bank shallower than 200 m is closed to trawling.

The fleet segmentation used to regulate the demersal fisheries in the Faroe Islands and the regulations applied are summarized in Table 2.1.3.

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 (2.1.6).

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 allowed 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 %

Technical measures such as area closures during the spawning periods, to protect juveniles and young fish and mesh size regulations as mentioned above are still in effect.

2.1.3 The marine environment

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 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. From 1992 onwards the conditions have returned to more normal values which also is reflected in the fish landings. There has been observed a very 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. 2001). In the section below on catchability analysis this is further discussed.

2.1.4 Catchability analysis

In an effort management regime with a limited numbers of fishing days, it is expected that vessels will try to increase their efficiency (catchability) as much as possible in order to optimise the catch and its value within the number of days allocated. “Technological creeping” should therefore be monitored closely in such a system. However, catchability of the fleets can change for other reasons, e.g. availability of the fish to the gears. If such effects are known or believed to exist, catchability changes may need to be incorporated in the advice on fisheries.

The primary production of the Faroe Shelf ecosystem may vary by as much as a factor of five and given the link between primary production and recruitment and growth (production) of cod as demonstrated by Steingrund & Gaard (2005), this could have pronounced effects on catchability and stock assessment as a whole. Below are the results from an analysis regarding Faroe Plateau cod, Faroe haddock and Faroe saithe.

For cod there seems to be a link between the primary production and growth of cod (Fig. 2.1.2). The growth of cod seems to be negatively correlated with the catchability of longlines (Figure 2.1.3), suggesting that cod attack longline baits to a higher degree when natural food

abundance is low. Since longliners usually take a large proportion of the cod catch, the total fishing mortality fluctuates in the same way as the long line catchability and thus there is a negative relationship between cod growth and fishing mortality (Fig. 2.1.4).

Also for haddock there seems to be similar relationship between primary production, growth, catchability and fishing mortality as for cod. The negative relationship between growth and fishing mortality as shown in Fig. 2.1.5 suggests, that the same mechanism is valid for haddock as for cod.

It is, however, important to note that the relationship between the productivity of the ecosystem and the catchability of long lines depends on the age of the fish. For cod, the relationship is most clear for age 5; for age 3 and 4, the relationship is less clear. For young haddock there apparently is no such relationship between productivity and catchability.

For saithe no clear relationship was observed between the catchability for the Cuba pair trawlers (pair trawlers take the majority of the catch) and other variables such as primary production, growth and stock size.

The analysis reported above suggests that natural factors may have a larger influence than technological ones, at least for Faroe Plateau cod and Faroe haddock on changes in catchability. In addition, the available data indicate that there has not been sufficient time since the implementation of the effort management system in 1996 to detect convincing changes in catchability. However, from a management perspective, if the hypothesis that catchability is related to productivity is true, and if productivity in 2005 and 2006 is low, there is the potential for very high fishing mortality to be exerted on cod. It could therefore be prudent to consider substantial reductions in fishing effort for the next fishing season.

2.1.5 Summary of the 2006 assessment of Faroe Plateau cod, haddock and saithe

A summary of selected parameters from the 2006 assessment of Faroe Plateau cod, Faroe haddock and Faroe saithe is shown in Figure 2.1.6. Landings of cod, haddock and saithe on the Faroes appear to be closely linked with the total biomass of the stocks. For cod, the peaks and valleys are generally of the same height, suggesting that the exploitation ratio has remained relatively stable over time. For haddock, the difference at the beginning of the series suggest that the exploitation rate was decreasing during that period, while it would have been relatively steady since the mid 1970s. For saithe, there is a suggestion that the exploitation rate was increasing at the beginning of the period with reasonable stability since the mid to late 1970s.

Fishing mortality estimates from the assessment do not confirm this perception, but that is partly due to unstable estimates of fishing mortality 1) at the oldest, poorly sampled ages and 2) for very small poorly sampled year classes. The ratio of landings to biomass could therefore provide a more stable indication of the exploitation status of the resource

The plot of exploitation ratio over time does support the above hypothesised trends in fishing. The overall ratio (sum of cod, haddock and saithe landings over the sum of their biomass) is remarkably stable between 0.18 and 0.25 over the period 1961 to 1989, with possibly a slight increasing trend. The ratio has been more variable since for both individual species and for the aggregate. Although variable, there appears to be an increasing trend from 0.14 in 1995 to 0.27 in 2005. The most recent biomass estimates, however, are most likely to change in future assessments, and the trend could therefore change as a result of future stock assessments.

The same data can be shown differently with area graphs. This suggests that the landings of saithe have taken an increasing part of the total biomass in the area.

2.1.6 Medium term projections and reference points for Faroe Stocks

In recent years, the NWWG has noted the inappropriateness of existing reference points for Faroe Plateau cod, Faroe haddock and Faroe saithe and the need to revise them. In particular, in 2005, the NWWG made 100 year simulations using the results of the 2004 assessment and suggested that the biomass reference points for haddock and saithe, and the fishing mortality reference points for all three stocks be revised in accordance with the guidelines of the Study Group on Precautionary Reference Points for Advice on Fishery Management (SGPRP 2003, ICES CM 2003/ACFM:15), taking into account the results of the 100 year simulations. According to its Technical Minutes, the 2005 ACFM Review Group accepted the WG suggestions, with the exception of the Bpa for saithe which the WG suggested should be set at Bloss (the current Blim) given the shape of the stock and recruitment data pairs (the highest recruitment is observed at the lowest SSB). The reasons that led ACFM to reject the NWWG's proposals remain unclear, but the WG has attempted to address possible reasons.

According to generic term of reference 2 of C.Res. 2005/2/ACFM01, the NWWG was asked to review reference points. This was done by scrutinising the results of the 100 year simulations done last year, by examining the stock and recruitment scatter plots from this year's assessment, and by investigating the dynamics of the three Faroese stocks.

Existing reference points for Faroe stocks and their technical basis are provided in the table below:

	BLIM	TECH. BASIS	BPA	TECH. BASIS	FLIM	TECH. BASIS	FPA	TECH. BASIS
Faroe Plateau cod	21 000t	Bloss	40 000t	From Blim assuming sigma of 0.40	0.68	From Fpa assuming sigma of 0.40	0.35	Close to Fmax and Fmed in 1998 assessment
Faroe haddock	40 000t	Former MBAL	55 000t	Based on inspection of S and R	0.40	From Fpa assuming 2 st. dev.	0.25	Fmed in 1998 assessment
Faroe saithe	60 000t	Bloss in 1999 assessment	85 000t	Former MBAL	0.40	Consistent with Blim of 60 000t	0.28	Consistent with Flim and previous estimate of Fmed

Data and methodology (update to the 2005 report of the NWWG)

One hundred years projections using the results of the 2004 assessments were made for the stocks of Faroe Plateau cod, Faroe haddock and Faroe saithe under similar assumptions. Natural mortality was assumed fixed at M = 0.20 for all ages and all years. The average of the values for 1996 to 2003, the period covered by the effort management regime, were used for the average weights at age, maturity at age and for the exploitation pattern. Weights at age in the stock were assumed equal to weights at age in the catch. Future recruitment was modelled from a Ricker stock – recruitment relationship fitted using the USA National Marine Fisheries Service NFT SRFIT software. The form used by SRFIT is R = S*exp(alpha + beta *S). The line goes nicely through the cloud of points for the three stocks, and the scatter of points supports the choice of a Ricker relationship over a Beverton and Holt one (Figure 2.1.7).

Stochasticity was introduced in the projections by randomly selecting residuals from the fits and adding them to the predicted recruitment. If the residual added to the recruitment calculated from the equation was negative and larger than the predicted recruitment, the resulting negative value was replaced with zero in order to avoid producing negative recruits.

Four scenarios of fishing mortality were investigated: F status quo, F target = 0.45 corresponding to 33% exploitation rate in numbers, increasing F at 3% per year, and decreasing F at 3% per year until F had been reduced by 50%. The increasing F scenario is considered plausible in the effort management system extant on the Faroes since 1996.

Each scenario was run 250 times in an excel spreadsheet using the FishLab software. In the 2005 NWWG report, the yearly SSB and Catches were recorded, and the median catch, the coefficient of variation of the catch, the median SSB, and the probability that the SSB will be lower than reference points were examined. These are not reproduced here. The spreadsheet was re-run this year record the Recruits under the F target scenario. Otherwise, results from last years simulations were re-examined.

Few details of the simulations were reported in the 2005 NWWG report and ACFM may have been concerned that the recruitment values used in the 100 year simulations had a different distribution than what had been observed in reality. Figure 2.1.8 shows that the frequency distribution of recruitment observed in the assessments, and that generated for the 100 year simulations are very close for cod and haddock. For saithe, the weak to moderately strong (stronger than average but not exceptional) are more frequent in the observed than in the predicted year classes. This is reflected in the medians: 23.75 million in the observed series vs 28 millions in the predicted series for saithe. The frequency of moderately strong to very strong year classes is similar in the two saithe series. For cod, the observed median recruits is 15 million fish and the one in the simulations is 15.2 millions. For haddock, the observed median recruits is 24.9 million and the one in the simulations is 23.5 millions.

Biomass reference points

As indicated in the 2005 report of the NWWG, the existing Blim for Faroe cod is supported by the data, but those for haddock and saithe are not.

The 1998 Study Group on the Precautionary Approach to Fishery Management (SGPAFM) suggested that Blim for haddock be set at the lowest biomass observed, that is 21 000t. Instead, ACFM choose to set Blim at the previously established MBAL above which the probability of good recruitment was said to be high. New stock and recruitment data pairs have been added since Blim for haddock has been set in the 1998 ACFM advice and recruitment has not been particularly low when SSB was below Blim (Figure 2.1.9). In fact, the 1993 yc, the second strongest on record was produced at an SSB below Blim. This is consistent with the results of the SGPRP 2003 where segmented regression on the data available at the time suggested a break point in the order of 23 000t. **The NWWG recommends that Blim for Faroe haddock be set at 23 000t.** Assuming sigma equal to 0.40, this would imply a Bpa of 35 000t as suggested in the SGPAFM 1998.

For saithe, the 1998 SGPAFM suggested Blim of 70 000t (the lowest observed at the time). ACFM advice in 1998 raised Blim to 85 000t, the 1999 ACFM advice also used Blim = 85 000t but Blim becomes 60 000t in the 2000 ACFM advice as the lowest observed SSB. The SGPRP 2003 indicated that in cases where recruitment seemed to increase with decreasing biomass, as is clearly the case for Faroe saithe, it was more appropriate to use Bloss as an estimate of Bpa rather than as an estimate of Blim (Figure 2.1.10). **The NWWG recommends that 60 000t be the new Bpa for saithe** as it is clear that recruitment has not been impaired below Bpa or near Blim, on the contrary. Assuming a sigma of 0.3 as a precautionary measure, this would imply a Bpa of 45 000t.

Fishing mortality reference points and development of the Faroese demersal stocks

Figure 2.1.11 shows the recruitment and SSB time trends for the three main Faroese demersal stocks. Variability of the recruitment is the dominant feature, but no downward trends in recruitment are apparent. For haddock and saithe, recruitment seems to have improved in

recent years. For cod, it seems to continue to fluctuate in the range observed in the past. SSB for cod seems to be trending downwards, that of haddock seems to be trending upwards, while that for saithe appears to be slowly increasing. It should be noted that the 2006 saithe assessment is possibly underestimating stock size if the development of the fishery in 2006 is reflective of stock size. See section 2.5 on the Faroe saithe assessment for further information. It is noteworthy that strong year classes for the three species have been produced at low biomasses.

Figure 2.1.12 shows the time trends in estimated fishing mortality. It should be noted that the average F's on the graphs may not be the best nor the most stable indicators of the effect of exploitation on the stocks. Nevertheless, since they are the currency in which Fpa has been set, the time trends are presented to show that the existing Flim does not possess the characteristics of a limit reference point, that is Flim has been breached for the three stocks on numerous occasions, yet the productivity does not seem to have been affected.

During 1961 to 2005, the period covered by the assessment, the median F for cod was 0.47, F was less than Fpa in three years and over Flim in seven years. The saithe assessment covers the same period, and the median F was 0.35, F was less than Fpa in 18 years and above Flim in 17 years. During 1957 to 2005, the period covered by the haddock assessment, the median F was 0.29, F was less than Fpa in 13 years and above Flim in 18 years. Clearly, history shows that the current values used for Flim do not possess the characteristics of limit reference points since they have been preached on numerous occasions and productivity of the three stocks do not seem to have been impaired. Based on the history as depicted in the current assessment, the NWWG concludes that the median F's experienced by the Faroese demersal stocks over the period 1957/1961 to 2005 have been sustainable (F = 0.47 for cod, F = 0.29 for haddock, and F = 0.35 for saithe) and therefore that the current Flim's and associated Fpa's are not appropriate.

The frequency distributions of the SSB's for the target F's and the time trends of SSB's under various F scenarios are shown in figure 2.4.13. The left hand panel of the figures, showing the time trends under various F scenarios, shows that the F status quo, the F target (as defined in these simulations, i.e. the average F's at age of 2001 to 2003 as estimated in the 2004 assessment) and the decreasing F scenarios are all sustainable, but that the scenario where F was increased at 3% per year will eventually lead to a collapse of the SSB and of the stocks. The right hand panel shows the frequency distributions of the SSB at the target F = 0.45 compared with the Bpa and Blim proposed above. For cod and saithe, there is a zero probability that SSB will get below the existing (and supported) Blim if F is maintained at Ftarget or below. For haddock, there is a small probability that Ftarget could push SSB below the suggested Blim. Based on the 100 year simulations, the NWWG concludes that Ftarget is sustainable for the three Faroese demersal stocks. However, the increasing F scenario is not sustainable, and the NWWG believes that the existing effort management system will result in increasing F's over time, although the magnitude of the yearly increase is unknown.

Conclusion

The NWWG concludes that the effort management system for demersal fishes on the Faroes has been consistent with the precautionary approach and it is expected that it will continue to be consistent with the PA in the short to medium term when SSB is above the Blim proposed herein. Based on the history of the fishery and on 100 years simulations, the NWWG also concludes that the target exploitation rates of 33% of the exploitable stock in numbers of each species, corresponding approximately to F = 0.45 are sustainable for cod, haddock and saithe. Generally, however, the fishing mortality on saithe has been less than the target, although F on saithe has had a tendency to increase in the recent past (although the most recent F estimate is considered to be an overestimate).

Under the effort management system applied on the Faroes the NWWG expects that the effectiveness of fishing will increase. This implies that the fishing mortality exerted by one day's fishing will progressively increase over time. As a result, the number of days currently allocated, which result in what seems to be sustainable fishing mortality, will result in progressively higher F's which are unlikely to remain sustainable in the medium to long term.

The NWWG has no basis to evaluate if the effort management system is consistent with the Precautionary Approach when SSB is below Blim because actions to be taken in those cases, if any, are not documented. According to the current assessment, the SSB for cod is decreasing towards Blim, and unless strong recruitment is produced, the probability to reach Blim in the near term is sufficient to justify deciding what management measures will be taken should the event occur.

If the hypothesis underpinning the management system that fishing effort will be directed towards haddock and saithe actually materialise, F on cod could decrease. But should an unfortunate combination of increase in catchability due to low food availability (or some other factor out of the control of fishery management) and high prices due to high demand for cod could result in a targeting of fishing effort on cod, producing very high fishing mortalities that could deplete the remaining biomass very rapidly.

The NWWG believes that 10 years after the implementation of the effort management system, it would be appropriate to evaluate and suggest improvements to the system, including management measures to be taken when stocks approach or are under Blim. This could be done by a group of Faroese interested parties whose composition would be similar to that who originally designed the system, i.e. it should involve fishermen, fishery managers and fishery scientists. The improvements should also suggest how to monitor improvements in efficiency and how to adjust for them in a manner that will not ultimately lead to very few fishing days per individuals. A Study Group, to be held in advance of the 2007 meeting of the NWWG, could evaluate scientifically the proposals for improvements.

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.

Table 2.1.1. Number of fishing days used by various fleet groups in Vb1 1985-95 and 1998-05. For other fleets there are no effort limitations. Catches of cod, haddock saithe and redfish are regulated by the by-catch percentages given in section 2.1.1. In addition there are special fisheries regulated by licenses and gear restrictions. (This is the real number of days fishing not affected by doubling or tripling of days by changing areas/gears)

Year	Longliner 0-110 GRT, jiggers, trawlers < 400 HP	Longliners > 110 GRT	Pairtrawlers > 400 HP
1985	13449	2973	8582
1986	11399	2176	11006
1987	11554	2915	11860
1988	20736	3203	12060
1989	28750	3369	10302
1990	28373	3521	12935
1991	29420	3573	13703
1992	23762	2892	11228
1993	19170	2046	9186
1994	25291	2925	8347
1995	33760	3659	9346
Average(85-95)	22333	3023	10778
1998	23971	2519	6209
1999	21040	2428	7135
2000	24820	2414	7167
2001	29560	2512	6771
2002	30333	2680	6749
2003	27642	2196	6624
2004	22211	2728	7059
2005	21829	3123	6377
Average(98-05)	25176	2575	6761

Table 2.1.2. Number of allocated days for each fleet group since the new management scheme was adopted and number of licenses per fleet.

Fishing year	Group 1 Single trawlers > 400 HP	Group 2 Pair trawlers > 400 HP	Group 3 Longliners > 110 GRT	Group 4 Longliners and jiggers 15-110 GRT, single trawlers < 400 HP	Group 5 Longliners and jiggers < 15 GRT
1996/1997		8225	3040	9320	22000
1997/1998		7199	2660	9328	23625
1998/1999		6839	2527	8861	22444
1999/2000	Regulated by area	6839	2527	8861	22444
2000/2001	and by-catch	6839	2527	8861	22444
2001/2002	limitations	6839	2527	8861	22444
2002/2003		6771	2502	8772	22220
2003/2004		6636	2452	8597	21776
2004/2005		6536	2415	8468	21449
2005/2006		5752	3578	5603	21335
No. of licenses	13	28	19	106	> 1400 (696)

FLEET SEGMENT		SUB GROUPS		MAIN REGULATION TOOLS
1	Single trawlers > 400 HP	*none*		Bycatch quotas, 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

Table 2.1.3. Main regulatory measures by fleet in the Faroese fisheries in Vb. The fleet capacity is fixed, based on among other things no. of licences. 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.

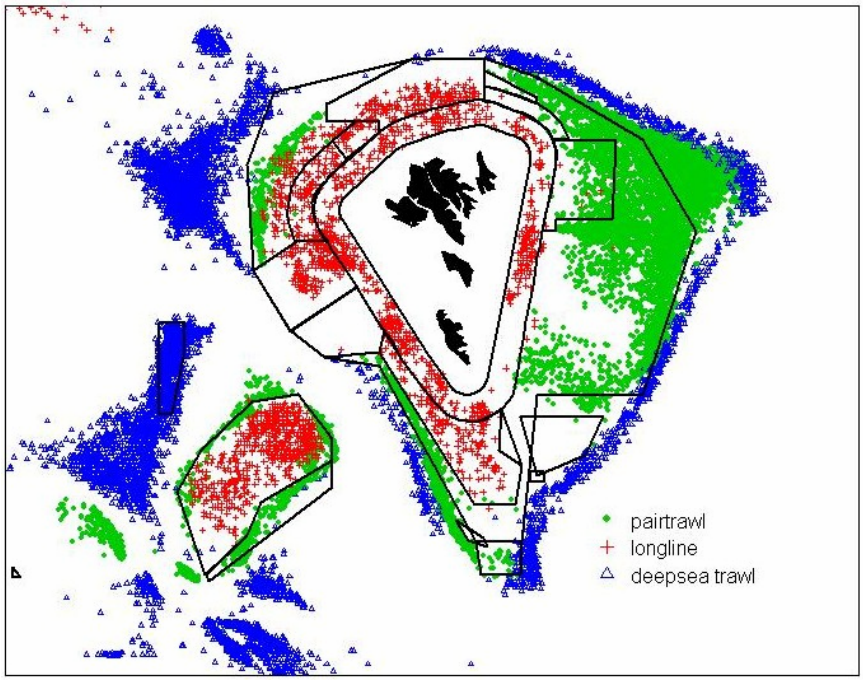
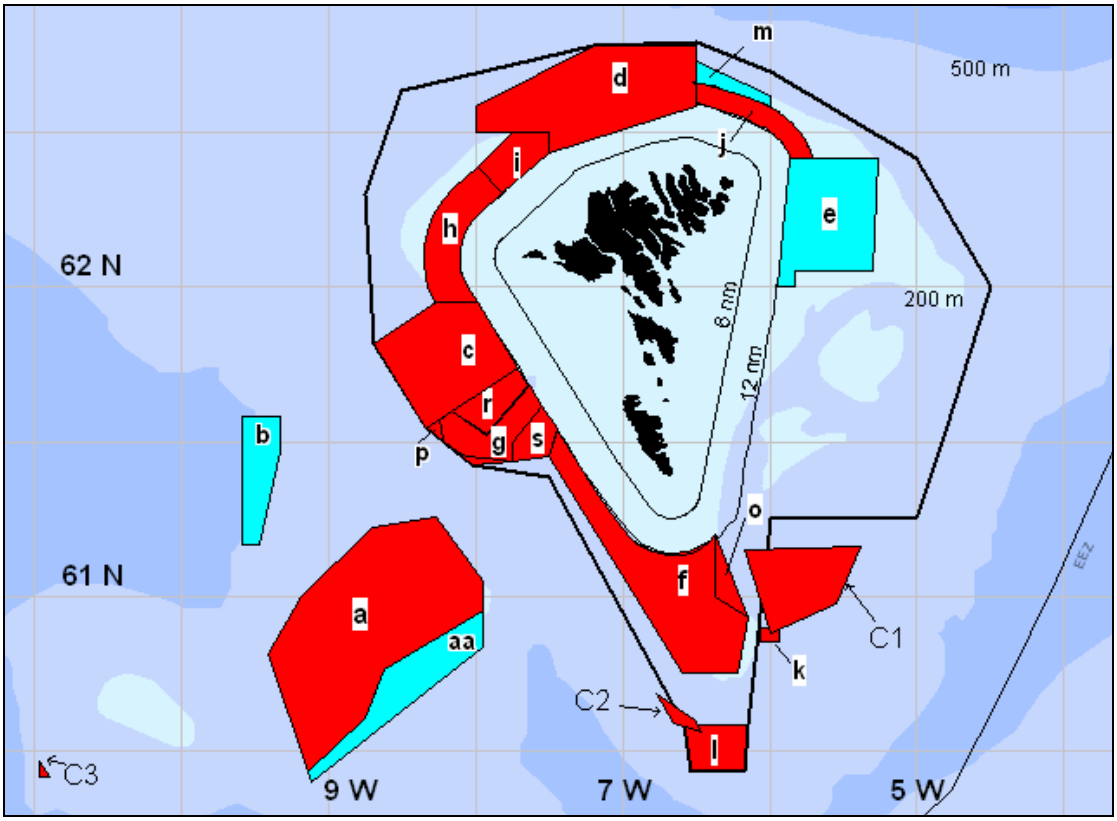
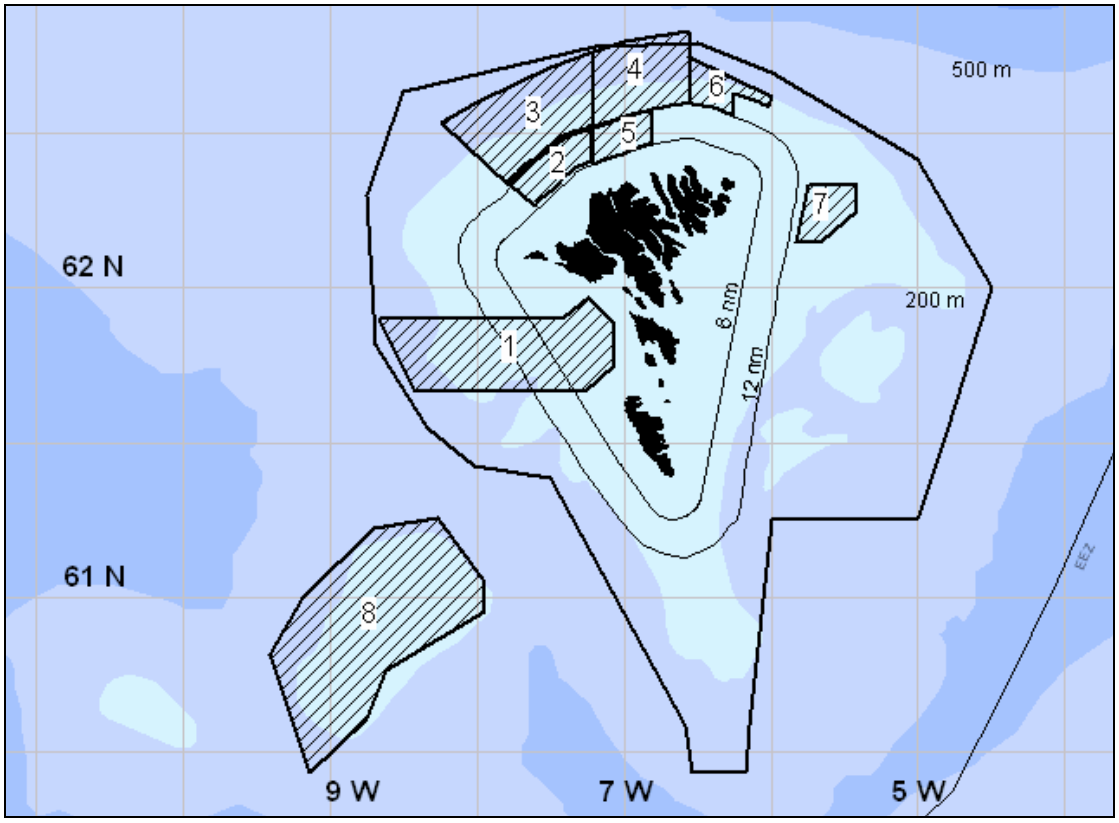


Figure 2.1.0. The 2000-2005 distribution of fishing activities by some major fleets.


m
d
500 m
j
i
e
h
62 N
200 m
8 nm
12 nm
c
r
b
p
g
s
o
61 N
f
a
aa
C1
k
C2
l
C3
9 W
7 W
5 W
EEZ


4
6
500 m
3
5
2
7
62 N
200 m
8 nm
12 nm
1
61 N
8
9 W
7 W
5 W
EEZ

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 2.1.1. 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.

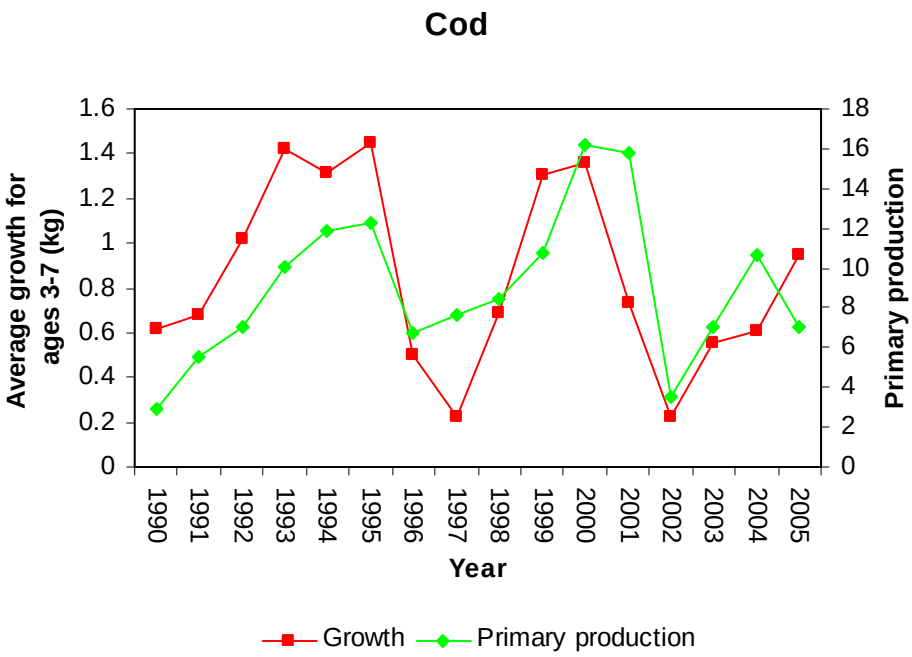


Figure 2.1.2. Faroe Plateau Cod. Relationship between primary production and growth of cod during the last 12 months.

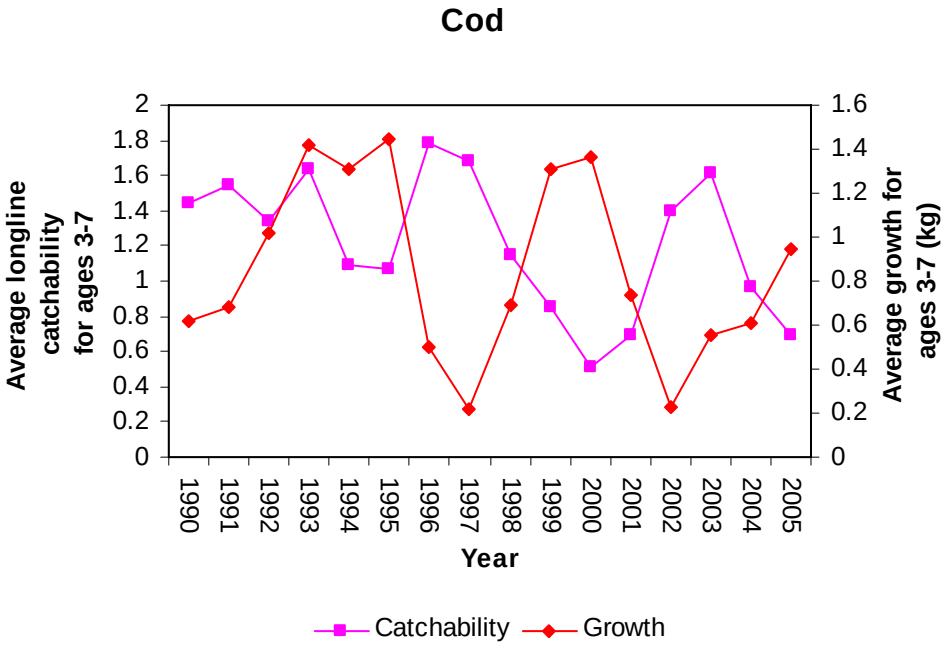


Figure 2.1.3. Faroe Plateau Cod. Relationship between long line catchability and growth of cod during the last 12 months.

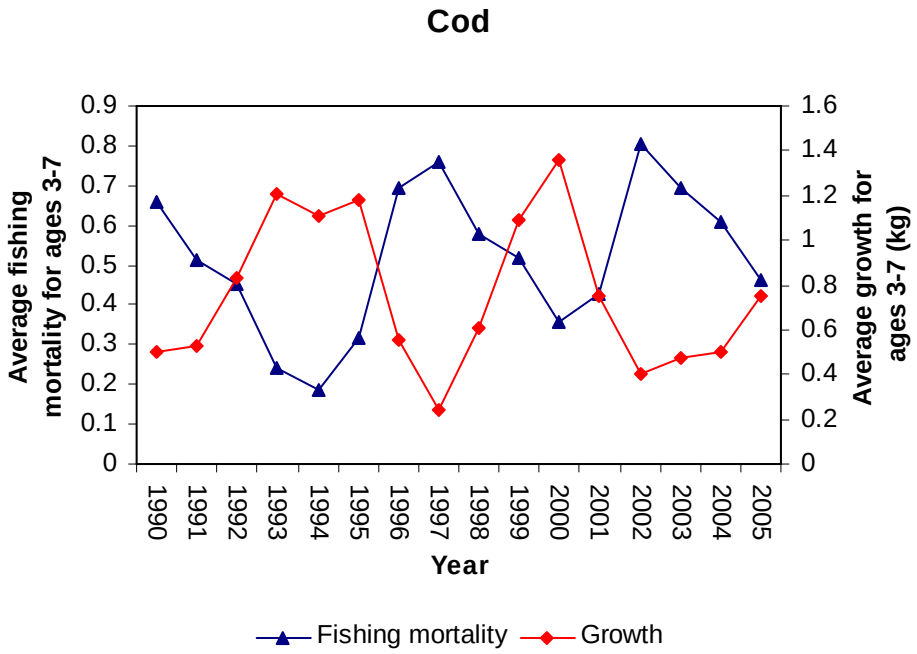


Figure 2.1.4. Faroe Plateau Cod. Relationship between fishing mortality and growth of cod during the last 12 months.

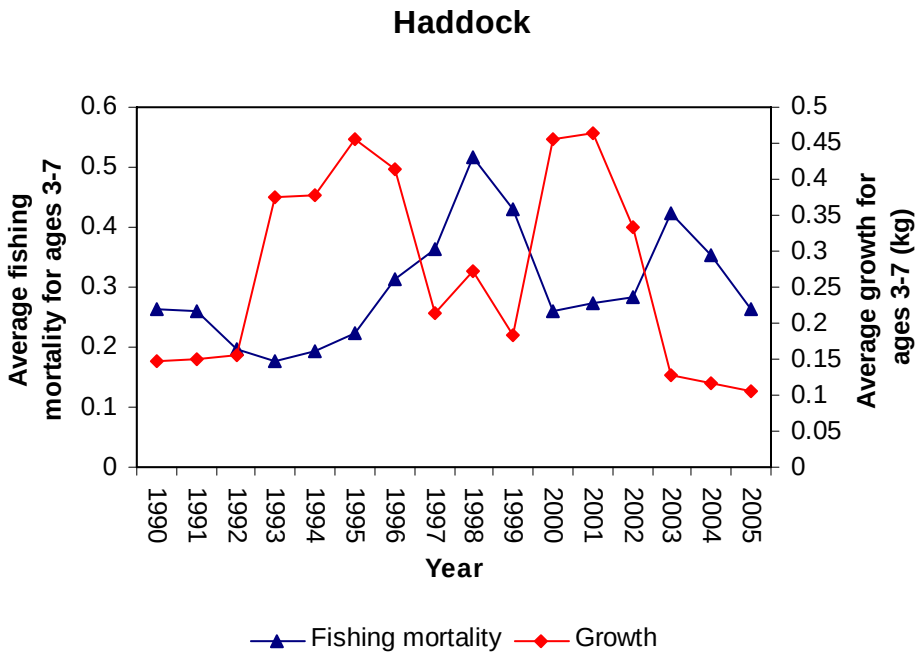


Figure 2.1.5. Faroe Haddock. Relationship between fishing mortality and growth of haddock during the last 12 months.

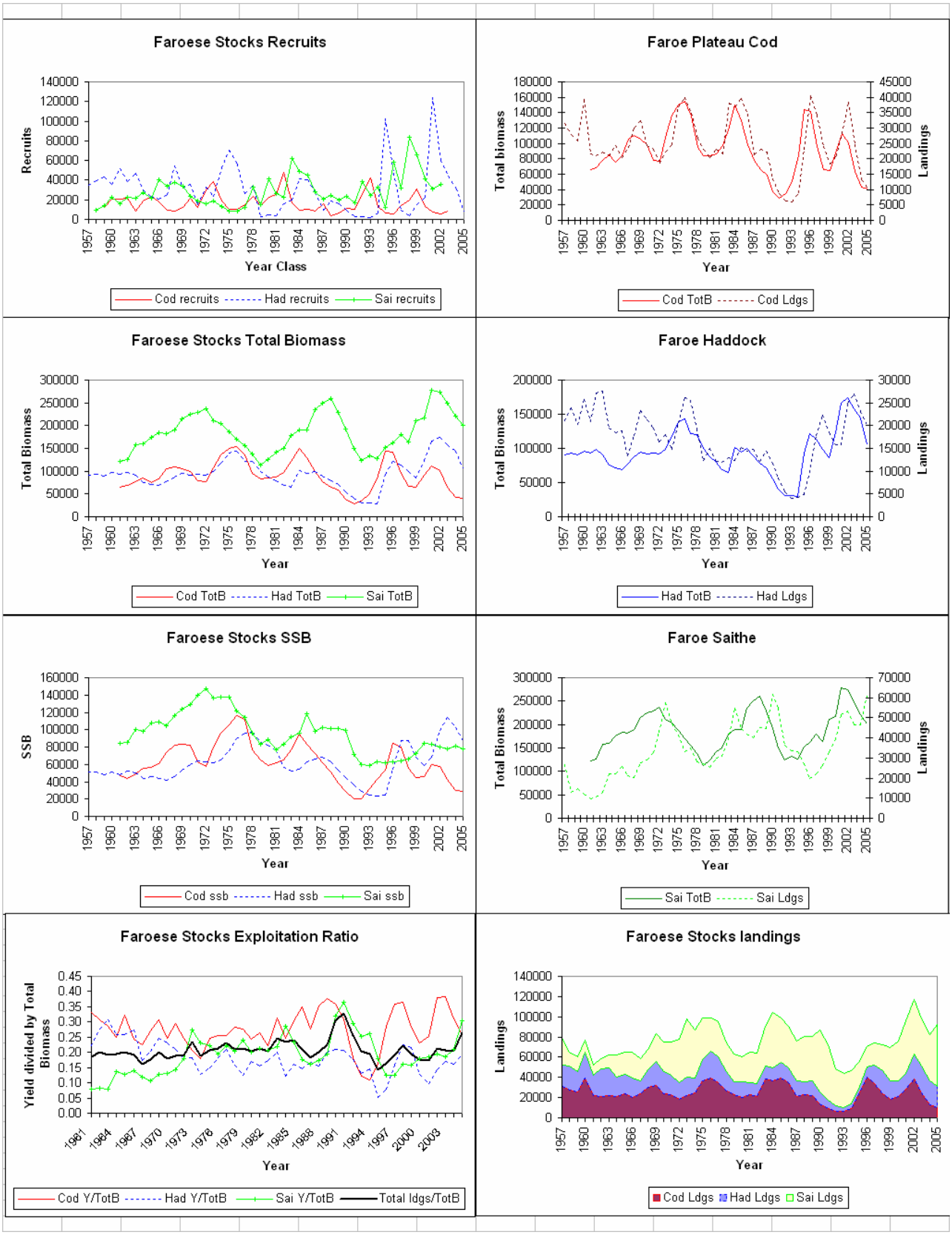


Figure 2.1.6. Faroe Plateau cod, Faroe haddock and Faroe saithe. 2006 stock summary.

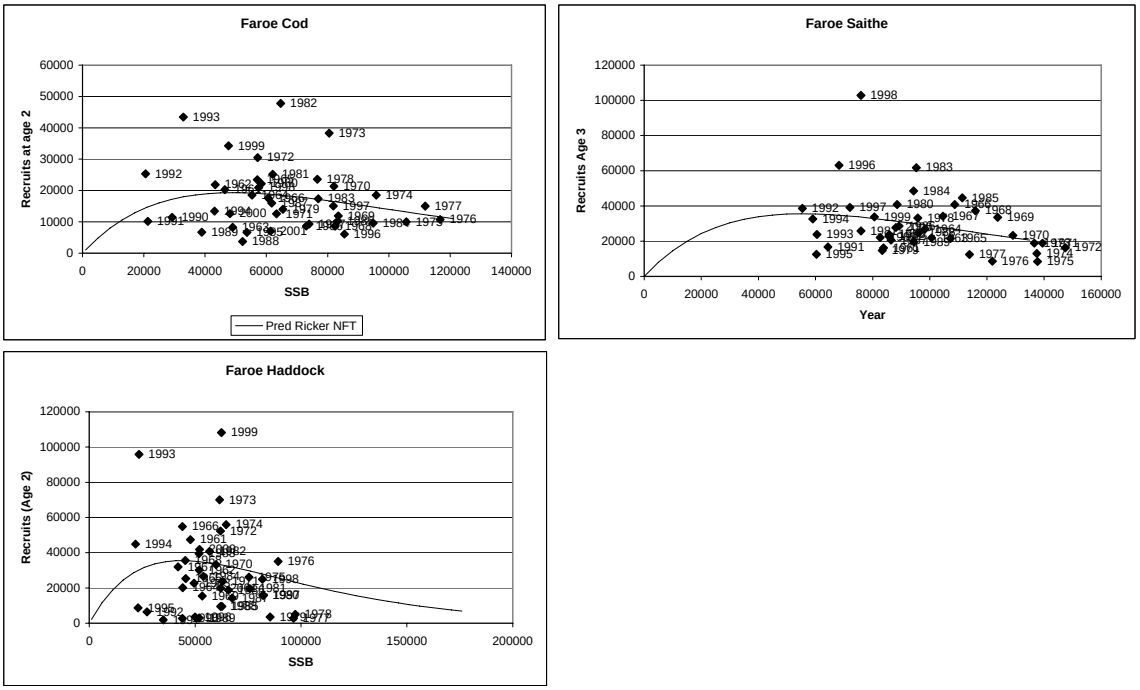
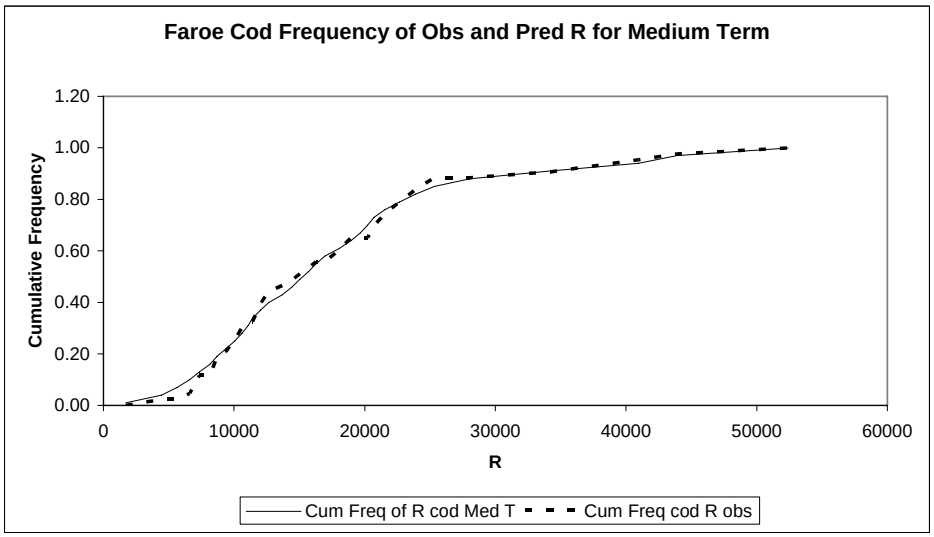
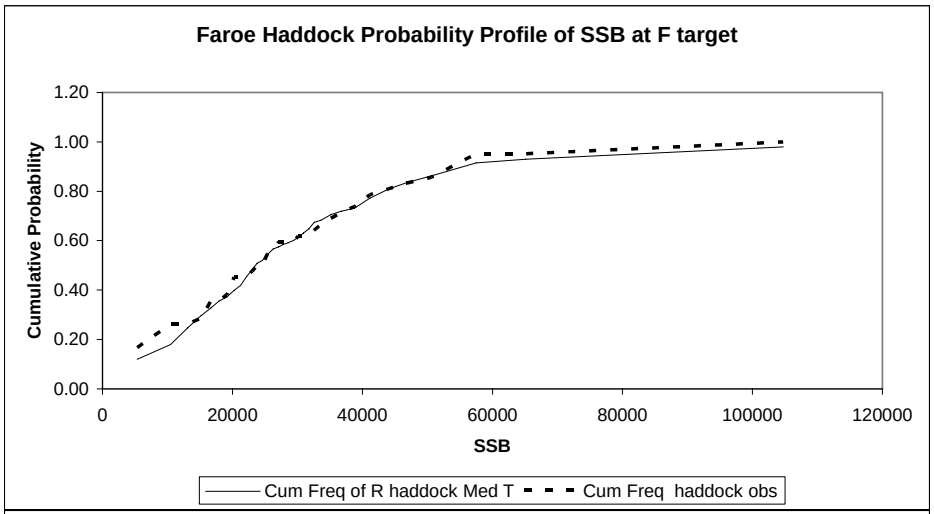


Figure 2.1.7: Stock and recruitment fits for Faroese demersal stocks using the NMFS SRFIT software. The lines go nicely through the cloud of points, and the scatter of points suggest a Ricker relationship over a Beverton and Holt type.





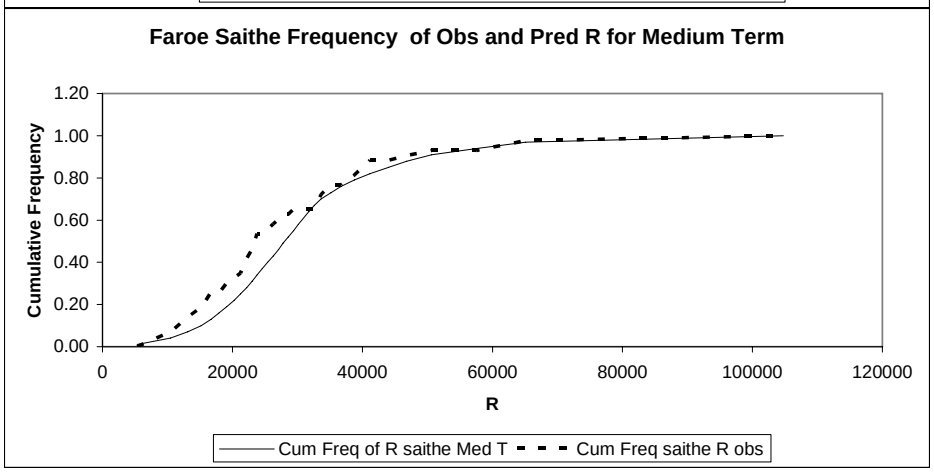


Figure 2.1.8: Frequency Distribution of year class sizes observed in the assessment and used in the 100 year simulations for Faroe cod, haddock and saithe.

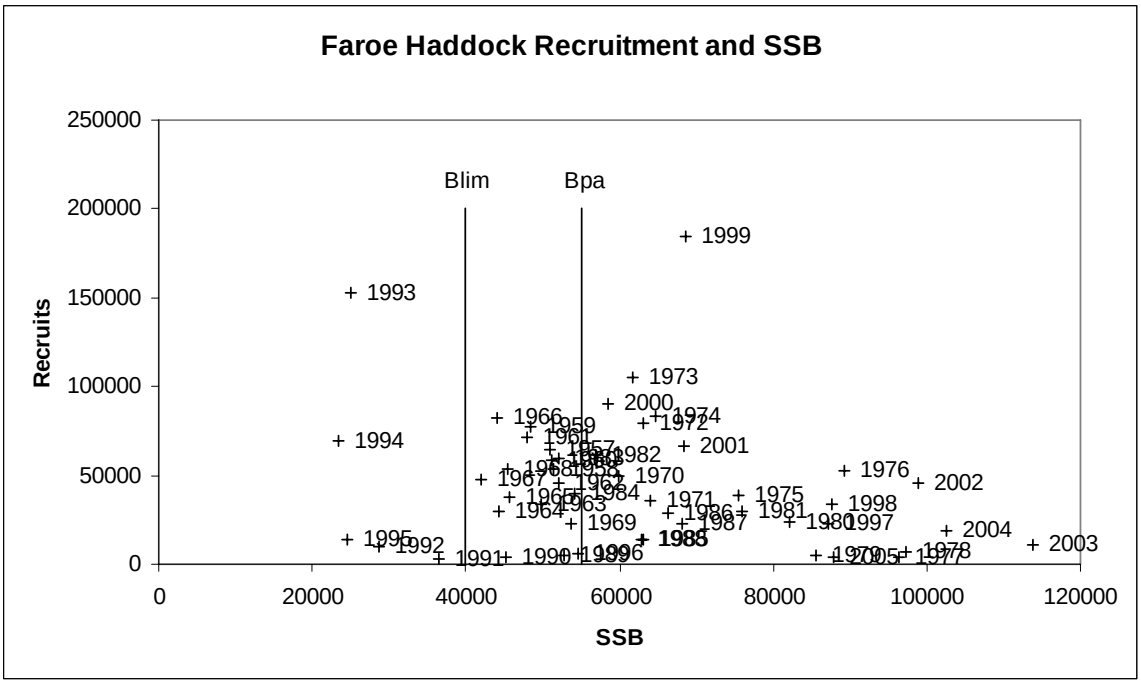


Figure 2.1.9:Stock and recruitment data for Faroe haddock based on the 2006 assessment. Data points to the left of Blim suggest that recruitment is not impaired between 20 000t and 40 000t.

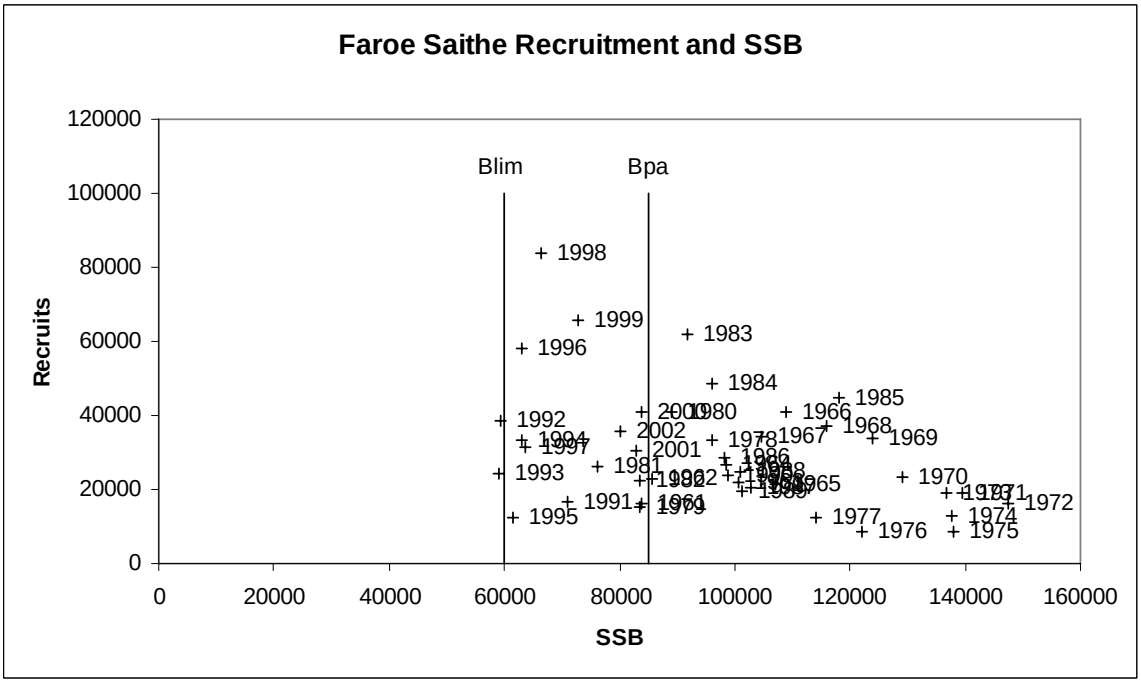


Figure 2.1.10: Stock and recruitment data for Faroe saithe based on the 2006 assessment. The highest recruitment is at the lowest SSB. In these cases, SGPRP 2003 suggested that Bloss be used as Bpa.

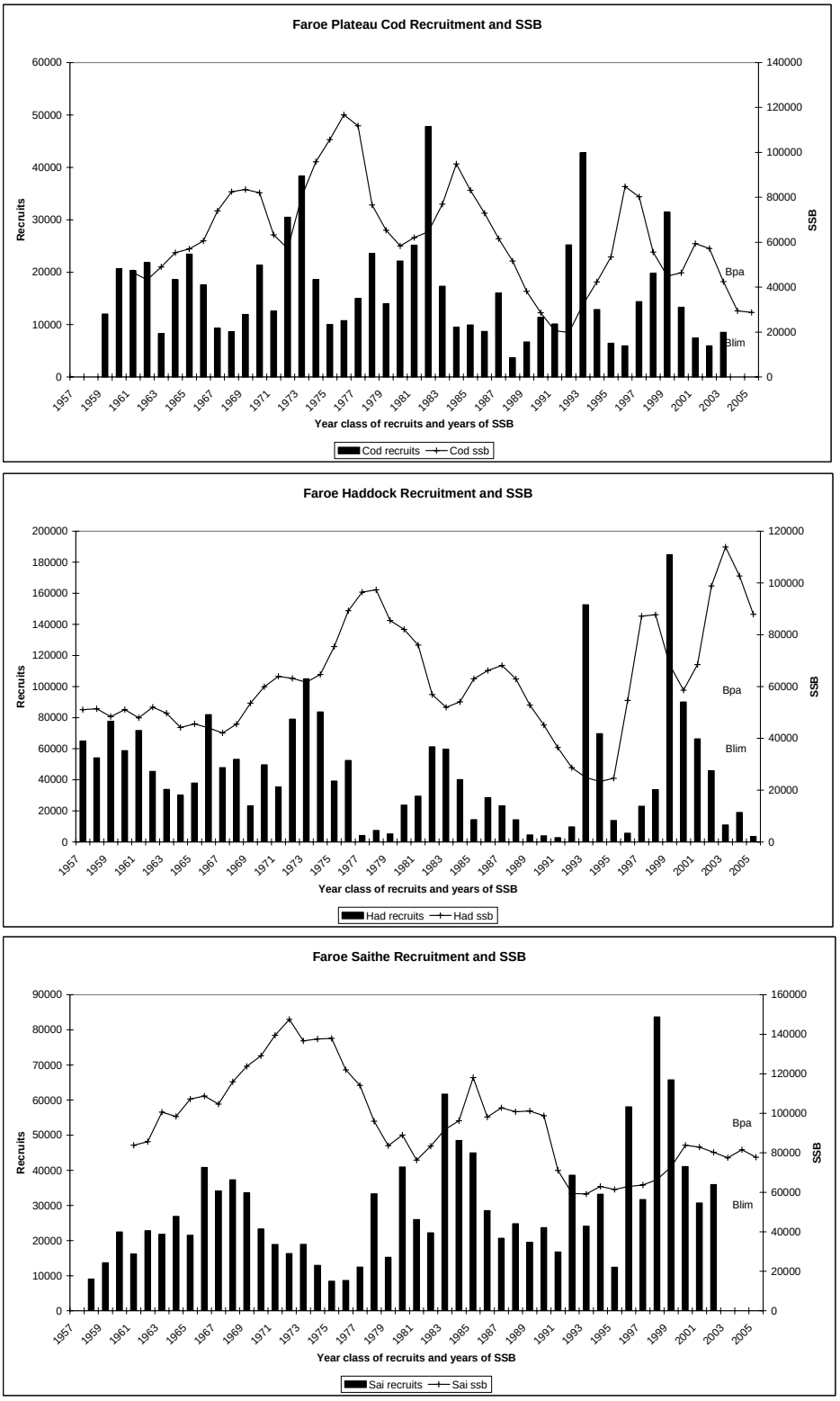


Figure 2.1.11: Development of the dermersal stocks at the Faroes. No long term decrease in the productivity are apparent.

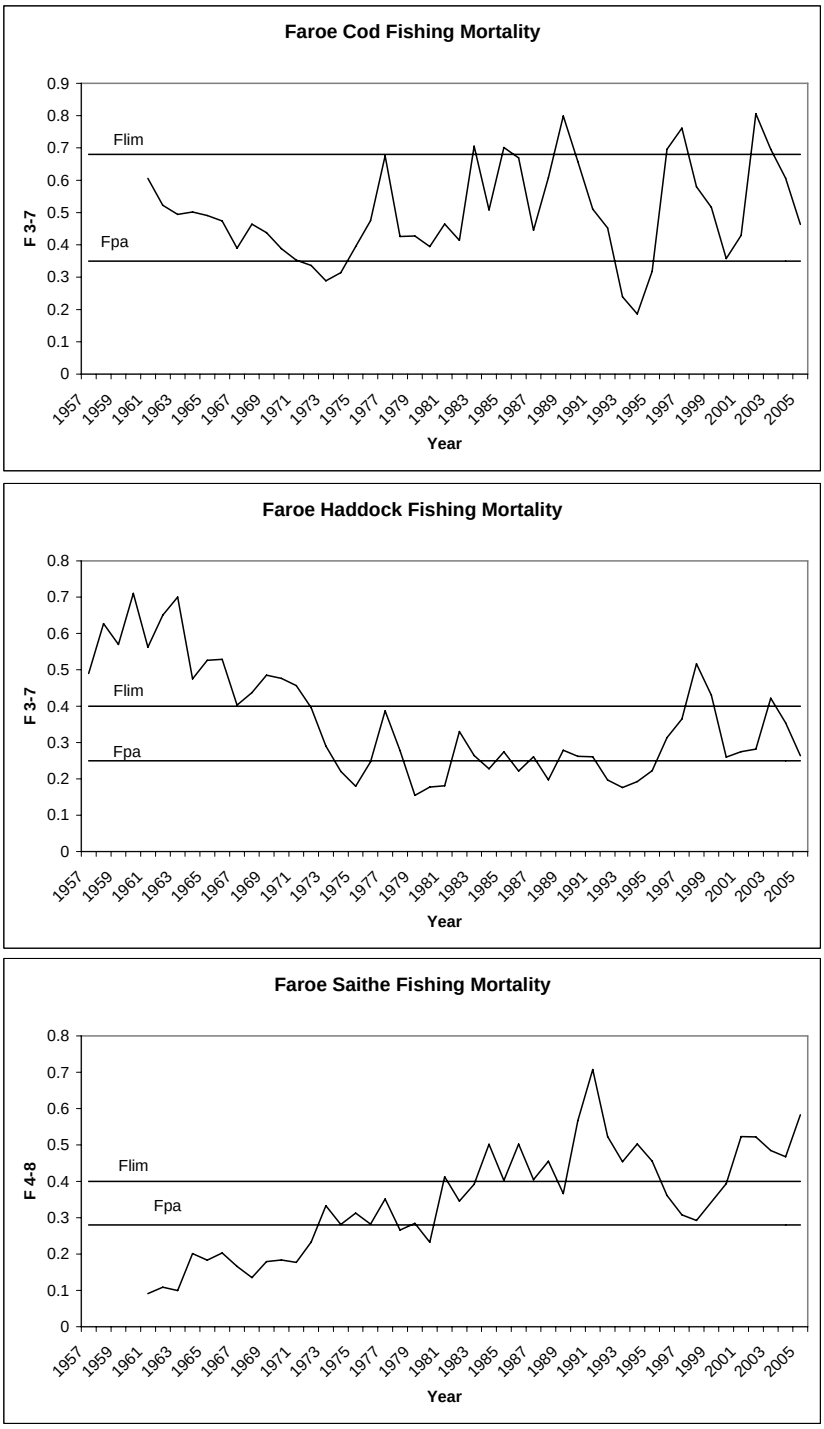


Figure 2.1.12: Time trends in fishing mortality estimates from the 2006 assessment. The figure shows that the existing Flim's do not possess the characterisitics of a limit reference point.

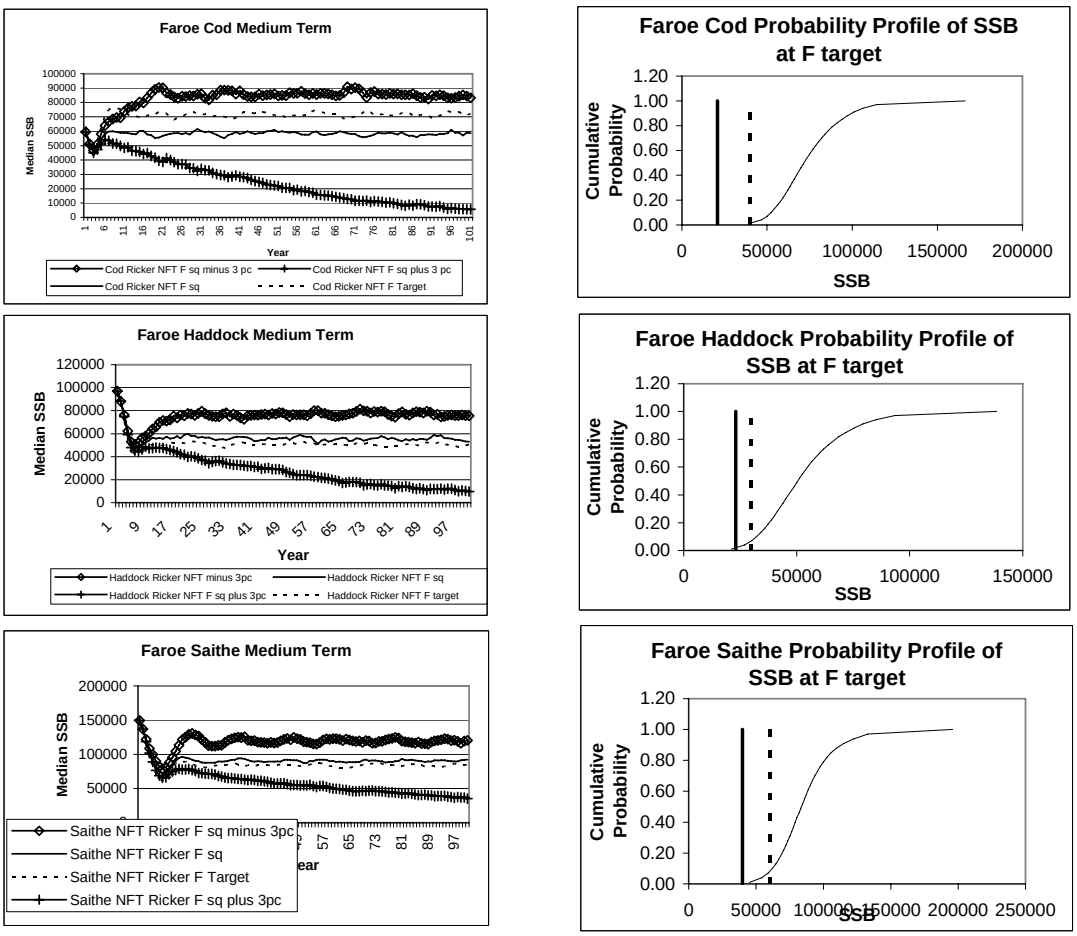


Figure 2.1.13: Results of 100 simulations for Faroese demersal stocks. Left panel shows the time trends of SSB under various F scenarios. It shows that the F status quo, F target and decreasing F are all sustainable, but that the increasing F at 3% per year is not. The right panel shows the frequency distributions of the SSB at the target F = 0.45, compared with the Bpa and Blim proposed herein. These results suggest that Ftarget and Fsq (as defined in these simulations, i.e. the average F's at age of 2001 to 2003 as estimated in the 2004 assessment) are sustainable. The frequency distributions in the right hand panel have been recorded from the 10th to the 100th year of the simulation to reduce the effect of initial conditions.

2.2 Faroe Plateau Cod

2.2.1 Stock definition

Faroe Plateau cod is distributed on the entire plateau down to approximately the 500 m depth contour. Tagging experiments show that immigration to other areas is very rare (about 0.1% of recaptured cod; Strubberg, 1916, 1933; Tåning, 1940, 1943; unpublished data). Cod spawn in February-March at two main spawning grounds north and west of the islands at depths around 90-120 m. The larvae hatch in April and are carried by the Faroe Shelf residual current (Hansen, 1992) that flows clockwise around the Faroe plateau within the 100-130 m isobath (Gaard *et al.* 1998; Larsen *et al.*, 2002). The fry settle in July-August and occupy the near shore areas, which normally are covered by dense algae vegetation. In autumn the following year (*i.e.* as 1 group), the juvenile cod begin to migrate to deeper waters (usually within the 200 m contour), thus entering the feeding areas of adult cod. They seem to be fully recruited to the fishing grounds as 3 year olds. Faroe plateau cod mature as 3-4 year old. The spawning migration seems to start in December-January and ends in May. Cod move gradually to deeper waters when they are growing older. The diet in shallow water (< 200 m) is dominated by sandeels and benthic crustaceans, whereas the diet in deeper water mainly consists of Norway pout, blue whiting and a few species of benthic crustaceans.

Icelandic and Faroese tagging experiments suggest that the cod population on the Faroe-Icelandic ridge mainly belongs to the Icelandic cod stock. Faroese Fisheries Laboratory tagged about 24 000 cod in Faroese waters during 1997-2006 and about 6 000 have been recaptured so far. Of these one was caught on the Icelandic shelf and one on the Faroe-Icelandic ridge. In 2002 168 individuals were tagged on the Faroe-Icelandic rigde (Midbank). Ten have been recaptured so far, 5 at Iceland, 3 on the Faroe-Icelandic ridge and 0 on the Faroe Plateau (2 had unknown recapture position).

The Marine Research Institute in Iceland tagged 25572 cod in Icelandic waters during 1997-2004 and 3708 have been recaptured so far. Of these only 13 individuals were recaptured on the Faroe-Icelandic ridge and none on the Faroe Plateau. The proportion of Icelandic tags reported from the Faroe-Icelandic ridge (13 out of 3708) is significantly higher than the proportion of Faroese tags recaptured on the Faroe-Icelandic ridge (1 out of 6000) .

2.2.2 Trends in landings

The annual landings of Faroe cod (ICES Division Vb) normally varied between 20 and 40 thousand tonnes during the last century. English and Scottish vessels took the majority of the catches up to the 1950s. Thereafter their part of the catches declined gradually, and when Faroe Islands established the 200 nm EEZ in 1977, the vast majority of the catch was taken by Faroese vessels. From 1965 there have been separate catch figures for Faroe Plateau (ICES Division Vb1) and Faroe Bank (ICES Division Vb2).

The relatively high recruitment in 1980-1983 allowed a good fishery for cod in the period 1983 to 1986 when landings some years reached almost 40 000 t. Landings decreased afterwards to only 6 000 tonnes in 1993, the lowest on record (Table 2.2.2.1). In 1995 the officially reported landings increased to slightly above 19 000 t. Information from the fishing industry indicated misreporting in the order of 3 330 t (3 000t. gutted weight) for 1995 which were added to the officially reported landings in Table 2.2.2.2. Misreporting is not suspected to have been a problem afterwards. Landings increased spectacularly in 1996, to above 40 000 t, the highest value during the 1961 to 2004 time period. This increase is believed to be due to a combination of increased stock size and increased availability. After a drop to about 20 000 tonnes in 2000 the catches increased again to about 40 000 tonnes in 2002, mainly caused by the 1998-1999 year classes, which were of average or above average strength, respectively.

The index of primary production was high in 2000 and 2001, but decreased markedly in 2002-2003 and so did the recruitment in 2003-2005. The cod catches on the Faroe Plateau dropped to only 10 thousand tonnes in 2005.

In recent years, statistics for the Faroese fishery in that part of Sub-division IIa which is within the Faroese EEZ, have become available. It is expected that these are taken from the Faroe Plateau area so they are included in the total used in the assessment in Table 2.2.2.2 under the row labeled "Used in the assessment". No information on the Faroese landings from IIa were available for 1993-1996. The French landings of Faroe Plateau cod in 1989 and 1990 as reported to the Faroese authorities are also included. Scottish catches 1991-1999 reported from the Faroe Bank (Vb2) were in the 2001 assessment moved to the Faroe Plateau (Vb1), by advice from the Faroese Coastal Guard.

Since the introduction of the EEZ, the Faroe Plateau cod has almost entirely been exploited by the Faroese fishing fleets. In recent years, the longliners and the pair trawlers have usually taken most of the catches. Since the autumn in 1999 single trawlers > 1000 HP have increased their share of the total catches considerably as a result of a special quota (in tonnes, not fishing days) allocated to them in shallow water (< 200 m) on a half year basis (September 1 and March 1). The reason was probably that their catches of redfish and Greenland halibut in deep waters were low.

A small part of the cod catches are not landed and not reported. It has been a long, legal, practice on Faroese vessels that small cod (ages 1-3) are dryed and used for private consumption. Recreational fishermen also fish legally a small quantum of small cod and use it for private consumption. The extent of this common practice is not known, but has been ongoing for several decades and it is not believed that there has been any time trend in it.

The nominal landings of cod (1986-2005) from the Faroe Plateau by nations as officially reported to ICES, are given in Table 2.2.2.1. Table 2.2.2.2 shows the figures used in the assessment. In 2005, the catches were about 10 thousand tonnes, which is far below the long term average and also below the normal “downs” in the catches (20 thousand tonnes). The Faroese catches on the Faroe-Icelandic ridge, within the Faroese EEZ, were removed from the assessment-catches back to 1999 (Table 2.2.2.2 and 2.2.2.3). Table 2.2.2.4 shows the landings for the most important fleet categories.

2.2.3 Catch-at-age

The sampling strategy is to have length, length-age, and length-weight samples from all major gears during three periods: January-April, May-August and September-December. In the period 1985-1995, the year was split into four periods: January-March, April-June, July-September, and October-December. The reason for this change was that the three-period splitup was considered to be in better agreement with biological cycles (the spawning period ends in April). When sampling was insufficient, length-age and length-weight samples were borrowed from similar fleets in the same time period. Length measurements were, if possible, not borrowed. The number of samples in 2005 was not sufficient to allow the traditional three period splitup for all the fleets, and a two period splitup (January-June and July-December) was adopted for those fleets.

Landings-at-age were updated to account for a change in the nominal landings for 2004, and also to account for the changes by excluding the landings from the Faroe-Icelandic ridge 1999-2005. Landings-at-age for 2005 are provided for the Faroese fishery in Table 2.2.3.1. Faroese landings from most of the fleet categories were sampled (see text table below). Landings-at-age for the fleets covered by the sampling scheme were calculated from the age composition in each fleet category and raised by their respective landings. The age composition of the combined Faroese landings was used to raise the foreign landings prior to

1998 when, the age composition of the corresponding Faroese fleets were used. Landings-at-age from 1961 to 2005 are shown in Table 2.2.3.2. Catch curves are shown in Fig. 2.2.3.1. They show atypical patterns in 1996 and to some extent in 2001-2002 when there appears to be an increase over the previous year for ages where a decrease would normally have been expected. This could be due to catchability for longliners depending on fish growth, causing atypical catch curves for longliners.

Samples from commercial fleets in 2005.

Fleet	Size	Samples	Lengths	Otoliths	Weights
Open boats		16	1,089	300	1,503
Longliners	<100 GRT	60	3,284	1,077	9,267
Longliners	>100 GRT	54	4,085	809	6,951
Jiggers		4	235	120	316
Sing. trawlers	<400 HP	1	257	0	0
Sing. trawlers	400-1000 HP	17	2,192	479	1,392
Sing. trawlers	>1000 HP	3	655	0	0
Pair trawlers	<1000 HP	10	1,781	240	412
Pair trawlers	>1000 HP	46	9,140	958	958
Total		195	21,629	3,683	19,296

2.2.4 Weight-at-age

Mean weight-at-age data for 1961-2005 are provided for the Faroese fishery in Table 2.2.4.1. These were calculated using the length/weight relationship based on individual length/weight measurements of samples from the landings. The sum-of-products-check for 2005 showed a discrepancy of 4 %.

Figure 2.2.4.1 shows the mean weight-at-age for 1961 to 2005. For 2006-2008 the values used in the short term predictions are shown on this graph in order to put them in perspective with previous observations. The weights increased from 1998 to 2000, but have decreased since, although they appear to have increased in 2006. The expected weights in the commercial catches in 2006 (catch weights over the intire year: CW) were estimated by the weights in the commercial catches in January-February (Januar-February catch weights: JFW) or the weights in the spring survey (survey catch weights: SW). Linear regressions were made between CW and JFW for the years 1996-2004 and between the CW and the SW for the years 1996-2004 by each age. The correlation that was higher was chosen for prediction of the value in 2006.

2.2.5 Maturity-at-age

The proportion of mature cod by age during the Faroese groundfish surveys carried out during the spawning period (March) are given in Table 2.2.5.1 (1961 - 2005) and shown in Figure 2.2.5.1 (1983 - 2005). The observed values in 2006 and the estimated values in 2007-2008 are also shown in order to put them in perspective with previous observations. The average maturity at age for 1983 to 1996 was used in years prior to 1983. Some of the 1983-1996 values were revised in 2003 but not the maturities for the 1961-1982 period. Full maturity is generally reached at age 5 or 6, but considerable changes have been observed in the proportion mature for younger ages between years.

2.2.6 Groundfish surveys

The spring groundfish surveys in Faroese waters with the research vessel *Magnus Heinason* were initiated in 1983. Up to 1991 three cruises per year were conducted between February and the end of March, with 50 stations per cruise selected each year based on random stratified sampling (by depth) and on general knowledge of the distribution of fish in the area. In 1992

the period was shortened by dropping the first cruise and one third of the 1991-stations were used as fixed stations. Since 1993 all stations are fixed stations. The standard abundance estimates is the stratified mean catch per hour in numbers at age calculated using smoothed age/length keys. In last years assessment, the same strata were used as in the summer survey and calculated in the same way (see below). All cod less than 25 cm were set to 1 year old.

In the 2004 assessment a new stratification was adopted where five new strata were added on the spawning grounds (Figure 2.2.6.1 in ICES, 2004). The catch curves showed a normal pattern (Figure 2.2.6.1).

The stratified mean catch of cod per unit effort in 1994-2006 is given in Figure 2.2.6.2. The CPUE increased substantially in 1995 and remained high up to 1998. The CPUE decreased from 2002 to 2004 and have been low in 2005 and 2006. Normally the stratified mean catch per trawl hour increases for the first 3-4 years of life of a year class, and decreases afterwards (Figure 2.2.6.1). From 1994 to 1995, however, there was an increase for all year classes, possibly because of increased availability. A more normal pattern was observed from 1996-2006.

In 1996, a summer (August-September) groundfish survey was initiated, having 200 fixed stations distributed within the 500 m contour of the Faroe Plateau. Half of the stations were the same as in the spring survey. The stratified mean catch of cod per unit effort (kg/trawl hour) 1996-2005 is shown in Figure 2.2.6.2, and catch curves in Figure 2.2.6.3. The catch curves show that the fish are fully recruited to the survey gear at an age of 3 or 4 years.

The abundance index was calculated as the stratified mean number of cod at age. The age length key was based on otolith samples pooled for all stations since there seemed to be a homogeneous size at age by strata and depth. Due to incomplete otolith samples for the youngest age groups, all cod less than 15 cm were considered being 0 years and between 15-34 cm 1 year (15-26 cm for 2005 because of abnormally small 2 year old fish). Since the age length key was the same for all strata, a mean length distribution was calculated by stratum and the overall length distribution was calculated as the mean length distribution for all strata weighted by stratum area. Having this length distribution and the age length key, the number of fish at age per station was calculated, and scaled up to 200 stations.

2.2.7 Stock assessment

2.2.7.1 Tuning and estimates of fishing mortality

Two commercial cpue series (longliners and Cuba trawlers) are updated every year, but the WG decided in 2004 not to use them in the tuning of the VPA. The cpue for the longliners was shown to be highly dependent upon environmental conditions whereas the cpue for the Cuba trawlers could be influenced by other factors than stock size, for example the price differential between cod and saithe.

Since the current assessment is an update assessment, the same procedure is followed as in the 2005 assessment: to use the two surveys for tuning and not the commercial series. The commercial series showed the same overall tendency as the surveys (Figure 2.2.7.1.1). As in the 2005 assessment, the ADAPT assessment package was used for comparison with the XSA.

The log catchability residuals from the adopted XSA run are shown in Figure 2.2.7.1.2. The spring survey shows no overall trends although there seems to be a year effect for the years 1993 (actually 1994 because the survey was shifted back to the previous year) and 2003 (actually 2004). For the summer survey there was a clear year effect in 2003. In addition there seemingly is an effect of year class..

The results from the retrospective analysis of the XSA (Figure 2.2.7.1.3) show that there has been a tendency to overestimate fishing mortality, but the estimates of recruitment, stock biomass and spawning stock biomass have been fairly close. The overestimation of the fishing mortality (average 3-7) is mainly caused by overestimation of the fishing mortality for ages 6-7 years.

Figure 2.2.7.1.4 shows the retrospective pattern from the ADAPT calibrated with the summer and the spring surveys ages 2 to 8. There is a tendency to overestimate the fishing mortality while the estimates of SSB are surprisingly close given the absence of any shrinkage. The recruitment is sometimes overestimated and sometimes underestimated.

The estimated fishing mortalities are shown in Tables 2.2.7.1.3 and 2.2.7.1.5 and Figure 2.2.7.1.5. The average F for age groups 3 to 7 in 2005 (F3-7) is estimated at 0.46, equal to Fmax = 0.47.

The F3-7 seems to be a problematic measure of fishing mortality for two reasons. Firstly, the fishing mortalities for ages 6-7 are generally overestimated in the terminal year leading to an overestimation of F3-7 for the terminal year. Secondly, the proportion of 6-7 year old cod in the stock or catch is small (normally less than 20%) and therefore get a disproportionate influence on the F3-7. The yield over exploitable biomass (3 years and older) was introduced in the 2004 assessment, but has the drawback not being proportional to fishing effort. Another approach is to weight the fishing mortalities and three weighting procedures are presented in Figure 2.2.7.1.7: weighting by stock numbers, stock biomasses or catch weights. All measures of fishing mortality show high values for 2002-2003, but a decrease since then. The weighted fishing mortalities show that the fishing mortality in 2005 was low compared to other years, but was not as low as values estimated for 2000 and 1993-1994.

2.2.7.2 Stock estimates and recruitment

The stock size in numbers is given in Tables 2.2.7.1.4. A summary of the VPA, with recruitment, biomass and fishing mortality estimates is given in Table 2.2.7.1.5 and in Figure 2.2.7.1.5. The stock-recruitment relationship is presented in Figure 2.2.7.2.1.

Figure 2.2.7.2.2 shows the F and SSB's from a 1000 bootstraps of the ADAPT with the two surveys. The figure also shows the F and SSB from the XSA assessment. The XSA results fall in the cloud of the bootstrapped F and SSB pairs with the SSB and F close to the median of the bootstrapped values. From the NFT Adapt results, there is a zero probability that the Faroe cod 2005 SSB was less than Blim = 21 000t and there is a 100% probability that it was less than Bpa = 40 000t. There is a 50% probability that F 3-7 is higher than the target exploitation rate F = 045, a nearly 100% probability that it is higher than the existing Fpa = 0.35, but close to 100% probability that it is less than the existing Flim.

The assessment shows the poor recruitment for the 1984 to 1991 year classes, and the strong 1992 and 1993 year classes. Due to the continuous poor recruitment from 1984 to 1991 and the high fishing mortalities, the spawning stock biomass declined steadily from 1983 to 1992 when it was the lowest on record at 20 000 t. It increased sharply to above 80 000 t in 1996 and 1997 before declining to about 45 000 t in 1999. The 1998 year class is slightly above average strength and the 1999 year class well above. The 2000-2003 year classes are estimated to be below average strength, and the 2004 year class seems also to be below average strength according to the XSA run.

2.2.8 Prediction of catch and biomass

2.2.8.1 Short-term prediction

The input data for the short term prediction are given in Table 2.2.8.1.1. The XSA retrospective pattern of the recruitment looked consistent so the recruitment of 2 year old cod in 2005 (2003 year class) was obtained from the XSA. The 2005-2006 year classes were estimated as the geometric mean for the period 1961-2005. Estimates of stock size (ages 2+) were taken directly from the VPA stock numbers. The exploitation pattern was estimated as the average fishing mortality for 2003-2005 and rescaled to the 2005 because the reduction in F is believed to be true. The weights at age in the catches in 2006 were estimated from the commercial catches in January-February or the spring survey (ages 2 and 4). Regression analyses were made between weights in January-February (or March), and the weights during the whole year 1996-2005. The weights in the catches in 2006 were predicted from the regressions. The weights in the catches in 2007-2008 were set to the values in 2006. The proportion mature in 2006 was set to the 2006 values from the spring groundfish survey, and for 2007-2008 to the average values for 2004-2006.

Table 2.2.8.1.2 shows that the landings in 2006 are expected to be 12 000 tonnes (the landings from the Faroe-Icelandic ridge should be added to this figure in order to get the total Faroese landings within the Vb1 area). The spawning stock biomass is expected to be 33 000 tonnes in 2006, 30 000 tonnes in 2007 and eventually 34 000 tonnes in 2008. The current short term prediction is therefore quite pessimistic.

2.2.8.2 Biological reference points

The stock trajectory with respect to existing reference points is illustrated in Figure 2.2.8.2.1. The reference points are dealt with in the general section of Faroese stocks.

2.2.8.3 Medium-term prediction

Medium term projections are dealt with in the general section of Faroese stocks.

2.2.8.4 Long-term prediction

The input data for the yield-per-recruit calculations (long-term predictions) are given in Table 2.2.8.4.1. The exploitation pattern was taken as an average for the years 2000-2005. The weights at age were set to the average values for 1978-2005, since no long term trend was present. The proportion mature was set to the average for 1983-2006.

The output from the yield-per-recruit calculations is shown in Table 2.2.8.4.2. and in Figure 2.2.8.4.1. $F_{0.1}$ was calculated as 0.26 and F_{max} as 0.47. The present average fishing mortality (F3-7) in 2005 of 0.46 is the same as F_{max} = 0.47 and above F_{med} = 0.34 (Figure 2.2.8.2.1).

2.2.9 Management considerations

The current assessment shows that fishing mortality on cod decreased from 0.70 in 2003 to 0.46 in 2005, which is consistent with the reduction anticipated in the 2005 report of the NWWG based on the hypothesis that catchability in the longline fishery is linked to the primary production. The number of fishing days allocated and used are similar between 2004 and 2005 and changes in F are therefore likely related to changes in catchability, whatever the explaining mechanism, rather than to changes in fishing effort. If the catchability hypothesis is true and if primary productivity in 2006 is low, F could increase or continue to decrease if productivity is high.

According to the short term prediction the landings (excluding the Faroe-Icelandic ridge) in 2006 and 2007 will be similar to those in 2005, in the order of 10 000 – 12 000 tonnes. The short term prediction is based on the assumption that recruitment in 2007 and 2008 will be equal to the geometric mean of 1961 to 2005, 14 millions fish at age 2, about two times higher than the estimated recruitment in 2003-2006. Unusually low catches of cod on the Faroe Plateau can therefore be expected for the next few years, unless productivity increases substantially and results in strong cod year classes.

The collapse of the cod fishery in 1990-1994 was the first in at least a century, it can therefore be considered an exceptional, but explainable, event: seven of the eight year classes that recruited during 1986 to 1991 were below average and fishing mortality was high, which resulted in a precipitous decline in biomass and in catches. Although fishing mortality is now considered to be somewhat lower, the three most recent year classes are smaller than average and a decline in catches in 2006 and 2007 is possible if the assumed recruits for 2007 and 2008 turn out to be smaller than assumed (the 2006 spring survey suggest that the 2004 year class, the recruitment in 2006, is below average). The current assessment shows that a second collapse, 14 years after the first one is possible. Overall, however, the decrease in cod biomass may not cause as intense a crisis in the fishery sector as occurred in the early 1990s because the biomass of the other two important demersal fish stocks, haddock and saithe, is higher than it was in the early 1990s.

Given the above, it would seem prudent to decrease fishing mortality in the short term in order to have sufficient spawning cod to take advantage of improved production conditions should they occur (Steingrund and Gaard, 2005).

2.2.10 Comments on the assessment

New or changed things compared to last years report: the catches in 1999-2004 were changed by excluding the Faroese catches on the Faroe-Icelandic ridge (within the Vb1 area). The effect is investigated in Figure 2.2.7.1.8. It shows that the fishing mortality, total biomass and the spawning biomass decreased, whereas the perception of recruitment changed little. The assessment settings were the same as last year.

2.2.10.1 References

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Table 2.2.2.1. Faroe Plateau (Sub-division Vb1) COD. Nominal catches (tonnes) by countries,

	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998
Denmark	8	30	10	-	-	-	-	-	-	-	-	-	-
Faroe Islands	34,492	21,303	22,272	20,535	12,232	8,203	5,938	5,744	8,724	19,079	39,406	33,556	23,308
France	4	17	17	-	-	- [1]	3 [2]	1 [2]	-	2 [2]	1 [2]	-	- [*]
Germany	8	12	5	7	24	16	12	+	2 [2]	2	+	+	-
Norway	83	21	163	285	124	89	39	57	36	38	507	410	405
Greenland	-	-	-	-	-	-	-	-	-	-	-	-	-
UK (E/W/NI)	-	8	-	-	-	1	74	186	56	43	126	61 [2]	27 [2]
UK (Scotland)	-	-	-	-	-	-	-	-	-	-	-	-	-
United Kingdom	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	34,595	21,391	22,467	20,827	12,380	8,309	6,066	5,988	8,818	19,164	40,040	34,027	23,740

	1999	2000	2001	2002	2003	2004	2005 [*]
Denmark	-						
Faroe Islands	19,156		29,762	40,602	30,259	17,540	15,063
France	- [*]	1	9 [2]	20	14	2	0
Germany	39	2	9	6	7	3 [2]	
Iceland	-	-	-	5	-		
Norway	450	374	531 [*]	573	527	414	201
Greenland	-	-	-	29 [2]	-		
Portugal						1	
UK (E/W/NI)[2]	51	18	50	42	15	15	
UK (Scotland)[1]	-	-	-	-	-	-	-
United Kingdom							[1]
Total	19,696	395	30,361	41,277	30,822	17,975	15,264

[*] Preliminary
[1)] Included in Vb2.
[2)] Reported as Vb.

1986-2005, as officially reported to ICES.

Table 2.2.2.2. Nominal catch (tonnes) of COD in sub-division Vb1 (Faroe Plateau) 1986-2005, as used in the assessment.

	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998
Officially reported	34,595	21,391	22,467	20,827	12,380	8,309	6,066	5,988	8,818	19,164	40,040	34,027	23,740
Faroese catches in IIA within Faroe area jurisdiction			715	1,229	1,090	351	154						
Expected misreporting/discard										3330			
French catches as reported to Faroese authorities				12	17								
Catches reported as Vb2:													
UK (E/W/NI)					-	-	+	1	1	-	-	-	-
UK (Scotland)					205	90	176	118	227	551	382	277	265
Used in the assessment	34,595	21,391	23,182	22,068	13,487	8,750	6,396	6,107	9,046	23,045	40,422	34,304	24,005

	1999	2000	2001	2002	2003	2004	2005 *
Officially reported	19,696	395	30,361	41,277	30,822	17,975	15,264
Faroese catches in Vb1		21,793 *					
Correction of Faroese catches in Vb1 [1]			-1,766	-2,409	-1,795	-1,041	-894
Faroese catch on the Faroe-Icelandic ridge	-1,600	-1,400	-700	-600	-4,700	-4,000	-4,200
Greenland[2]						35	
France[2]						2	
Catches reported as Vb2:							
UK (E/W/NI)	-	-	-	-	-	-	
UK (Scotland)	210	245	288	218	254	244	
United Kingdom				-	-	-	329
Used in the assessment	18,306	21,033	28,183	38,486	24,581	13,215	10,499

*) Preliminary

1) In order to be consistent with procedures used previous years.

2) Reported to Faroese Coastal Guard.

Table 2.2.2.3. Faroe Plateau (sub-division Vb1) COD. Estimate of the landings from the Faroe-Icelandic ridge. The landings were estimated from total landings by the single trawlers larger thant 1000 HP (ST>1000 HP) and the proportion of the catch taken on the Faroe-Icelandic ridge (obtained from logbooks).

YEAR	TOTAL LANDINGS IN TONNES FROM ST>1000HP	ROUND WEIGHT (x1.11)	RATIO ON THE ICELANDIC RIDGE (LOGBOOKS)	TONNES FROM THE ICELANDIC RIDGE (ROUNDED)
1991	329	365	0.23	100
1992	196	218	0.51	100
1993	179	199	0.38	100
1994	449	498	0.02	0
1995	862	957	0.05	0
1996	667	740	0.06	0
1997	985	1093	0.15	200
1998	1359	1508	0.13	200
1999	2074	2302	0.7	1600
2000	2515	2792	0.49	1400
2001	1649	1831	0.37	700
2002	2267	2516	0.26	600
2003	4492	4986	0.94	4700
2004	3826	4247	0.94	4000
2005	3933	4365	0.95	4200

Table 2.2.2.4. Faroe Plateau (sub-division Vb1) COD. The landings of Faroese fleets (in percents) of total catch.

Year	Open boats	Longliners <100 GRT	Singletrawl <400 HP	Gill net	Jiggers	Singletrawl 400-1000 HP	Singletrawl >1000 HP	Pairtrawl <1000 HP	Pairtrawl >1000 HP	Longliners >100 GRT	Industrial trawlers	Others	Faroe catch Round.weight
1986	9.5	15.1	5.1	1.3	2.9	6.2	8.5	29.6	14.9	5.1	0.4	1.3	34,492
1987	9.9	14.8	6.2	0.5	2.9	6.7	8.0	26.0	14.5	9.9	0.5	0.1	21,303
1988	2.6	13.8	4.9	2.6	7.5	7.4	6.8	25.3	15.6	12.7	0.6	0.2	22,272
1989	4.4	29.0	5.7	3.2	9.3	5.7	5.5	10.5	8.3	17.7	0.7	0.0	20,535
1990	3.9	35.5	4.8	1.4	8.2	3.7	4.3	7.1	10.5	19.6	0.6	0.2	12,232
1991	4.3	31.6	7.1	2.0	8.0	3.4	4.7	8.3	12.9	17.2	0.6	0.1	8,203
1992	2.6	26.0	6.9	0.0	7.0	2.2	3.6	12.0	20.8	13.4	5.0	0.4	5,938
1993	2.2	16.0	15.4	0.0	9.0	4.1	3.6	14.2	21.7	12.6	0.8	0.4	5,744
1994	3.1	13.4	9.6	0.5	19.2	2.7	5.3	8.3	23.7	13.7	0.5	0.1	8,724
1995	4.2	17.9	6.5	0.3	24.9	4.1	4.7	6.4	12.3	18.5	0.1	0.0	19,079
1996	4.0	19.0	4.0	0.0	20.0	3.0	2.0	8.0	19.0	21.0	0.0	0.0	39,406
1997	3.1	28.4	4.4	0.5	9.8	5.1	2.9	4.8	11.3	29.7	0.0	0.1	33,556
1998	2.4	31.2	6.0	1.3	6.5	6.3	5.5	3.1	8.6	29.1	0.1	0.0	23,308
1999	2.7	24.0	5.4	2.3	5.4	5.2	11.8	6.4	14.5	21.9	0.4	0.1	19,156
2000	2.3	19.3	9.1	0.9	10.5	9.6	12.7	5.7	13.9	15.7	0.1	0.1	21,793
2001	3.7	28.3	7.4	0.2	15.6	6.4	6.4	5.2	9.2	17.8	0.0	0.0	28,838
2002	3.8	32.9	5.8	0.3	9.9	6.7	6.6	2.5	7.2	24.4	0.0	0.0	38,347
2003	4.9	28.7	4.0	1.5	7.4	3.0	14.4	2.2	7.4	26.5	0.0	0.0	29,382
2004	4.4	31.1	2.1	0.5	6.6	1.6	12.9	2.2	11.7	26.8	0.0	0.0	16,772
2005	3.7	27.5	5.1	0.8	5.4	2.4	28.1	1.7	6.4	18.8	0.0	0.0	15,472
Average	**4.1**	**24.2**	**6.3**	**1.0**	**9.8**	**4.8**	**7.9**	**9.5**	**13.2**	**18.6**	**0.5**	**0.2**	

Table 2.2.3.1. Faroe Plateau COD. Catch in numbers at age per fleet in 2005. Numbers are in thousands and the catch is in tonnes, round weight.

Age\Fleet	Open boats longline	Open boats jiggers	Longliners < 100 GRT	Jiggers	Single trwl 0-399HP	Single trwl 400-1000H	Single trwl > 1000 HP	Pair trwl 700-999 HI	Pair trwl > 1000 HP	Longliners > 100 GRT	Gillnetters	Others (scaling)	Catch-at-age
2	50	25	428	44	21	6	1	0	3	17	0	-72	523
3	41	35	339	108	73	29	6	5	22	55	0	-86	627
4	57	42	593	54	83	37	6	10	35	139	0	-126	930
5	55	44	541	84	119	59	15	27	109	296	1	-161	1189
6	31	24	355	52	48	28	14	22	94	319	7	-122	872
7	4	3	48	21	11	6	4	6	23	115	6	-31	216
8	0	0	1	4	1	0	1	1	6	32	3	-6	43
9	0	0	1	2	0	0	0	0	2	15	1	-1	20
10+	1	1	18	1	0	0	0	0	1	15	0	-5	32
Sum	239	174	2324	370	356	165	47	71	295	1003	18	-610	4452
G.weight	376	268	3839	749	715	338	134	233	891	3085	119	-1288	9459

Others include industrial bottom trawlers, longlining for halibut, small gillnetters, foreign fleets, **and scaling to correct catch.**
Gutted total catch is calculated as round weight divided by 1.11.

Table 2.2.3.2. Faroe Plateau COD. Catch in numbers at age 1961-2005.

Table 1 Catch numbers at age
Numbers*10**-3

YEAR,	1961,	1962,	1963,	1964,	1965,
AGE					
1,	0,	0,	0,	0,	0,
2,	3093,	4424,	4110,	2033,	852,
3,	2686,	2500,	3958,	3021,	3230,
4,	1331,	1255,	1280,	2300,	2564,
5,	1066,	855,	662,	630,	1416,
6,	232,	481,	284,	350,	363,
7,	372,	93,	204,	158,	155,
8,	78,	94,	48,	79,	48,
9,	29,	22,	30,	41,	63,
TOTALNUM,	8887,	9724,	10576,	8612,	8691,
TONSLAND,	21598,	20967,	22215,	21078,	24212,
SOPCOF %,	91,	94,	96,	98,	113,

YEAR,	1966,	1967,	1968,	1969,	1970,	1971,	1972,	1973,	1974,	1975,
AGE										
1,	0,	0,	0,	0,	0,	0,	0,	0,	0,	0,
2,	1337,	1609,	1529,	878,	402,	328,	875,	723,	2161,	2584,
3,	970,	2690,	3322,	3106,	1163,	757,	1176,	3124,	1266,	5689,
4,	2080,	860,	2663,	3300,	2172,	821,	810,	1590,	1811,	2157,
5,	1339,	1706,	945,	1538,	1685,	1287,	596,	707,	934,	2211,
6,	606,	847,	1226,	477,	752,	1451,	1021,	384,	563,	813,
7,	197,	309,	452,	713,	244,	510,	596,	312,	452,	295,
8,	104,	64,	105,	203,	300,	114,	154,	227,	149,	190,
9,	33,	27,	11,	92,	44,	179,	25,	120,	141,	118,
TOTALNUM,	6666,	8112,	10253,	10307,	6762,	5447,	5253,	7187,	7477,	14057,
TONSLAND,	20418,	23562,	29930,	32371,	24183,	23010,	18727,	22228,	24581,	36775,
SOPCOF %,	109,	102,	106,	109,	99,	123,	125,	105,	104,	100,

YEAR,	1976,	1977,	1978,	1979,	1980,	1981,	1982,	1983,	1984,	1985,
AGE										
1,	0,	0,	0,	0,	0,	0,	0,	0,	0,	0,
2,	1497,	425,	555,	575,	1129,	646,	1139,	2149,	4396,	998,
3,	4158,	3282,	1219,	1732,	2263,	4137,	1965,	5771,	5234,	9484,
4,	3799,	6844,	2643,	1673,	1461,	1981,	3073,	2760,	3487,	3795,
5,	1380,	3718,	3216,	1601,	895,	947,	1286,	2746,	1461,	1669,
6,	1427,	788,	1041,	1906,	807,	582,	471,	1204,	912,	770,
7,	617,	1160,	268,	493,	832,	487,	314,	510,	314,	872,
8,	273,	239,	201,	134,	339,	527,	169,	157,	82,	309,
9,	120,	134,	66,	87,	42,	123,	254,	104,	34,	65,
TOTALNUM,	13271,	16590,	9209,	8201,	7768,	9430,	8671,	15401,	15920,	17962,
TONSLAND,	39799,	34927,	26585,	23112,	20513,	22963,	21489,	38133,	36979,	39484,
SOPCOF %,	103,	70,	102,	101,	107,	107,	104,	99,	99,	97,

YEAR,	1986,	1987,	1988,	1989,	1990,	1991,	1992,	1993,	1994,	1995,
AGE										
1,	0,	0,	0,	0,	0,	0,	0,	0,	0,	0,
2,	210,	257,	509,	2237,	243,	192,	205,	120,	573,	2615,
3,	3586,	1362,	2122,	2151,	2849,	451,	455,	802,	788,	2716,
4,	8462,	2611,	1945,	2187,	1481,	2152,	466,	603,	1062,	2008,
5,	2373,	3083,	1484,	1121,	852,	622,	911,	222,	532,	1012,
6,	907,	812,	2178,	1026,	404,	303,	293,	329,	125,	465,
7,	236,	224,	492,	997,	294,	142,	132,	96,	176,	118,
8,	147,	68,	168,	220,	291,	93,	53,	33,	39,	175,
9,	47,	69,	33,	61,	50,	53,	30,	22,	23,	44,
0 TOTALNUM,	15968,	8486,	8931,	10000,	6464,	4008,	2545,	2227,	3318,	9153,
TONSLAND,	34595,	21391,	23182,	22068,	13487,	8750,	6396,	6107,	9046,	23045,
SOPCOF %,	97,	98,	102,	98,	101,	109,	108,	107,	103,	103,

YEAR,	1996,	1997,	1998,	1999,	2000,	2001,	2002,	2003,	2004,	2005,
AGE										
1,	0,	0,	0,	0,	0,	0,	0,	0,	0,	0,
2,	351,	200,	455,	1185,	2091,	3912,	2080,	681,	101,	523,
3,	5164,	1278,	745,	993,	2637,	3759,	7288,	2135,	693,	627,
4,	4608,	6710,	1558,	799,	782,	2101,	3374,	4587,	1266,	930,
5,	1542,	3731,	5140,	1107,	426,	367,	1673,	1933,	2111,	1189,
6,	1526,	657,	1529,	2225,	674,	367,	470,	642,	738,	872,
7,	596,	639,	159,	439,	809,	718,	533,	178,	241,	216,
8,	147,	170,	118,	59,	104,	437,	413,	91,	65,	43,
9,	347,	51,	28,	17,	7,	36,	290,	115,	42,	20,
0 TOTALNUM,	14281,	13436,	9732,	6824,	7530,	11697,	16121,	10362,	5257,	4420,
TONSLAND,	40422,	34304,	24005,	18306,	21033,	28183,	38486,	24581,	13215,	10499,
SOPCOF %,	100,	104,	104,	102,	104,	101,	100,	101,	103,	103,

Table 2.2.4.1. Faroe Plateau COD. Catch weight at age 1961-2005.

Table 2 Catch weights at age (kg)

YEAR,	1961,	1962,	1963,	1964,	1965,
AGE					
1,	.0000,	.0000,	.0000,	.0000,	.0000,
2,	1.0800,	1.0000,	1.0400,	.9700,	.9200,
3,	2.2200,	2.2700,	1.9400,	1.8300,	1.4500,
4,	3.4500,	3.3500,	3.5100,	3.1500,	2.5700,
5,	4.6900,	4.5800,	4.6000,	4.3300,	3.7800,
6,	5.5200,	4.9300,	5.5000,	6.0800,	5.6900,
7,	7.0900,	9.0800,	6.7800,	7.0000,	7.3100,
8,	9.9100,	6.5900,	8.7100,	6.2500,	7.9300,
9,	8.0300,	6.6600,	11.7200,	6.1900,	8.0900,
SOPCOFAC,	.9068,	.9444,	.9573,	.9824,	1.1262,

YEAR,	1966,	1967,	1968,	1969,	1970,	1971,	1972,	1973,	1974,	1975,
AGE										
1,	.0000,	.0000,	.0000,	.0000,	.0000,	.0000,	.0000,	.0000,	.0000,	.0000,
2,	.9800,	.9600,	.8800,	1.0900,	.9600,	.8100,	.6600,	1.1100,	1.0800,	.7900,
3,	1.7700,	1.9300,	1.7200,	1.8000,	2.2300,	1.8000,	1.6100,	2.0000,	2.2200,	1.7900,
4,	2.7500,	3.1300,	3.0700,	2.8500,	2.6900,	2.9800,	2.5800,	3.4100,	3.4400,	2.9800,
5,	3.5100,	4.0400,	4.1200,	3.6700,	3.9400,	3.5800,	3.2600,	3.8900,	4.8000,	4.2600,
6,	4.8000,	4.7800,	4.6500,	4.8900,	5.1400,	3.9400,	4.2900,	5.1000,	5.1800,	5.4600,
7,	6.3200,	6.2500,	5.5000,	5.0500,	6.4600,	4.8700,	4.9500,	5.1000,	5.8800,	6.2500,
8,	7.5100,	7.0000,	7.6700,	7.4100,	10.3100,	6.4800,	6.4800,	6.1200,	6.1400,	7.5100,
9,	10.3400,	11.0100,	10.9500,	8.6600,	7.3900,	6.3700,	6.9000,	8.6600,	8.6300,	7.3900,
SOPCOFAC,	1.0905,	1.0224,	1.0598,	1.0851,	.9943,	1.2264,	1.2481,	1.0485,	1.0432,	1.0033,

YEAR,	1976,	1977,	1978,	1979,	1980,	1981,	1982,	1983,	1984,	1985,
AGE										
1,	.0000,	.0000,	.0000,	.0000,	.0000,	.0000,	.0000,	.0000,	.0000,	.0000,
2,	.9400,	.8700,	1.1120,	.8970,	.9270,	1.0800,	1.2300,	1.3380,	1.1950,	.9050,
3,	1.7200,	1.7900,	1.3850,	1.6820,	1.4320,	1.4700,	1.4130,	1.9500,	1.8880,	1.6580,
4,	2.8400,	2.5300,	2.1400,	2.2110,	2.2200,	2.1800,	2.1380,	2.4030,	2.9800,	2.6260,
5,	3.7000,	3.6800,	3.1250,	3.0520,	3.1050,	3.2100,	3.1070,	3.1070,	3.6790,	3.4000,
6,	5.2600,	4.6500,	4.3630,	3.6420,	3.5390,	3.7000,	4.0120,	4.1100,	4.4700,	3.7520,
7,	6.4300,	5.3400,	5.9270,	4.7190,	4.3920,	4.2400,	5.4420,	5.0200,	5.4880,	4.2200,
8,	6.3900,	6.2300,	6.3480,	7.2720,	6.1000,	4.4300,	5.5630,	5.6010,	6.4660,	4.7390,
9,	8.5500,	8.3800,	8.7150,	8.3680,	7.6030,	6.6900,	5.2160,	8.0130,	6.6280,	6.5110,
SOPCOFAC,	1.0285,	.7026,	1.0228,	1.0055,	1.0680,	1.0674,	1.0428,	.9901,	.9872,	.9695,

YEAR,	1986,	1987,	1988,	1989,	1990,	1991,	1992,	1993,	1994,	1995,
AGE										
1,	.0000,	.0000,	.0000,	.0000,	.0000,	.0000,	.0000,	.0000,	.0000,	.0000,
2,	1.0990,	1.0930,	1.0610,	1.0100,	.9450,	.7790,	.9890,	1.1550,	1.1940,	1.2180,
3,	1.4590,	1.5170,	1.7490,	1.5970,	1.3000,	1.2710,	1.3640,	1.7040,	1.8430,	1.9860,
4,	2.0460,	2.1600,	2.3000,	2.2000,	1.9590,	1.5700,	1.7790,	2.4210,	2.6130,	2.6220,
5,	2.9360,	2.7660,	2.9140,	2.9340,	2.5310,	2.5240,	2.3120,	3.1320,	3.6540,	3.9250,
6,	3.7860,	3.9080,	3.1090,	3.4680,	3.2730,	3.1850,	3.4770,	3.7230,	4.5840,	5.1800,
7,	4.6990,	5.4610,	3.9760,	3.7500,	4.6520,	4.0860,	4.5450,	4.9710,	4.9760,	6.0790,
8,	5.8930,	6.3410,	4.8960,	4.6820,	4.7580,	5.6560,	6.2750,	6.1590,	7.1460,	6.2410,
9,	9.7000,	8.5090,	7.0870,	6.1400,	6.7040,	5.9730,	7.6190,	7.6140,	8.5640,	7.7820,
0 SOPCOFAC,	.9715,	.9755,	1.0153,	.9810,	1.0064,	1.0857,	1.0770,	1.0652,	1.0303,	1.0299,

YEAR,	1996,	1997,	1998,	1999,	2000,	2001,	2002,	2003,	2004,	2005,
AGE										
1,	.0000,	.0000,	.0000,	.0000,	.0000,	.0000,	.0000,	.0000,	.0000,	.0000,
2,	1.0160,	.9010,	1.0040,	1.0500,	1.4160,	1.1640,	1.0170,	.8200,	1.0370,	.9860,
3,	1.7370,	1.3410,	1.4170,	1.5860,	2.1700,	2.0760,	1.7680,	1.3620,	1.1540,	1.3730,
4,	2.7450,	1.9580,	1.8020,	2.3500,	3.1870,	3.0530,	2.8050,	2.1270,	1.6930,	1.7600,
5,	3.8000,	3.0120,	2.2800,	2.7740,	3.7950,	3.9760,	3.5290,	3.3290,	2.3630,	2.2930,
6,	4.4550,	4.1580,	3.4780,	3.2140,	4.0480,	4.3940,	4.0950,	4.0920,	3.8300,	3.1380,
7,	4.9780,	4.4910,	5.4330,	5.4960,	4.5770,	4.8710,	4.4750,	4.6700,	5.1910,	5.2870,
8,	5.2700,	5.3120,	5.8510,	8.2760,	8.1820,	5.5630,	4.6500,	6.0000,	6.3260,	8.2850,
9,	5.5930,	6.1720,	7.9700,	9.1290,	11.8950,	7.2770,	6.2440,	6.7270,	7.6560,	8.7030,
0 SOPCOFAC,	1.0026,	1.0367,	1.0376,	1.0184,	1.0434,	1.0053,	1.0020,	1.0059,	1.0287,	1.0346,

Table 2.2.5.1. Faroe Plateau (sub-division Vb1) COD. Proportion mature at age 1983-2005. From 1961-1982 the average from 1983-1996 is used.

Table 5 Proportion mature at age

YEAR, AGE	1961,	1962,	1963,	1964,	1965,
1,	.0000,	.0000,	.0000,	.0000,	.0000,
2,	.1700,	.1700,	.1700,	.1700,	.1700,
3,	.6400,	.6400,	.6400,	.6400,	.6400,
4,	.8700,	.8700,	.8700,	.8700,	.8700,
5,	.9500,	.9500,	.9500,	.9500,	.9500,
6,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,
7,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,
8,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,
9,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,

YEAR, AGE	1966,	1967,	1968,	1969,	1970,	1971,	1972,	1973,	1974,	1975,
1,	.0000,	.0000,	.0000,	.0000,	.0000,	.0000,	.0000,	.0000,	.0000,	.0000,
2,	.1700,	.1700,	.1700,	.1700,	.1700,	.1700,	.1700,	.1700,	.1700,	.1700,
3,	.6400,	.6400,	.6400,	.6400,	.6400,	.6400,	.6400,	.6400,	.6400,	.6400,
4,	.8700,	.8700,	.8700,	.8700,	.8700,	.8700,	.8700,	.8700,	.8700,	.8700,
5,	.9500,	.9500,	.9500,	.9500,	.9500,	.9500,	.9500,	.9500,	.9500,	.9500,
6,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,
7,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,
8,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,
9,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,

YEAR, AGE	1976,	1977,	1978,	1979,	1980,	1981,	1982,	1983,	1984,	1985,
1,	.0000,	.0000,	.0000,	.0000,	.0000,	.0000,	.0000,	.0000,	.0000,	.0000,
2,	.1700,	.1700,	.1700,	.1700,	.1700,	.1700,	.1700,	.0300,	.0700,	.0000,
3,	.6400,	.6400,	.6400,	.6400,	.6400,	.6400,	.6400,	.7100,	.9600,	.5000,
4,	.8700,	.8700,	.8700,	.8700,	.8700,	.8700,	.8700,	.9300,	.9800,	.9600,
5,	.9500,	.9500,	.9500,	.9500,	.9500,	.9500,	.9500,	.9400,	.9700,	.9600,
6,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,
7,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,
8,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,
9,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,

YEAR, AGE	1986,	1987,	1988,	1989,	1990,	1991,	1992,	1993,	1994,	1995,
1,	.0000,	.0000,	.0000,	.0000,	.0000,	.0000,	.0000,	.0000,	.0000,	.0000,
2,	.0000,	.0000,	.0600,	.0500,	.0000,	.0000,	.0600,	.0300,	.0500,	.0900,
3,	.3800,	.6700,	.7200,	.5400,	.6800,	.7200,	.5000,	.7300,	.3300,	.3500,
4,	.9300,	.9100,	.9000,	.9800,	.9000,	.8600,	.8200,	.7800,	.8800,	.3300,
5,	1.0000,	1.0000,	.9700,	1.0000,	.9900,	1.0000,	.9800,	.9100,	.9600,	.6600,
6,	1.0000,	1.0000,	1.0000,	1.0000,	.9600,	1.0000,	1.0000,	.9900,	1.0000,	.9700,
7,	.9600,	1.0000,	1.0000,	1.0000,	.9800,	1.0000,	1.0000,	1.0000,	.9600,	1.0000,
8,	.9400,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,
9,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,

YEAR, AGE	1996,	1997,	1998,	1999,	2000,	2001,	2002,	2003,	2004,	2005,
1,	.0000,	.0000,	.0000,	.0000,	.0000,	.0000,	.0000,	.0000,	.0000,	.0000,
2,	.0400,	.0000,	.0000,	.0200,	.0200,	.0700,	.0400,	.0000,	.0000,	.0500,
3,	.4300,	.6400,	.6200,	.4300,	.3900,	.4700,	.3700,	.2900,	.5100,	.6600,
4,	.7400,	.9100,	.9000,	.8800,	.6900,	.8600,	.7600,	.7900,	.7800,	.9000,
5,	.8500,	.9700,	.9900,	.9800,	.9200,	.9400,	.9700,	.8800,	.9200,	.9300,
6,	.9400,	1.0000,	.9900,	1.0000,	.9900,	1.0000,	.9300,	.9800,	.8900,	.9800,
7,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	.9700,	1.0000,	.8700,	.9200,
8,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,
9,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,

Table 2.2.7.1.1. Faroe Plateau (sub-division Vb1) COD. Summer survey tuning series (number of individuals per 200 stations) and spring survey tuning series (number of individuals per 100 stations).

```
FAROE PLATEAU COD (ICES SUBDIVISION VB1)        Surveys.TXT
102
SUMMER SURVEY
1996 2005
1 1 0.6 0.7
2 8
 200  707.3   6614.6   3763     1322.2   714    236.2   49
 200  513.1   1502.1   6771     1479.9   180.8  139.5   30.4
 200  527      509.1    989.1   3723.7   915.6   50.5   37.2
 200  373.4   1257.4    753.8    676.1  1424.8  239.1   40.5
 200 1364.1   1153.3    673.8    309.6   436.9  600.8   35.4
 200 3422.1   2458.7   1537.8    415.9   234.8  283    242
 200 2326     5562.9   1816.5    810.8   147.7   83.3   69.5
 200  354     1038.8   2209.2    565.9   123.4   17.6   11.9
 200  437      839.9   1080.2   1550.2   344.2   80.2   25.7
 200  616.5    735.1    872.1   1166.3   756    142.5   44.8
SPRING SURVEY (shifted back to december)
1993 2005
1 1 0.9 1.0
1 8
 100   565.8    328.1     888.5     493.1     125.3    180.9    28       0.1
 100   707.7    778.5    1438      1490.8    1211.2    287.3   353.1    48.7
 100   395.8   3988.4    3612.4    1769.3    1315.5    403.8    79.8   160.7
 100    91.1    933.8    5492.1    2331.6     332.8    226.7    58.2     5.2
 100    75.9    428.7    1572.1    4927.7    1127.9     80.2    39.6    33.9
 100   528      636.9     956.4    1181.7    2005.5    243.5    24.2    12.9
 100   291.5   1413.4     730.2     430       494      815.2    61.2     3
 100   873.5   2266      1917.8     439.6     314.6    562.8   126.8     3.8
 100   343.9   4154.7    2708.1    1486.3     311.9    217.9   168.3   124.1
 100    79.4    703.7    4250.5    1326.7     541.8     63.4    48.1    36.8
 100   427.1    451       784.7    1197.6     299.5     66.5    22.2    11.9
 100   294.7    390.1    1046.6    1328.1     791.1    133.6    13.4     3.6
 100   130.3    433.4     634.4    1129.7     688.4    178.2    24       5.5
```

Table 2.2.7.1.2. Faroe Plateau (sub-division Vb1) COD. SPALY run.

```
Lowestoft VPA Version 3.1

   22/04/2006  14:29

 Extended Survivors Analysis

 COD FAROE PLATEAU (ICES SUBDIVISION Vb1)                 COD_ind_Surveys.txt

 CPUE data from file Surveys.TXT

 Catch data for  45 years. 1961 to 2005. Ages  1 to   9.

      Fleet,            First, Last, First, Last, Alpha,  Beta
                     ,    year, year,  age ,  age
 SUMMER SURVEY       ,   1996, 2005,   2,     8,   .600,   .700
 SPRING SURVEY (shift,   1993, 2005,   1,     8,   .900,  1.000


 Time series weights :

      Tapered time weighting not applied


 Catchability analysis :

      Catchability independent of stock size for all ages

      Catchability independent of age for ages >=    6


 Terminal population estimation :

      Survivor estimates shrunk towards the mean F
      of the final   5 years or the   5 oldest ages.

      S.E. of the mean to which the estimates  are shrunk =   2.000

      Minimum standard error for population
      estimates derived from each fleet =    .300

      Prior weighting not applied


 Tuning converged after   49 iterations

1


 Regression weights
       , 1.000, 1.000, 1.000, 1.000, 1.000, 1.000, 1.000, 1.000, 1.000, 1.000



 Fishing mortalities
    Age,  1996,  1997,  1998,  1999,  2000,  2001,  2002,  2003,  2004,  2005

      1,  .000,  .000,  .000,  .000,  .000,  .000,  .000,  .000,  .000,  .000
      2,  .031,  .035,  .088,  .095,  .124,  .148,  .190,  .107,  .019,  .070
      3,  .192,  .149,  .176,  .283,  .318,  .343,  .451,  .304,  .151,  .157
      4,  .452,  .410,  .273,  .290,  .378,  .452,  .595,  .576,  .298,  .311
      5,  .805,  .831,  .643,  .318,  .247,  .305,  .812,  .841,  .575,  .507
      6,  .903, 1.031, 1.046,  .648,  .326,  .350,  .816,  .884,  .954,  .498
      7, 1.129, 1.385,  .762, 1.043,  .519,  .696, 1.358,  .876, 1.053,  .845
      8,  .881, 1.308, 1.127,  .730,  .758,  .596, 1.226,  .923,  .982,  .522
      9, 1.083,  .914,  .782,  .457,  .169,  .653, 1.081, 1.711, 1.931,  .987


1
```

Table 2.2.7.1.2 (Cont'd)

XSA population numbers (Thousands)

YEAR ,	1,	2,	3,	4,	5,	6,	7,	8,	9,
	AGE								
1996 ,	7.89E+03,	1.29E+04,	3.26E+04,	1.40E+04,	3.08E+03,	2.84E+03,	9.73E+02,	2.77E+02,	5.80E+02,
1997 ,	7.26E+03,	6.46E+03,	1.02E+04,	2.20E+04,	7.31E+03,	1.13E+03,	9.42E+02,	2.58E+02,	9.41E+01,
1998 ,	1.76E+04,	5.94E+03,	5.11E+03,	7.21E+03,	1.20E+04,	2.61E+03,	3.29E+02,	1.93E+02,	5.70E+01,
1999 ,	2.42E+04,	1.44E+04,	4.45E+03,	3.51E+03,	4.49E+03,	5.16E+03,	7.49E+02,	1.26E+02,	5.12E+01,
2000 ,	3.84E+04,	1.98E+04,	1.07E+04,	2.75E+03,	2.15E+03,	2.68E+03,	2.21E+03,	2.16E+02,	4.97E+01,
2001 ,	1.62E+04,	3.14E+04,	1.43E+04,	6.38E+03,	1.54E+03,	1.37E+03,	1.58E+03,	1.08E+03,	8.30E+01,
2002 ,	9.07E+03,	1.33E+04,	2.22E+04,	8.32E+03,	3.33E+03,	9.31E+02,	7.93E+02,	6.46E+02,	4.85E+02,
2003 ,	7.27E+03,	7.43E+03,	9.00E+03,	1.16E+04,	3.76E+03,	1.21E+03,	3.37E+02,	1.67E+02,	1.55E+02,
2004 ,	1.04E+04,	5.95E+03,	5.46E+03,	5.44E+03,	5.33E+03,	1.33E+03,	4.09E+02,	1.15E+02,	5.43E+01,
2005 ,	6.94E+03,	8.54E+03,	4.78E+03,	3.85E+03,	3.31E+03,	2.46E+03,	4.19E+02,	1.17E+02,	3.52E+01,

Estimated population abundance at 1st Jan 2006

, 0.00E+00, 5.68E+03, 6.52E+03, 3.35E+03, 2.31E+03, 1.63E+03, 1.22E+03, 1.47E+02, 5.67E+01,

Taper weighted geometric mean of the VPA populations:

, 1.71E+04, 1.43E+04, 1.07E+04, 6.75E+03, 3.67E+03, 1.77E+03, 7.88E+02, 3.17E+02, 1.31E+02,

Standard error of the weighted Log(VPA populations) :

,	.5827,	.5668,	.5546,	.5358,	.5303,	.5645,	.6201,	.7024,	.8116,	1

Log catchability residuals.

Fleet : SUMMER SURVEY

Age ,	1996,	1997,	1998,	1999,	2000,	2001,	2002,	2003,	2004,	2005
1 ,	No data for this fleet at this age									
2 ,	-.30,	.07,	.22,	-1.01,	-.01,	.46,	.96,	-.39,	-.02,	.00
3 ,	.20,	-.15,	-.52,	.59,	-.35,	.13,	.58,	-.29,	-.10,	-.10
4 ,	.23,	.34,	-.56,	-.10,	.09,	.12,	.12,	-.03,	-.17,	-.03
5 ,	.73,	-.01,	.30,	-.64,	-.73,	-.06,	.17,	-.30,	.19,	.34
6 ,	.30,	-.07,	.73,	.23,	-.51,	-.45,	-.22,	-.62,	.36,	.24
7 ,	.41,	.08,	-.29,	.63,	.13,	-.18,	-.28,	-1.29,	.15,	.56
8 ,	-.07,	-.19,	.18,	.43,	-.22,	-.01,	-.34,	-.95,	.23,	.47

Mean log catchability and standard error of ages with catchability
independent of year class strength and constant w.r.t. time

Age ,	2,	3,	4,	5,	6,	7,	8
Mean Log q,	-7.7521,	-6.8407,	-6.4190,	-6.2197,	-6.2614,	-6.2614,	-6.2614,
S.E(Log q),	.5217,	.3747,	.2484,	.4498,	.4406,	.5559,	.4225,

Regression statistics :

Ages with q independent of year class strength and constant w.r.t. time.

Age,	Slope ,	t-value ,	Intercept,	RSquare,	No Pts,	Reg s.e,	Mean Q
2,	.89,	.361,	7.91,	.60,	10,	.49,	-7.75,
3,	.85,	.989,	7.20,	.84,	10,	.32,	-6.84,
4,	.87,	1.188,	6.73,	.92,	10,	.21,	-6.42,
5,	.85,	.673,	6.53,	.71,	10,	.39,	-6.22,
6,	.74,	1.385,	6.60,	.78,	10,	.31,	-6.26,
7,	.80,	.872,	6.33,	.70,	10,	.45,	-6.27,
8,	1.21,	-.898,	6.48,	.70,	10,	.51,	-6.31,

Fleet : SPRING SURVEY (shift

Age ,	1993,	1994,	1995
1 ,	-.02,	-.33,	.29
2 ,	-.81,	-.85,	.30
3 ,	-.60,	.01,	.08
4 ,	-.56,	.01,	.56
5 ,	-.62,	.78,	.35
6 ,	-.63,	.85,	.46
7 ,	-.36,	.41,	.09
8 ,	-4.77,	.74,	.06

Age ,	1996,	1997,	1998,	1999,	2000,	2001,	2002,	2003,	2004,	2005
1 ,	-.49,	-.59,	.47,	-.44,	.19,	.12,	-.76,	1.14,	.41,	.00
2 ,	.01,	-.08,	.45,	.37,	.55,	.72,	-.15,	-.10,	-.10,	-.31
3 ,	.04,	-.09,	.13,	.10,	.22,	.30,	.42,	-.51,	.13,	-.23
4 ,	-.03,	.23,	-.21,	-.48,	-.14,	.31,	.07,	-.38,	.21,	.41
5 ,	-.13,	.25,	.16,	-.57,	-.35,	.02,	.29,	-.40,	-.03,	.25
6 ,	-.12,	-.11,	.18,	.32,	.30,	.04,	-.36,	-.51,	.16,	-.60

```
     7 ,  -.19,  -.30,  -.33,   .04,  -.81,  -.03,   .04,  -.33,  -.87,  -.50
     8 , -1.59,   .77,  -.08, -1.49, -1.77,  -.04,  -.15,  -.21,  -.98, -1.01
Table 2.2.7.1.2 (Cont'd)

 Mean log catchability and standard error of ages with catchability
 independent of year class strength and constant w.r.t. time


    Age ,         1,         2,         3,         4,         5,         6,         7,         8
 Mean Log q,   -8.3903,   -7.0183,   -6.0555,   -5.7543,   -5.7481,   -5.9684,   -5.9684,   -5.9684,
 S.E(Log q),     .5237,     .4822,     .2946,     .3462,     .4055,     .4426,     .4394,    1.6791,


 Regression statistics :


 Ages with q independent of year class strength and constant w.r.t. time.

 Age, Slope , t-value , Intercept, RSquare, No Pts, Reg s.e,  Mean Q

  1,    1.04,    -.161,      8.34,     .62,     13,     .57,   -8.39,
  2,     .86,     .780,      7.37,     .72,     13,     .42,   -7.02,
  3,     .89,     .897,      6.40,     .86,     13,     .26,   -6.06,
  4,     .91,     .588,      6.04,     .78,     13,     .32,   -5.75,
  5,     .84,    1.057,      6.15,     .79,     13,     .34,   -5.75,
  6,    1.04,    -.170,      5.90,     .58,     13,     .48,   -5.97,
  7,     .90,     .659,      6.24,     .81,     13,     .33,   -6.21,
  8,     .55,    1.734,      6.18,     .57,     13,     .73,   -6.78,
1

 Terminal year survivor and F summaries :

 Age  1   Catchability constant w.r.t. time and dependent on age

 Year class = 2004

 Fleet,                 Estimated,    Int,       Ext,    Var,    N, Scaled,  Estimated
      ,                 Survivors,    s.e,       s.e,   Ratio,    , Weights,    F
 SUMMER SURVEY       ,         1.,   .000,       .000,    .00,   0,  .000,     .000
 SPRING SURVEY (shift,      5682.,   .543,       .000,    .00,   1, 1.000,     .000

   F shrinkage mean  ,         0.,   2.00,,,,                        .000,     .000

 Weighted prediction :

 Survivors,        Int,      Ext,    N,    Var,     F
 at end of year,   s.e,      s.e,     ,   Ratio,
      5682.,       .54,      .00,    1,    .000,   .000

1
 Age  2   Catchability constant w.r.t. time and dependent on age

 Year class = 2003

 Fleet,                 Estimated,    Int,       Ext,    Var,    N, Scaled,  Estimated
      ,                 Survivors,    s.e,       s.e,   Ratio,    , Weights,    F
 SUMMER SURVEY       ,      6524.,   .547,       .000,    .00,   1,  .304,     .070
 SPRING SURVEY (shift,      6644.,   .368,       .359,    .97,   2,  .672,     .069

   F shrinkage mean  ,      3780.,   2.00,,,,                        .024,     .118

 Weighted prediction :

 Survivors,        Int,      Ext,    N,    Var,     F
 at end of year,   s.e,      s.e,     ,   Ratio,
      6517.,       .30,      .18,    4,    .586,   .070

 Age  3   Catchability constant w.r.t. time and dependent on age

 Year class = 2002

 Fleet,                 Estimated,    Int,       Ext,    Var,    N, Scaled,  Estimated
      ,                 Survivors,    s.e,       s.e,   Ratio,    , Weights,    F
 SUMMER SURVEY       ,      3120.,   .319,       .039,    .12,   2,  .348,     .167
 SPRING SURVEY (shift,      3522.,   .235,       .369,   1.57,   3,  .641,     .149

   F shrinkage mean  ,      1532.,   2.00,,,,                        .010,     .315

 Weighted prediction :

 Survivors,        Int,      Ext,    N,    Var,     F
 at end of year,   s.e,      s.e,     ,   Ratio,
      3347.,       .19,      .19,    6,   1.020,   .157

1
 Age  4   Catchability constant w.r.t. time and dependent on age
```

Table 2.2.7.1.2 (Cont'd)

```
Year class = 2001

Fleet,                 Estimated,    Int,       Ext,    Var,    N, Scaled,  Estimated
     ,                 Survivors,    s.e,       s.e,   Ratio,    , Weights,    F
SUMMER SURVEY       ,      2088.,   .220,       .084,    .38,   3,  .456,     .339
SPRING SURVEY (shift,      2530.,   .198,       .204,   1.03,   4,  .536,     .287

  F shrinkage mean  ,      1429.,   2.00,,,,                        .008,     .463


Weighted prediction :

Survivors,        Int,      Ext,    N,    Var,     F
at end of year,   s.e,      s.e,     ,   Ratio,
     2307.,       .15,      .11,    8,    .747,   .311

Age  5   Catchability constant w.r.t. time and dependent on age

Year class = 2000

Fleet,                 Estimated,    Int,       Ext,    Var,    N, Scaled,  Estimated
     ,                 Survivors,    s.e,       s.e,   Ratio,    , Weights,    F
SUMMER SURVEY       ,      1680.,   .204,       .214,   1.05,   4,  .459,     .495
SPRING SURVEY (shift,      1593.,   .186,       .163,    .88,   5,  .531,     .516

  F shrinkage mean  ,      1431.,   2.00,,,,                        .011,     .561

Weighted prediction :

Survivors,        Int,      Ext,    N,    Var,     F
at end of year,   s.e,      s.e,     ,   Ratio,
     1630.,       .14,      .12,   10,    .839,   .507


1
Age  6   Catchability constant w.r.t. time and dependent on age

Year class = 1999

Fleet,                 Estimated,    Int,       Ext,    Var,    N, Scaled,  Estimated
     ,                 Survivors,    s.e,       s.e,   Ratio,    , Weights,    F
SUMMER SURVEY       ,      1490.,   .218,       .092,    .42,   5,  .470,     .425
SPRING SURVEY (shift,      1030.,   .204,       .187,    .91,   6,  .515,     .569

  F shrinkage mean  ,       823.,   2.00,,,,                        .015,     .672

Weighted prediction :

Survivors,        Int,      Ext,    N,    Var,     F
at end of year,   s.e,      s.e,     ,   Ratio,
     1221.,       .15,      .11,   12,    .755,   .498


Age  7   Catchability constant w.r.t. time and age (fixed at the value for age)  6

Year class = 1998

Fleet,                 Estimated,    Int,       Ext,    Var,    N, Scaled,  Estimated
     ,                 Survivors,    s.e,       s.e,   Ratio,    , Weights,    F
SUMMER SURVEY       ,       202.,   .277,       .123,    .44,   6,  .416,     .676
SPRING SURVEY (shift,       117.,   .256,       .138,    .54,   7,  .550,     .985

  F shrinkage mean  ,       132.,   2.00,,,,                        .034,     .910

Weighted prediction :

Survivors,        Int,      Ext,    N,    Var,     F
at end of year,   s.e,      s.e,     ,   Ratio,
      147.,       .19,      .11,   14,    .584,   .845

1
Age  8   Catchability constant w.r.t. time and age (fixed at the value for age)  6

Year class = 1997

Fleet,                 Estimated,    Int,       Ext,    Var,    N, Scaled,  Estimated
     ,                 Survivors,    s.e,       s.e,   Ratio,    , Weights,    F
SUMMER SURVEY       ,        74.,   .303,       .145,    .48,   7,  .645,     .422
SPRING SURVEY (shift,        36.,   .266,       .198,    .75,   8,  .320,     .734

  F shrinkage mean  ,        26.,   2.00,,,,                        .035,     .907
```

Table 2.2.7.1.2 (Cont'd)

```
Weighted prediction :

Survivors,        Int,      Ext,    N,    Var,     F
at end of year,   s.e,      s.e,     ,   Ratio,
       57.,       .22,      .14,   16,    .636,   .522

Age  9   Catchability constant w.r.t. time and age (fixed at the value for age)  6

Year class = 1996

Fleet,                 Estimated,    Int,       Ext,    Var,    N, Scaled,  Estimated
     ,                 Survivors,    s.e,       s.e,   Ratio,    , Weights,    F
SUMMER SURVEY       ,        11.,   .258,       .211,    .82,   7,  .552,    1.001
SPRING SURVEY (shift,         9.,   .212,       .110,    .52,   8,  .344,    1.133

  F shrinkage mean  ,        25.,   2.00,,,,                        .104,     .541

Weighted prediction :

Survivors,        Int,      Ext,    N,    Var,     F
at end of year,   s.e,      s.e,     ,   Ratio,
       11.,       .26,      .14,   16,    .520,   .987
```

Table 2.2.7.1.3. Faroe Plateau (sub-division Vb1) COD. Fishing mortality at age.

Table 8 Fishing mortality (F) at age

YEAR,	1961,	1962,	1963,	1964,	1965,
AGE					
1,	.0000,	.0000,	.0000,	.0000,	.0000,
2,	.3346,	.2701,	.2534,	.1086,	.1209,
3,	.5141,	.4982,	.4138,	.2997,	.2518,
4,	.4986,	.4838,	.5172,	.4523,	.4498,
5,	.5737,	.7076,	.5124,	.5229,	.5622,
6,	.4863,	.5569,	.5405,	.5659,	.6604,
7,	.9566,	.3662,	.4879,	.6677,	.5305,
8,	.8116,	.6826,	.3269,	.3531,	.4345,
9,	.6715,	.5641,	.4806,	.5164,	.5318,
FBAR 3- 7,	.6059,	.5226,	.4944,	.5017,	.4909,

YEAR,	1966,	1967,	1968,	1969,	1970,	1971,	1972,	1973,	1974,	1975,
AGE										
1,	.0000,	.0000,	.0000,	.0000,	.0000,	.0000,	.0000,	.0000,	.0000,	.0000,
2,	.0829,	.0789,	.1010,	.1099,	.0530,	.0309,	.0464,	.0657,	.0816,	.0774,
3,	.1969,	.2389,	.2318,	.3063,	.2081,	.1337,	.1476,	.2322,	.1568,	.3193,
4,	.2552,	.2687,	.3949,	.3806,	.3654,	.2225,	.2070,	.3048,	.2046,	.4359,
5,	.4499,	.3442,	.5339,	.4180,	.3409,	.3845,	.2497,	.2813,	.2953,	.4134,
6,	.5016,	.5779,	.4472,	.5709,	.3709,	.5572,	.6058,	.2526,	.3797,	.4544,
7,	.9680,	.5203,	.7132,	.5118,	.6559,	.4651,	.4686,	.3722,	.5330,	.3504,
8,	.8520,	1.0438,	.3331,	.8457,	.4208,	.7528,	.2464,	.3259,	.3052,	.4485,
9,	.6106,	.5556,	.4882,	.5499,	.4339,	.4800,	.3578,	.3091,	.3457,	.4235,
FBAR 3- 7,	.4743,	.3900,	.4642,	.4375,	.3882,	.3526,	.3358,	.2886,	.3139,	.3947,

YEAR,	1976,	1977,	1978,	1979,	1980,	1981,	1982,	1983,	1984,	1985,
AGE										
1,	.0000,	.0000,	.0000,	.0000,	.0000,	.0000,	.0000,	.0000,	.0000,	.0000,
2,	.0933,	.0481,	.0588,	.0433,	.0544,	.0523,	.0586,	.0992,	.1073,	.0658,
3,	.1723,	.3036,	.1896,	.2623,	.2391,	.2877,	.2227,	.4673,	.3712,	.3544,
4,	.3665,	.4748,	.4291,	.4309,	.3695,	.3409,	.3602,	.5585,	.5791,	.5077,
5,	.5568,	.7532,	.4289,	.5049,	.4337,	.4369,	.3887,	.6411,	.6609,	.6135,
6,	.5167,	.7333,	.4851,	.4906,	.5182,	.5644,	.4047,	.7836,	.4534,	.9236,
7,	.7619,	1.1138,	.5968,	.4480,	.4119,	.6940,	.6926,	1.0780,	.4761,	1.1084,
8,	.6429,	.7776,	.5674,	.6903,	.6437,	.5015,	.5526,	.9417,	.4792,	1.3206,
9,	.5738,	.7783,	.5054,	.5170,	.4790,	.5115,	.4834,	.8088,	.5341,	.9044,
FBAR 3- 7,	.4749,	.6757,	.4259,	.4273,	.3945,	.4648,	.4138,	.7057,	.5082,	.7015,

YEAR,	1986,	1987,	1988,	1989,	1990,	1991,	1992,	1993,	1994,	1995,
AGE										
1,	.0000,	.0000,	.0000,	.0000,	.0000,	.0000,	.0000,	.0000,	.0000,	.0000,
2,	.0247,	.0291,	.0671,	.1675,	.0759,	.0323,	.0201,	.0132,	.0254,	.0700,
3,	.3547,	.2209,	.3530,	.4432,	.3335,	.1969,	.0998,	.1018,	.1126,	.1616,
4,	.6229,	.4757,	.5643,	.7614,	.6329,	.4545,	.3210,	.1861,	.1903,	.4634,
5,	.7035,	.4855,	.5497,	.7631,	.7831,	.6033,	.3531,	.2488,	.2490,	.2797,
6,	.8259,	.5562,	.7748,	.9644,	.7011,	.7259,	.6472,	.2068,	.2160,	.3593,
7,	.8403,	.4899,	.7999,	1.0621,	.8397,	.5730,	.8383,	.4529,	.1627,	.3257,
8,	.5411,	.6227,	.8652,	1.1062,	1.1230,	.7099,	.4349,	.5121,	.3345,	.2414,
9,	.7135,	.5302,	.7176,	.9417,	.8244,	.6188,	.5231,	.3233,	.8423,	.7925,
FBAR 3- 7,	.6694,	.4456,	.6084,	.7988,	.6581,	.5107,	.4519,	.2393,	.1861,	.3179,

YEAR,	1996,	1997,	1998,	1999,	2000,	2001,	2002,	2003,	2004,	2005,	FBAR **-**
AGE											
1,	.0000,	.0000,	.0000,	.0000,	.0000,	.0000,	.0000,	.0000,	.0000,	.0000,	.0000,
2,	.0306,	.0348,	.0884,	.0954,	.1241,	.1479,	.1899,	.1069,	.0189,	.0701,	.0653,
3,	.1922,	.1487,	.1758,	.2828,	.3175,	.3428,	.4507,	.3041,	.1510,	.1566,	.2039,
4,	.4516,	.4101,	.2728,	.2900,	.3775,	.4521,	.5948,	.5757,	.2976,	.3109,	.3947,
5,	.8049,	.8311,	.6430,	.3178,	.2473,	.3050,	.8118,	.8408,	.5755,	.5067,	.6410,
6,	.9026,	1.0312,	1.0460,	.6481,	.3260,	.3498,	.8162,	.8839,	.9537,	.4985,	.7787,
7,	1.1295,	1.3854,	.7622,	1.0426,	.5192,	.6961,	1.3584,	.8764,	1.0534,	.8446,	.9248,
8,	.8814,	1.3075,	1.1265,	.7298,	.7581,	.5962,	1.2264,	.9230,	.9820,	.5224,	.8091,
9,	1.0829,	.9145,	.7822,	.4571,	.1693,	.6530,	1.0811,	1.7107,	1.9312,	.9875,	1.5431,
FBAR 3- 7,	.6961,	.7613,	.5800,	.5163,	.3575,	.4292,	.8064,	.6962,	.6062,	.4635,	

Table 2.2.7.1.4. Faroe Plateau (sub-division Vb1) COD. Stock number at age.

Table 10 Stock number at age (start of year) Numbers*10**-3

YEAR,	1961,	1962,	1963,	1964,	1965,
AGE					
1,	25227,	24782,	26668,	10100,	22676,
2,	12019,	20654,	20290,	21834,	8269,
3,	7385,	7042,	12907,	12893,	16037,
4,	3747,	3616,	3503,	6986,	7823,
5,	2699,	1863,	1825,	1710,	3639,
6,	666,	1245,	752,	895,	830,
7,	668,	335,	584,	358,	416,
8,	155,	210,	190,	294,	151,
9,	66,	56,	87,	112,	169,
TOTAL,	52630,	59804,	66807,	55183,	60009,

YEAR,	1966,	1967,	1968,	1969,	1970,	1971,	1972,	1973,	1974,	1975,
AGE										
1,	28643,	21475,	11390,	10514,	14569,	26041,	15356,	37229,	46803,	22687,
2,	18566,	23451,	17582,	9325,	8608,	11928,	21320,	12573,	30480,	38319,
3,	5999,	13990,	17744,	13012,	6840,	6684,	9469,	16664,	9639,	23000,
4,	10207,	4034,	9020,	11522,	7843,	4548,	4788,	6689,	10816,	6747,
5,	4085,	6475,	2525,	4976,	6447,	4456,	2981,	3187,	4037,	7217,
6,	1698,	2133,	3757,	1212,	2682,	3754,	2483,	1901,	1969,	2460,
7,	351,	842,	980,	1967,	561,	1516,	1760,	1109,	1209,	1103,
8,	200,	109,	410,	393,	965,	238,	779,	902,	626,	581,
9,	80,	70,	31,	240,	138,	519,	92,	499,	533,	378,
TOTAL,	69829,	72579,	63439,	53161,	48654,	59683,	59029,	80752,	106115,	102492,

YEAR,	1976,	1977,	1978,	1979,	1980,	1981,	1982,	1983,	1984,	1985,
AGE										
1,	12208,	13128,	18318,	28803,	17100,	27026,	30727,	58328,	21148,	11611,
2,	18575,	9995,	10748,	14997,	23582,	14000,	22127,	25157,	47755,	17315,
3,	29035,	13853,	7799,	8298,	11759,	18286,	10878,	17086,	18653,	35121,
4,	13683,	20010,	8372,	5282,	5226,	7579,	11228,	7128,	8767,	10535,
5,	3572,	7765,	10190,	4463,	2811,	2957,	4413,	6412,	3339,	4022,
6,	3908,	1676,	2993,	5433,	2206,	1491,	1564,	2449,	2765,	1411,
7,	1279,	1909,	659,	1509,	2723,	1076,	694,	854,	916,	1439,
8,	636,	489,	513,	297,	789,	1477,	440,	284,	238,	466,
9,	304,	274,	184,	238,	122,	339,	732,	207,	91,	121,
TOTAL,	83200,	69098,	59776,	69320,	66318,	74232,	82804,	117907,	103671,	82041,

YEAR,	1986,	1987,	1988,	1989,	1990,	1991,	1992,	1993,	1994,	1995,
AGE										
1,	12109,	10593,	19582,	4489,	8160,	13938,	12365,	30789,	52212,	15720,
2,	9506,	9914,	8673,	16032,	3675,	6681,	11412,	10124,	25208,	42748,
3,	13273,	7593,	7884,	6640,	11102,	2789,	5296,	9158,	8180,	20120,
4,	20173,	7622,	4984,	4535,	3490,	6511,	1876,	3925,	6772,	5984,
5,	5192,	8860,	3878,	2321,	1734,	1517,	3384,	1114,	2668,	4583,
6,	1783,	2104,	4464,	1832,	886,	649,	680,	1946,	711,	1703,
7,	459,	639,	988,	1684,	572,	360,	257,	291,	1296,	469,
8,	389,	162,	321,	363,	477,	202,	166,	91,	152,	902,
9,	102,	185,	71,	111,	98,	127,	81,	88,	45,	89,
TOTAL,	62986,	47672,	50845,	38008,	30195,	32775,	35517,	57525,	97243,	92317,

YEAR,	1996,	1997,	1998,	1999,	2000,	2001,	2002,	2003,	2004,	2005,	2006,	GMST 61-**	AMST 61-**
AGE													
1,	7890,	7260,	17580,	24176,	38400,	16233,	9070,	7269,	10428,	6939,	0,	17688,	20707,
2,	12870,	6460,	5944,	14393,	19793,	31439,	13291,	7426,	5951,	8538,	5682,	14720,	17094,
3,	32633,	10220,	5108,	4455,	10712,	14314,	22200,	9000,	5463,	4781,	6517,	11100,	12808,
4,	14015,	22045,	7211,	3508,	2749,	6384,	8318,	11582,	5436,	3846,	3347,	6877,	7939,
5,	3083,	7305,	11977,	4494,	2149,	1543,	3326,	3757,	5332,	3305,	2307,	3650,	4208,
6,	2837,	1129,	2605,	5155,	2678,	1374,	931,	1209,	1327,	2455,	1630,	1770,	2070,
7,	973,	942,	329,	749,	2208,	1582,	793,	337,	409,	419,	1221,	812,	971,
8,	277,	258,	193,	126,	216,	1075,	646,	167,	115,	117,	147,	333,	419,
9,	580,	94,	57,	51,	50,	83,	485,	155,	54,	35,	57,	138,	191,
0 TOTAL,	75158,	55711,	51004,	57107,	78954,	74027,	59059,	40900,	34516,	30435,	20908,		

Table 2.2.7.1.5. Faroe Plateau (sub-division Vb1) COD. Summary table.

	RECRUITS (AGE 2)	TOTALBIO	TOTSPBIO	LANDINGS	YIELD/SSB	FBAR 3- 7
1961	12019	65428	46439	21598	0.4651	0.6059
1962	20654	68225	43326	20967	0.4839	0.5226
1963	20290	77602	49054	22215	0.4529	0.4944
1964	21834	84666	55362	21078	0.3807	0.5017
1965	8269	75043	57057	24212	0.4244	0.4909
1966	18566	83919	60629	20418	0.3368	0.4743
1967	23451	105289	73934	23562	0.3187	0.39
1968	17582	110433	82484	29930	0.3629	0.4642
1969	9325	105537	83487	32371	0.3877	0.4375
1970	8608	98398	82035	24183	0.2948	0.3882
1971	11928	78218	63308	23010	0.3635	0.3526
1972	21320	76439	57180	18727	0.3275	0.3358
1973	12573	107682	80516	22228	0.2761	0.2886
1974	30480	136663	95831	24581	0.2565	0.3139
1975	38319	149774	105676	36775	0.348	0.3947
1976	18575	154919	116736	39799	0.3409	0.4749
1977	9995	136017	111863	34927	0.3122	0.6757
1978	10748	94338	76608	26585	0.347	0.4259
1979	14997	83769	65380	23112	0.3535	0.4273
1980	23582	84536	58386	20513	0.3513	0.3945
1981	14000	86907	62058	22963	0.37	0.4648
1982	22127	96624	64695	21489	0.3322	0.4138
1983	25157	121638	76931	38133	0.4957	0.7057
1984	47755	150219	94846	36979	0.3899	0.5082
1985	17315	129603	83164	39484	0.4748	0.7015
1986	9506	98517	72949	34595	0.4742	0.6694
1987	9914	77641	61522	21391	0.3477	0.4456
1988	8673	65636	51640	23182	0.4489	0.6084
1989	16032	58633	38173	22068	0.5781	0.7988
1990	3675	37620	28631	13487	0.4711	0.6581
1991	6681	28242	20613	8750	0.4245	0.5107
1992	11412	34864	19886	6396	0.3216	0.4519
1993	10124	50212	32180	6107	0.1898	0.2393
1994	25208	83790	42324	9046	0.2137	0.1861
1995	42748	143695	53448	23045	0.4312	0.3179
1996	12870	142132	84752	40422	0.4769	0.6961
1997	6460	95563	80264	34304	0.4274	0.7613
1998	5944	65941	55560	24005	0.4321	0.58
1999	14393	65084	45008	18306	0.4067	0.5163
2000	19793	91491	46369	21033	0.4536	0.3575
2001	31439	112266	59387	28183	0.4746	0.4292
2002	13291	101227	57199	38486	0.6728	0.8064
2003	7426	64053	42489	24581	0.5785	0.6962
2004	5951	42626	29498	13215	0.448	0.6062
2005	8538	40522	28754	10499	0.3651	0.4635
Arith. Mean	20172	90259	62170	24243	0.3974	0.4988
Units	(Thousands)	(Tonnes)	(Tonnes)		(Tonnes)	

Table 2.2.8.1.1. Faroe Plateau (sub-division Vb1) COD. Input to management option table.

Recruitment

	XSA	RCT3	Geomean 61-05
YC2003	8538		
YC2004	5682		
YC2005			14253
YC2006			14253

Stock size

2006
5682
6517
3347
2307
1630
1221
147
57

Directly from XSA output

Maturity

Age	Observed 2006	Av.04-06 2007	Av.04-06 2008
2	0.04	0.03	0.03
3	0.59	0.59	0.59
4	0.8	0.83	0.83
5	0.99	0.95	0.95
6	0.99	0.95	0.95
7	1	0.93	0.93
8	1	1	1
9	1	1	1

Exploitation pattern
(rescaled to 2005 level)

Av03-05 2006	Av03-05 2007	Av03-05 2008
0.0514	0.0514	0.0514
0.1605	0.1605	0.1605
0.3108	0.3108	0.3108
0.5047	0.5047	0.5047
0.6131	0.6131	0.6131
0.7281	0.7281	0.7281
0.6371	0.6371	0.6371
1.2150	1.2150	1.2150

Weights

Est.from Jan-Feb 2006	As2005 2007	As2005 2008
0.9920	0.9920	0.9920
1.8070	1.8070	1.8070
2.1000	2.1000	2.1000
2.8680	2.8680	2.8680
3.7500	3.7500	3.7500
4.8460	4.8460	4.8460
6.7250	6.7250	6.7250
9.0940	9.0940	9.0940

Table 2.2.8.1.2. Faroe Plateau (sub-division Vb1) COD. Management option table.

MFDP VERSION 1
Run: Shortterm3
Index file 28/4-2006
Time and date: 15:22 29/04/2006
Fbar age range: 3-7

2006						
Biomass	**SSB**	**FMult**	**FBar**	**Landings**		
2007					**2008**	
Biomass	**SSB**	**FMult**	**FBar**	**Landings**	**Biomass**	**SSB**
49032	29674	0.0000	0.0000	0	71759	46948
.	29674	0.0750	0.0348	1056	70529	45806
.	29674	0.1500	0.0695	2072	69344	44705
.	29674	0.2250	0.1043	3052	68200	43644
.	29674	0.3000	0.1390	3996	67096	42623
.	29674	0.3750	0.1738	4907	66031	41638
.	29674	0.4500	0.2086	5785	65003	40689
.	29674	0.5250	0.2433	6632	64010	39773
.	29674	0.6000	0.2781	7449	63051	38891
.	29674	0.6750	0.3128	8239	62125	38039
.	29674	0.7500	0.3476	9001	61230	37217
.	29674	0.8250	0.3824	9737	60364	36425
.	29674	0.9000	0.4171	10449	59528	35659
.	29674	0.9750	0.4519	11137	58719	34920
.	29674	1.0500	0.4866	11802	57936	34206
.	29674	1.1250	0.5214	12445	57179	33517
.	29674	1.2000	0.5562	13068	56446	32851
.	29674	1.2750	0.5909	13671	55737	32207
.	29674	1.3500	0.6257	14254	55050	31584
.	29674	1.4250	0.6604	14819	54385	30983
.	29674	1.5000	0.6952	15367	53740	30401

Input units are thousands and kg - output in tonnes

Table 2.2.8.4.1. Faroe Plateau (sub-division Vb1) COD. Input to yield per recruit calculations (long term prediction).

	EXPLOITATION pattern	WEIGHTATAGE	PROPMATURE
	Average 2000-2005 Not rescaled	Average 1978-2005	Average 1983-2006
Age 2	0.1096	1.0603	0.0304
Age 3	0.2871	1.5947	0.5496
Age 4	0.4348	2.2868	0.8404
Age 5	0.5479	3.0916	0.9450
Age 6	0.638	3.8638	0.9838
Age 7	0.8914	4.8684	0.9858
Age 8	0.8347	6.0102	0.9975
Age 9	0.7228	7.5277	1.0000

Table 2.2.8.4.2. Faroe Plateau (sub-division Vb1) COD. Output from yield per recruit calculations (long term prediction).

MFYPR version 1
Run: YLD1
Time and date: 19:33 28/04/2006
Yield per results

FMult	Fbar	CatchNos	Yield	StockNos	Biomass	SpwnNosJan	SSBJan	SpwnNosSpwn	SSBSpwn
0.0000	0.0000	0.0000	0.0000	4.4029	12.7892	2.9141	10.7770	2.9141	10.7770
0.1000	0.0560	0.1523	0.5533	4.0459	10.9925	2.5699	9.0132	2.5699	9.0132
0.2000	0.1120	0.2622	0.8976	3.7566	9.5940	2.2924	7.6448	2.2924	7.6448
0.3000	0.1679	0.3432	1.1093	3.5190	8.4925	2.0661	6.5712	2.0661	6.5712
0.4000	0.2239	0.4044	1.2367	3.3213	7.6143	1.8791	5.7188	1.8791	5.7188
0.5000	0.2799	0.4518	1.3110	3.1548	6.9055	1.7227	5.0341	1.7227	5.0341
0.6000	0.3359	0.4894	1.3519	3.0129	6.3264	1.5905	4.4776	1.5905	4.4776
0.7000	0.3919	0.5198	1.3719	2.8906	5.8474	1.4775	4.0198	1.4775	4.0198
0.8000	0.4479	0.5451	1.3790	2.7842	5.4467	1.3799	3.6391	1.3799	3.6391
0.9000	0.5038	0.5666	1.3782	2.6907	5.1077	1.2948	3.3189	1.2948	3.3189
1.0000	0.5598	0.5850	1.3728	2.6078	4.8179	1.2200	3.0470	1.2200	3.0470
1.1000	0.6158	0.6012	1.3648	2.5337	4.5676	1.1538	2.8137	1.1538	2.8137
1.2000	0.6718	0.6155	1.3553	2.4670	4.3495	1.0947	2.6118	1.0947	2.6118
1.3000	0.7278	0.6283	1.3453	2.4066	4.1579	1.0415	2.4355	1.0415	2.4355
1.4000	0.7837	0.6400	1.3350	2.3516	3.9881	0.9936	2.2805	0.9936	2.2805
1.5000	0.8397	0.6505	1.3249	2.3013	3.8367	0.9500	2.1432	0.9500	2.1432
1.6000	0.8957	0.6603	1.3151	2.2549	3.7008	0.9102	2.0208	0.9102	2.0208
1.7000	0.9517	0.6692	1.3056	2.2121	3.5781	0.8737	1.9111	0.8737	1.9111
1.8000	1.0077	0.6775	1.2965	2.1723	3.4667	0.8401	1.8122	0.8401	1.8122
1.9000	1.0637	0.6853	1.2878	2.1353	3.3650	0.8091	1.7225	0.8091	1.7225
2.0000	1.1196	0.6925	1.2795	2.1007	3.2719	0.7803	1.6410	0.7803	1.6410

Reference point	F multiplier	Absolute F
Fbar(3-7)	1.0000	0.5598
FMax	0.8359	0.468
F0.1	0.4604	0.2577
F35%SPR	0.763	0.4272
Flow	0.0465	0.026
Fmed	0.6075	0.3401
Fhigh	1.7107	0.9577

Weights in kilograms

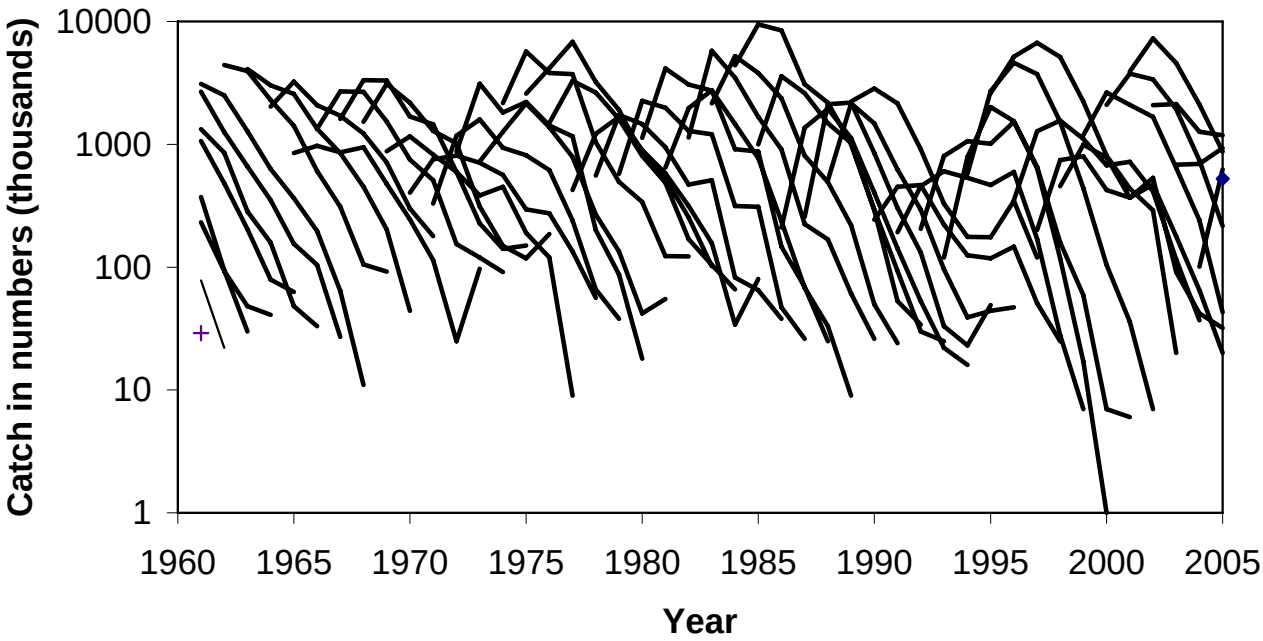


Figure 2.2.3.1. Faroe Plateau (sub-division VB1) COD. Catch in numbers.

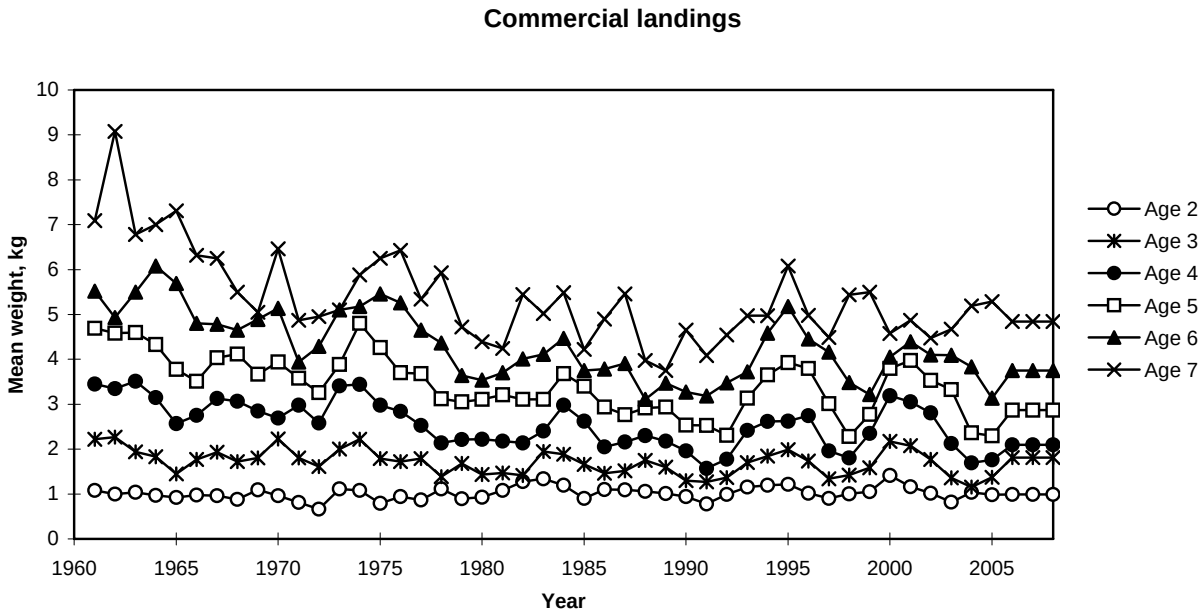


Figure 2.2.4.1. Faroe Plateau (sub-division VB1) COD. Mean weight at age 1961-2005. The estimated weights in 2006 are also shown. The weights in 2007 and 2008 are set to the 2006 value.

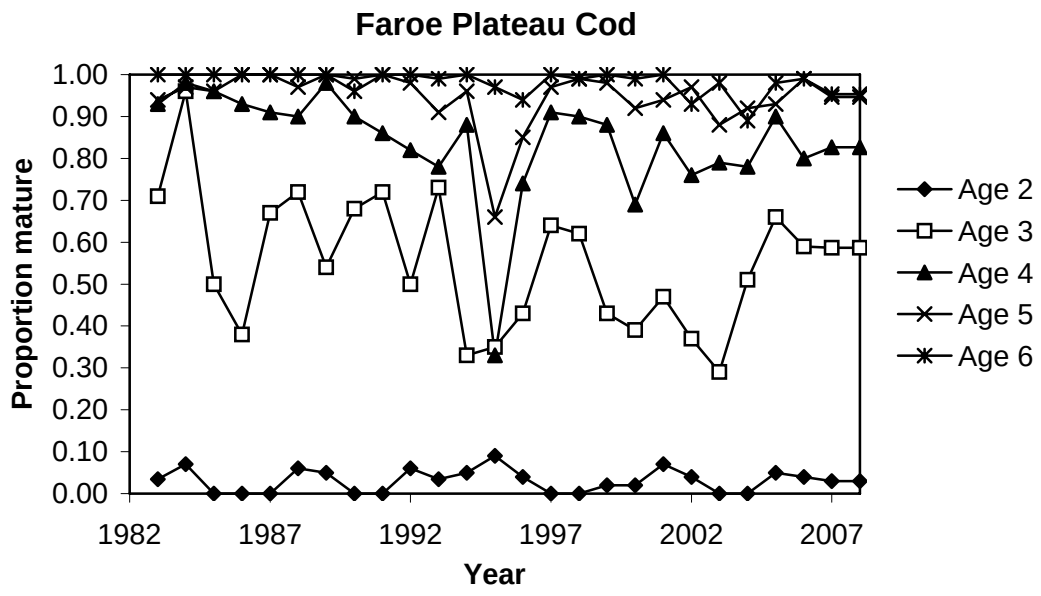


Figure 2.2.5.1. Faroe Plateau (sub-division VB1) COD. Proportion mature at age as observed in the spring groundfish survey. The values in 2007 and 2008 are estimated as the average of the 2004-2006 values.

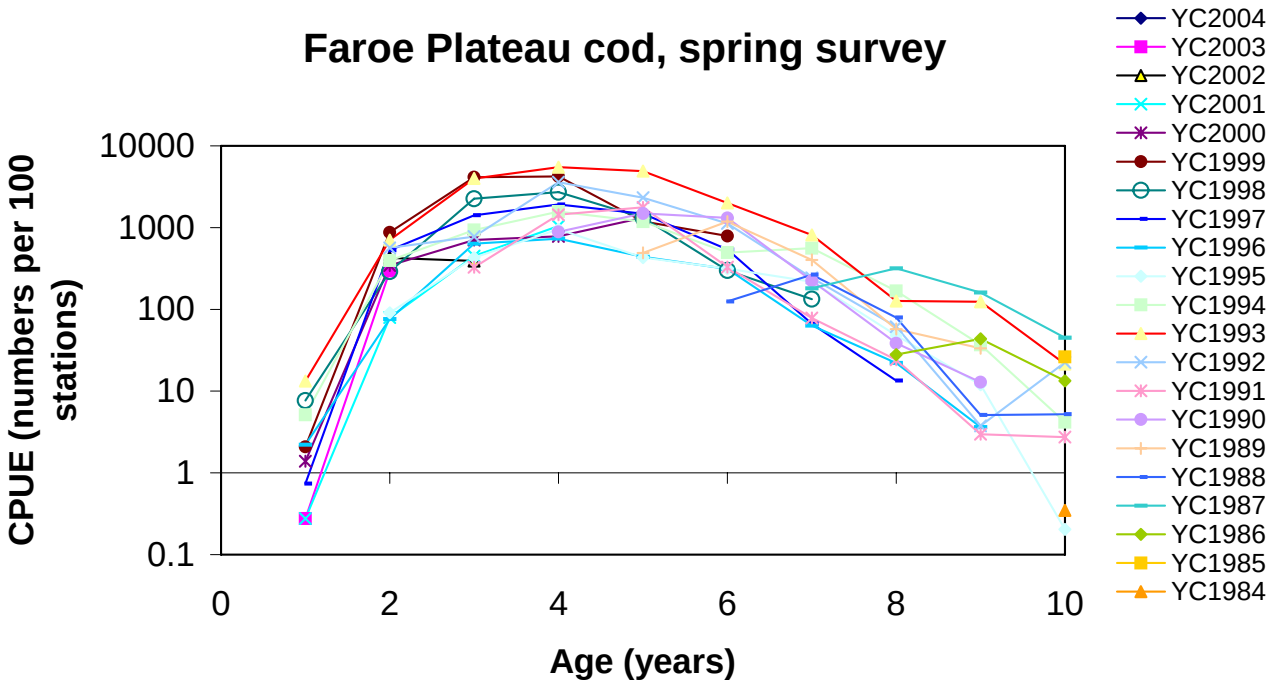


Figure 2.2.6.1. Faroe Plateau (sub-division VB1) COD. Catch curves from the spring groundfish survey.

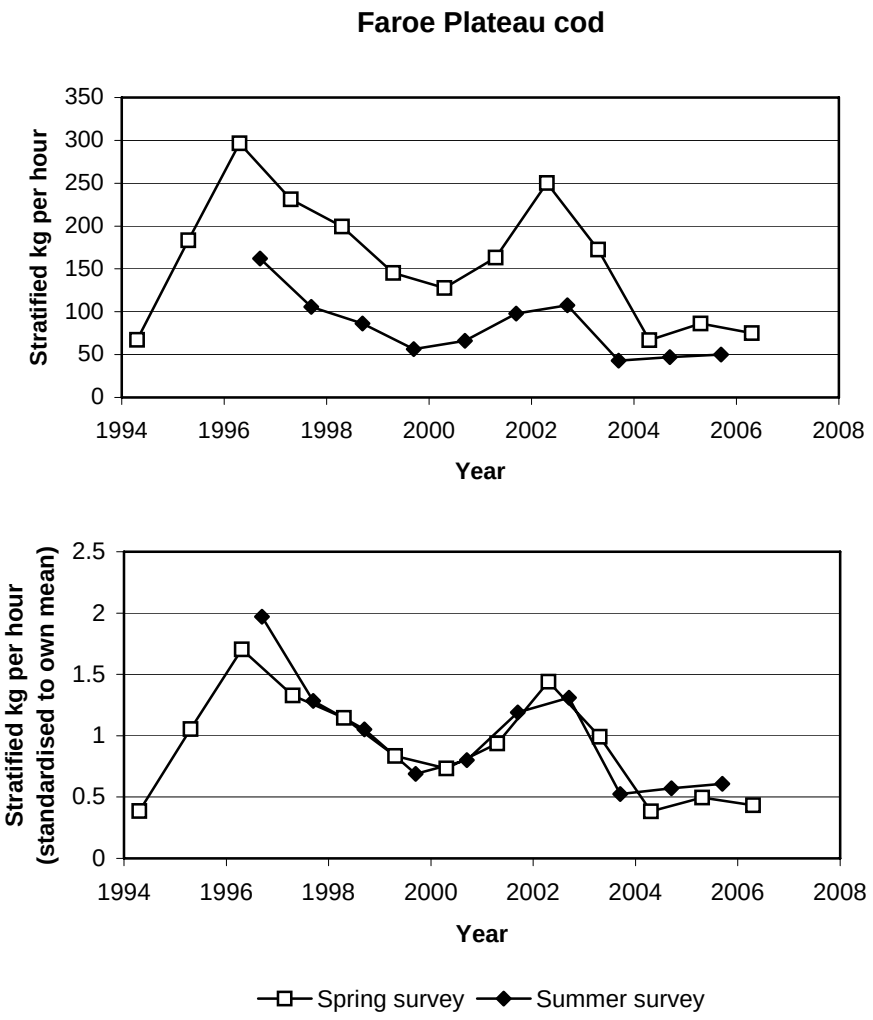


Figure 2.2.6.2. Faroe Plateau (sub-division VB1) COD. Stratified kg/hour in the spring and summer surveys.

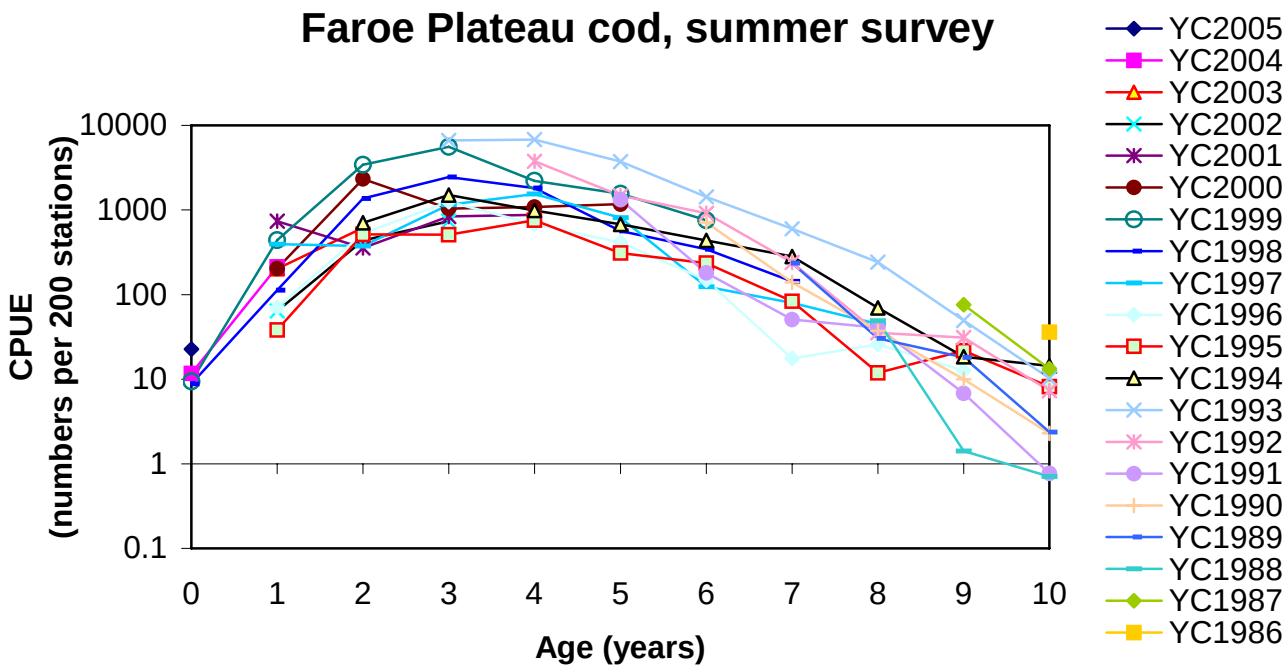


Figure 2.2.6.3. Faroe Plateau (sub-division VB1) COD. Catch curves from the summer groundfish survey.

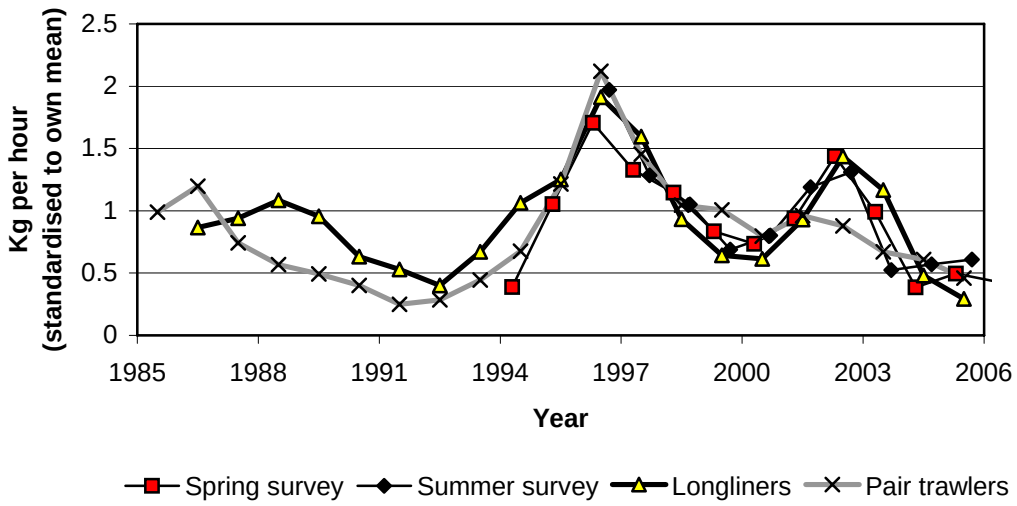


Figure 2.2.7.1.1. Faroe Plateau (sub-division VB1) COD. Standardised catch per unit effort for pair trawlers and longliners. The two surveys are shown as well.

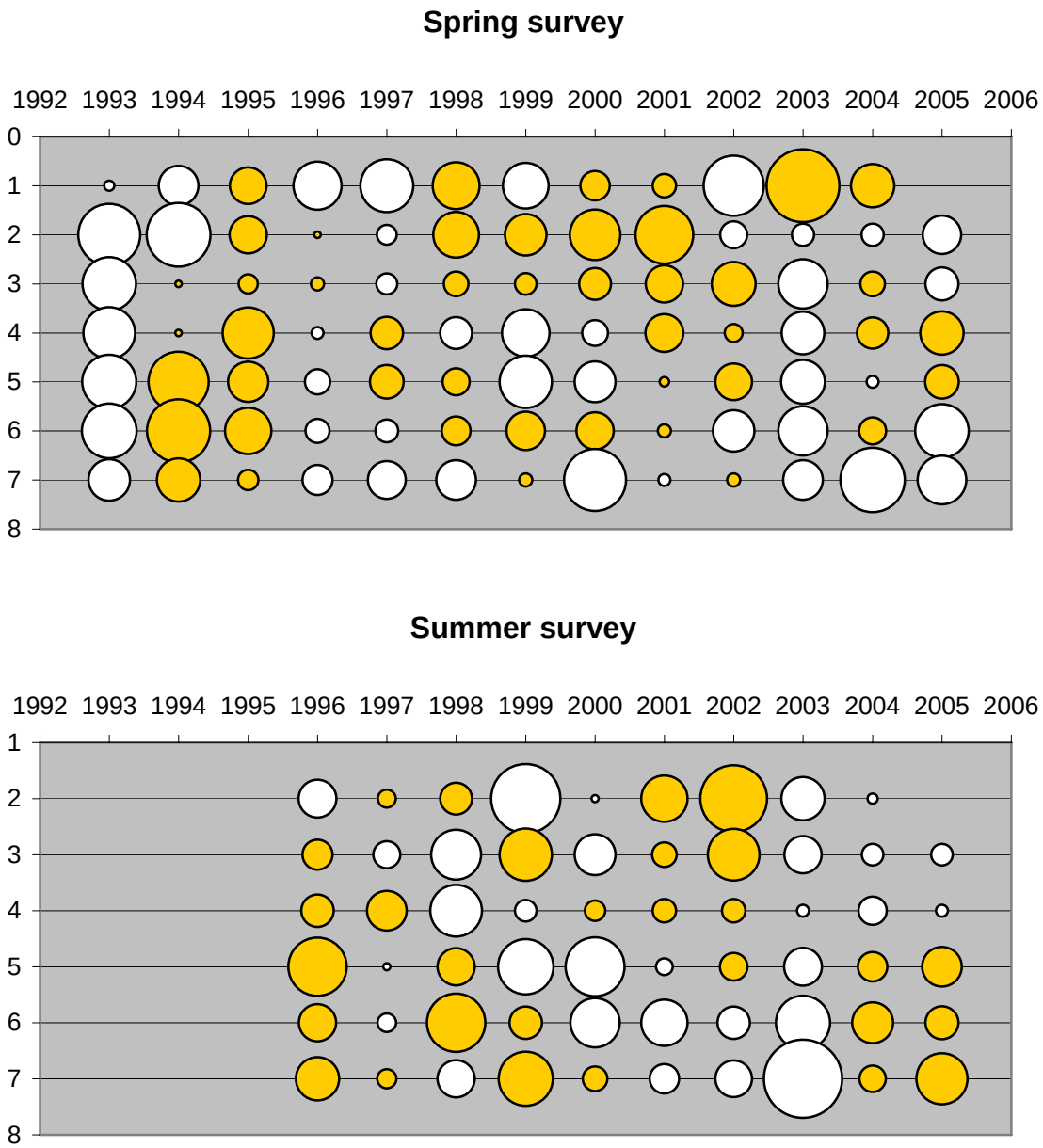


Figure 2.2.7.1.2. Faroe Plateau (sub-division VB1) COD. Log catchability residuals for the spring and summer survey. The residuals for age 8 are not presented because some values were off scale. White bubbles indicate negative residuals.

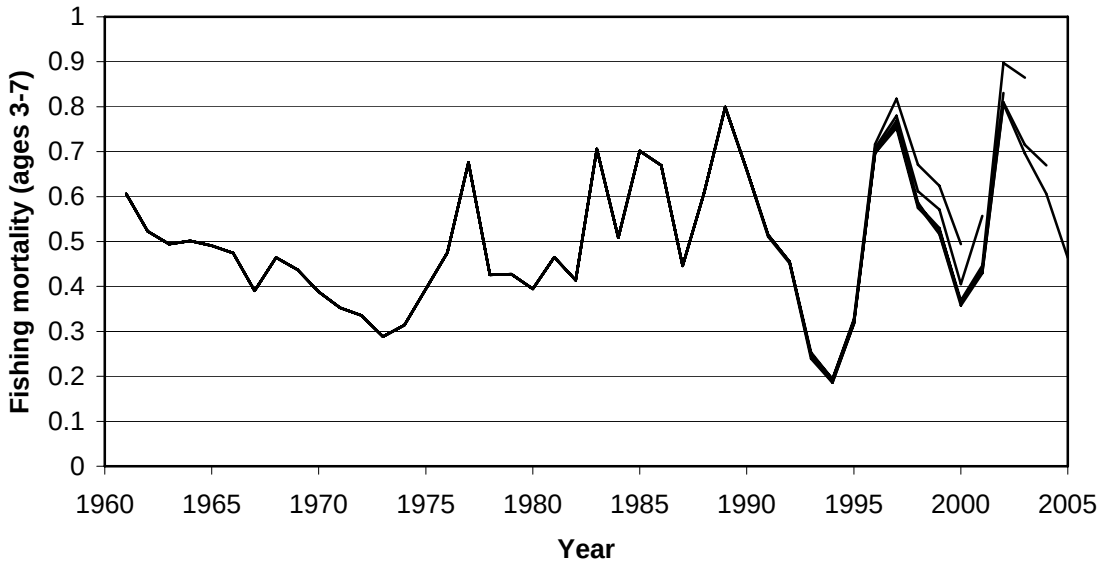
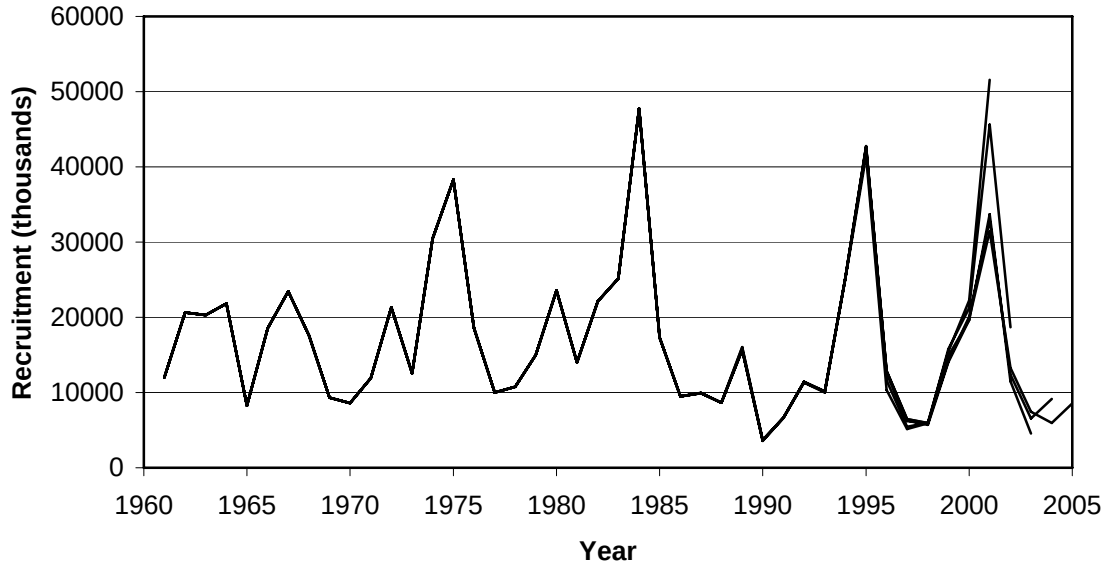


Figure 2.2.7.1.3. Faroe Plateau (sub-division VB1) COD. Results from the XSA retrospective analysis.



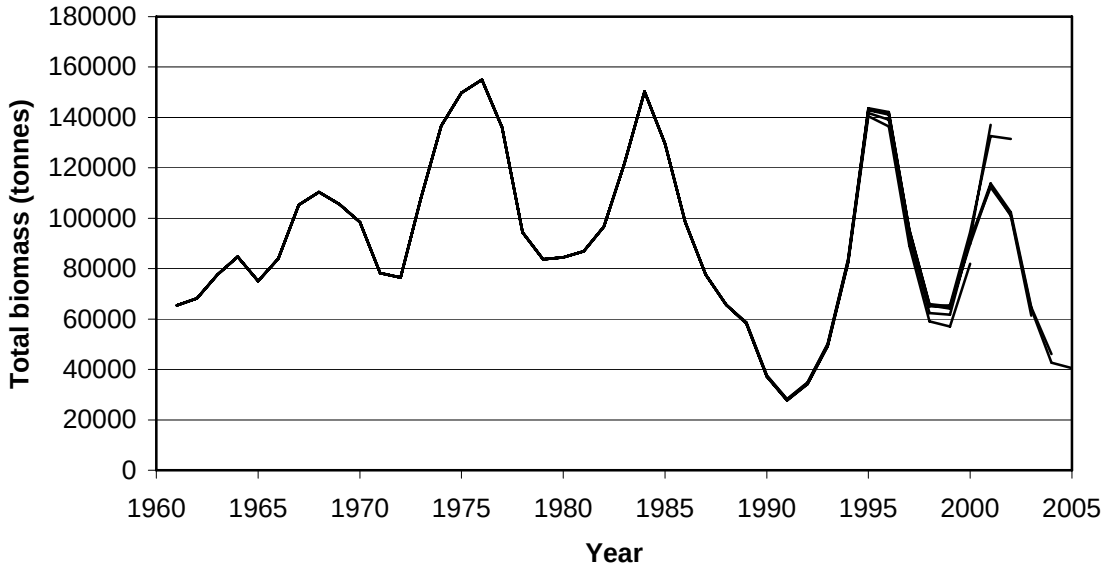


Figure 2.2.7.1.3. Faroe Plateau (sub-division VB1) COD. Results from the XSA retrospective analysis. Continued.

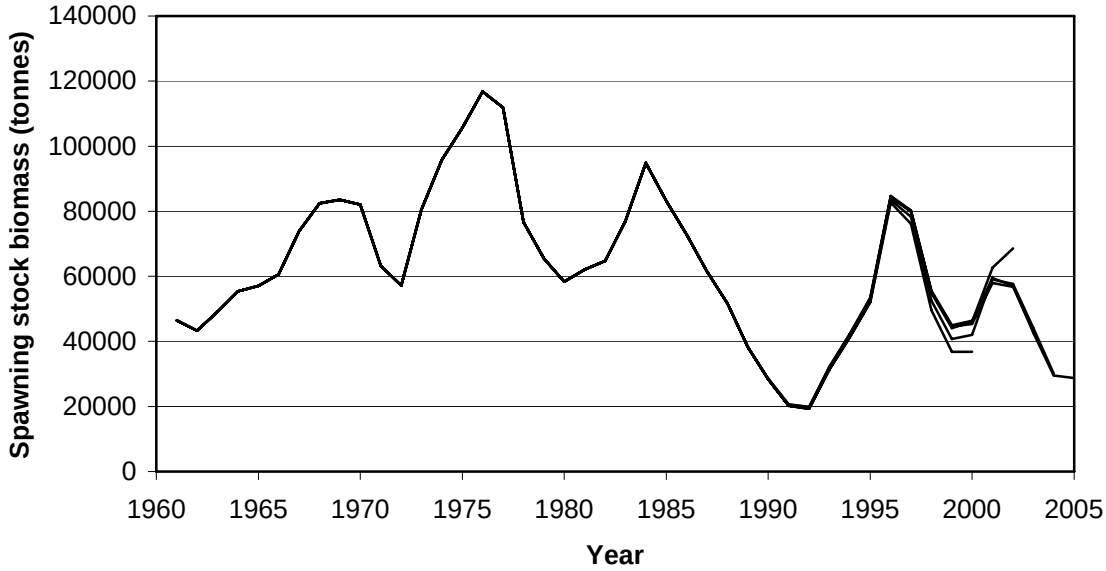


Figure 2.2.7.1.3. Faroe Plateau (sub-division VB1) COD. Results from XSA retrospective analysis. Continued.

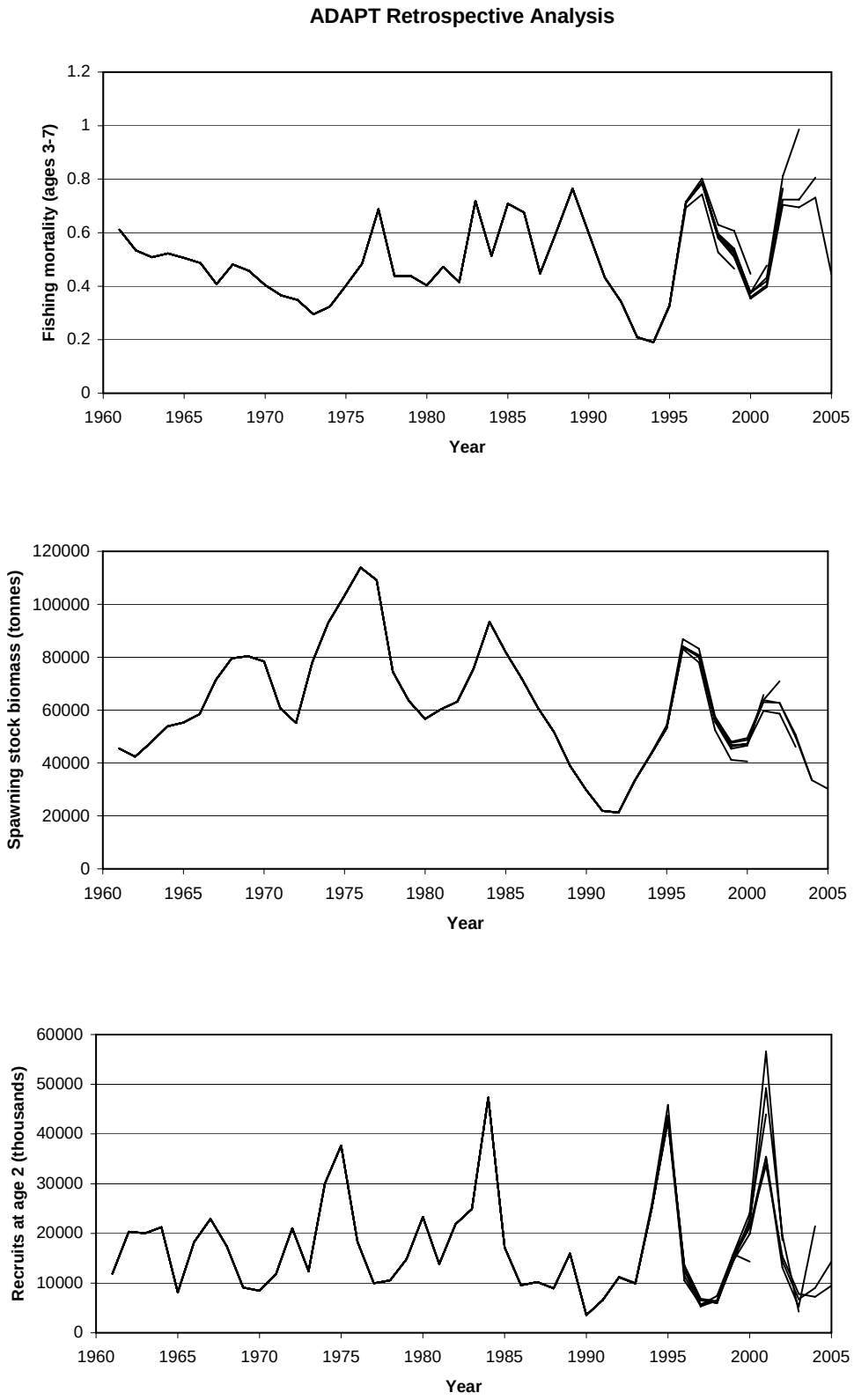


Figure 2.2.7.1.4. Retrospective pattern from the ADAPT calibrated with the summer and the spring surveys ages 2 to 8.

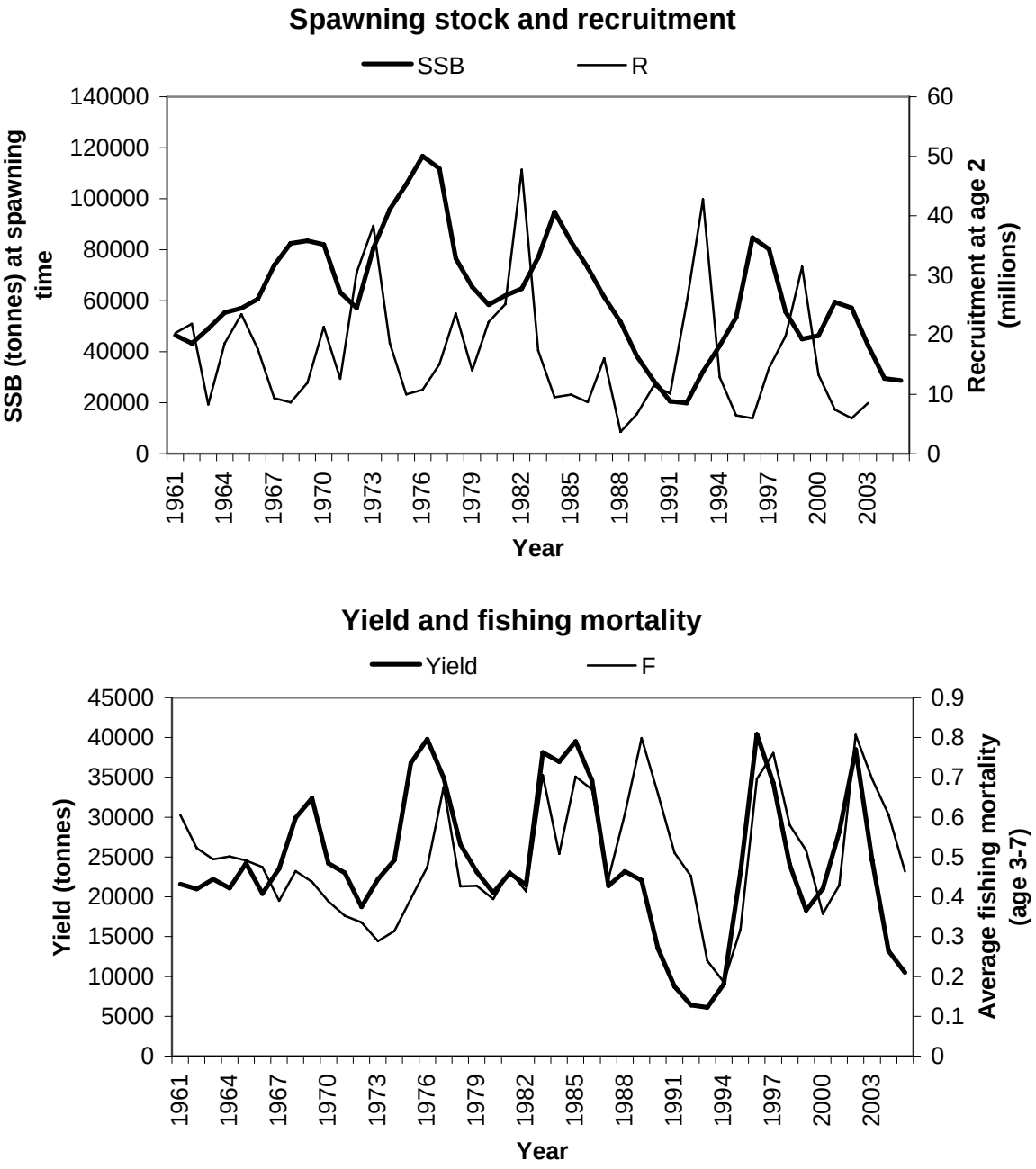


Figure 2.2.7.1.5. Faroe Plateau (sub-division VB1) COD. Yield and fishing versus year. Spawning stock biomass (SSB) and recruitment (year class) versus year.

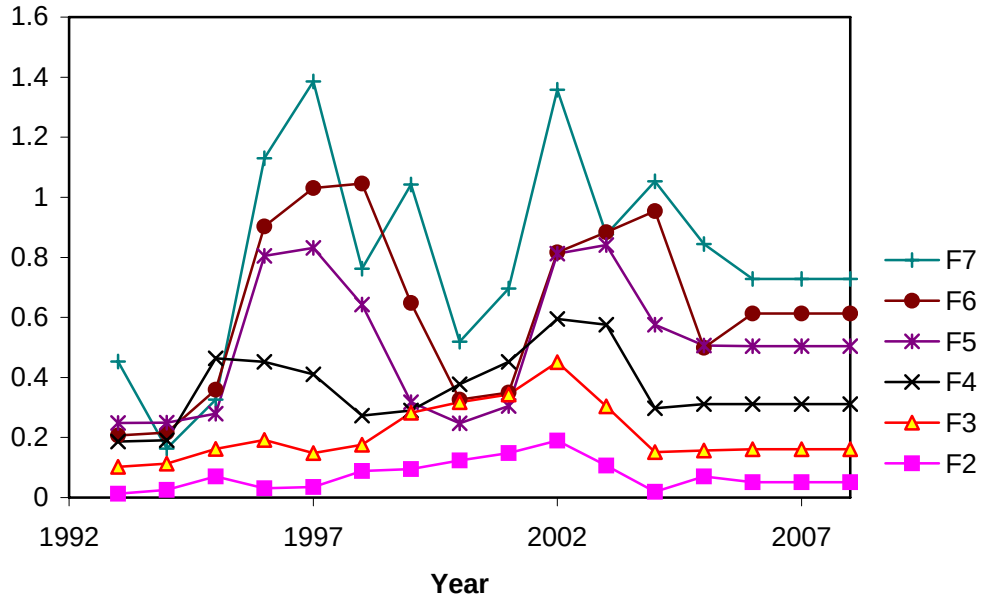


Figure 2.2.7.1.6. Faroe Plateau (sub-division VB1) COD. Fishing mortalities by age. The F-values in 2006-2008 are set to the average values in 2003-2005 rescaled to the 2005 level.

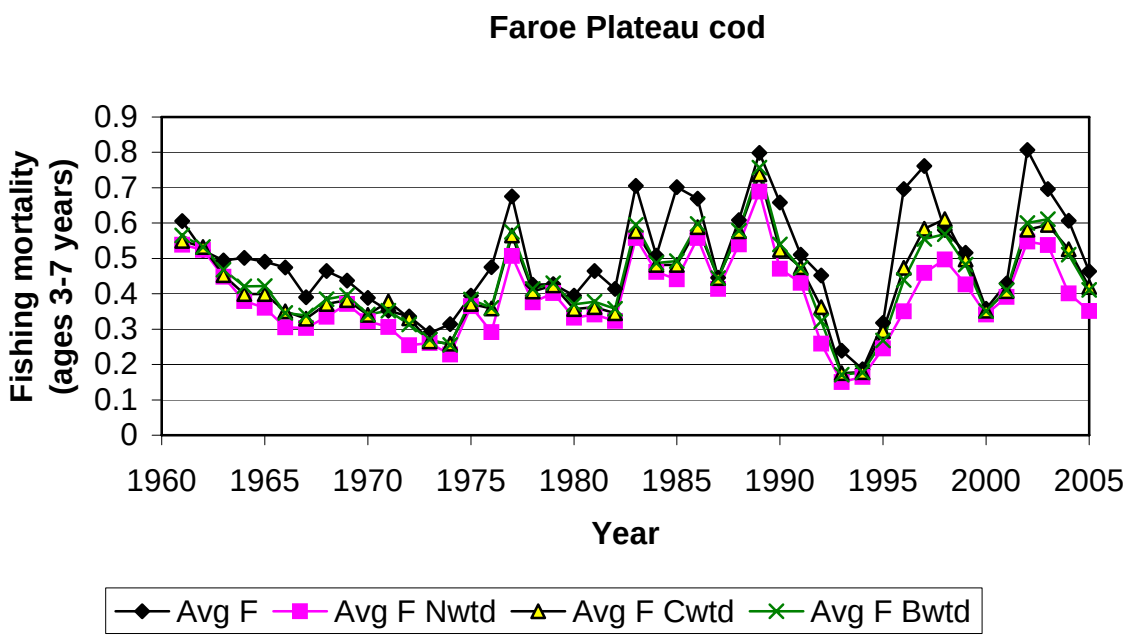


Figure 2.2.7.1.7. Faroe Plateau (sub-division VB1) COD. Different measures of fishing mortality: straight arithmetic average (Avg F), weighted by stock numbers (Nwtd), weighted by stock biomass (Bwtd) or weighted by catch (Cwtd).

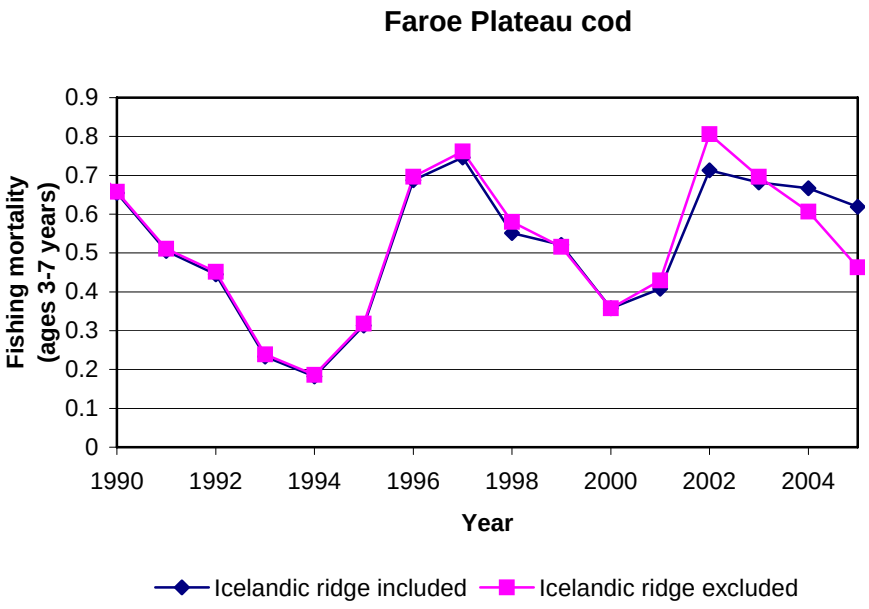


Figure 2.2.7.1.8. Faroe Plateau cod. Fishing mortalities from the XSA runs having the Faroese catches on the Faroe-Icelandic ridge included or excluded.

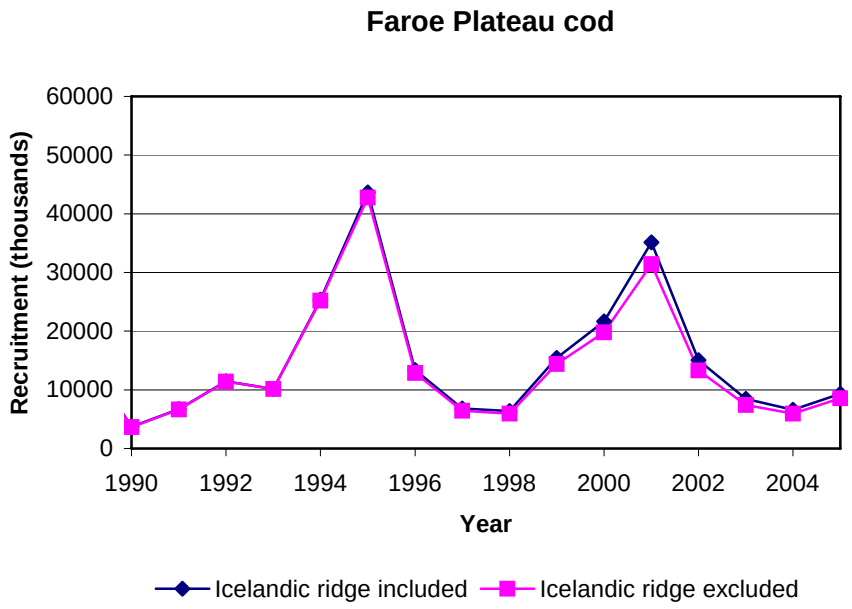


Figure 2.2.7.1.8 (continued). Faroe Plateau cod. Recruitment from the XSA runs having the Faroese catches on the Faroe-Icelandic ridge included or excluded.

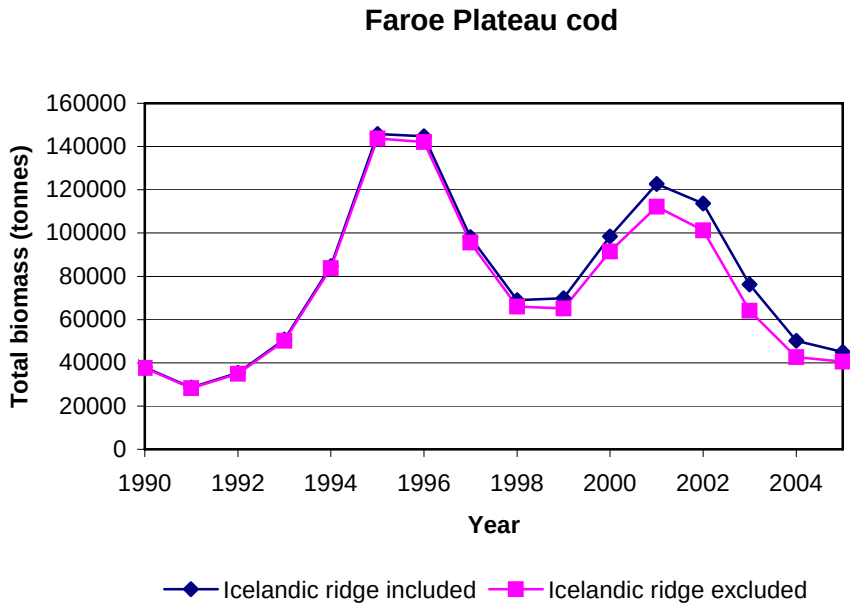


Figure 2.2.7.1.8 (continued). Faroe Plateau cod. Total biomass from the XSA runs having the Faroese catches on the Faroe-Icelandic ridge included or excluded.

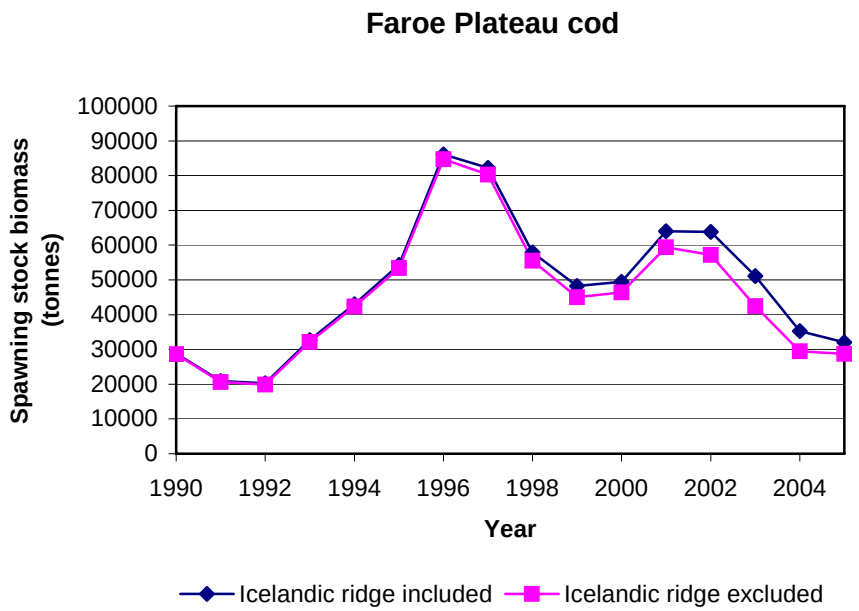


Figure 2.2.7.1.8 (continued). Faroe Plateau cod. Spawning stock biomass from the XSA runs having the Faroese catches on the Faroe-Icelandic ridge included or excluded.

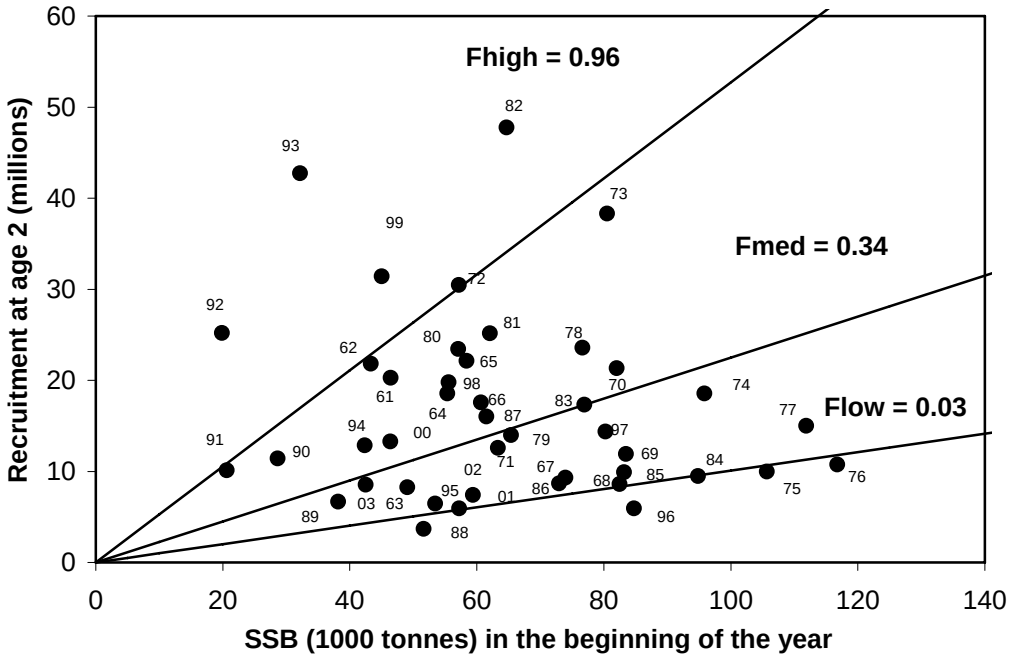


Figure 2.2.7.2.1. Faroe Plateau (sub-division VB1) COD. Spawning stock – recruitment relationship 1961-2002. Years are shown at each data point.

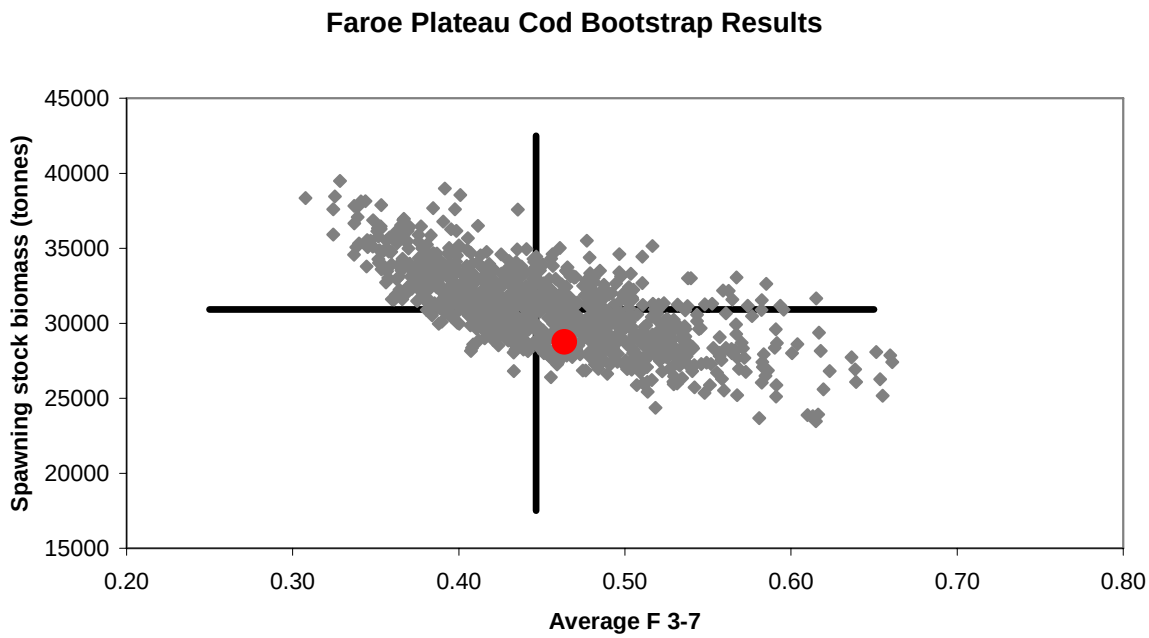


Figure 2.2.7.2.2. F and SSB's for 2004 from a 1000 bootstraps of the ADAPT with the two surveys. The XSA estimate is shown as a red point.

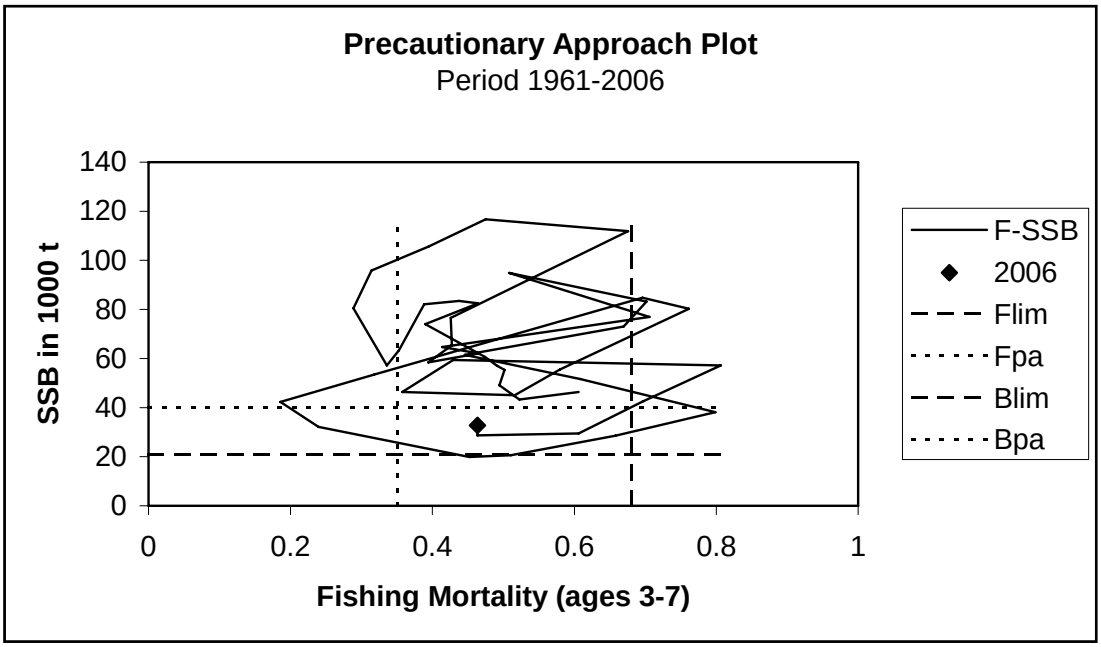
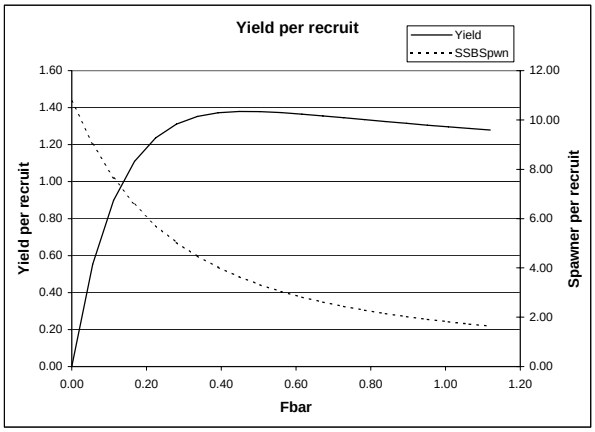
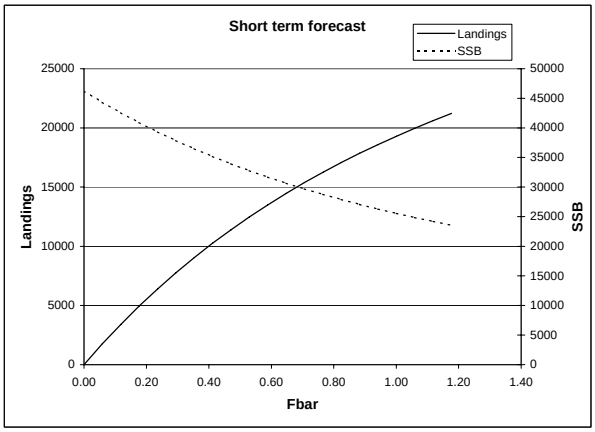


Figure 2.2.8.2.1. Faroe Plateau (sub-division VB1) COD. Spawning stock biomass versus fishing mortality 1961-2006.





MFYPR version 1
Run: YLD1
Time and date: 19:33 28/04/2006

Reference point	F multiplier	Absolute F
Fbar(3-7)	1.0000	0.5598
FMax	0.8359	0.4680
F0.1	0.4604	0.2577
F35%SPR	0.7630	0.4272
Flow	0.0465	0.0260
Fmed	0.6075	0.3401
Fhigh	1.7107	0.9577

Weights in kilograms

MFDP version 1
Run: Spreditction2
Index file 28/4-2006
Time and date: 18:48 28/04/2006
Fbar age range: 3-7

Input units are thousands and kg - output in tonnes

Figure 2.2.8.4.1. Faroe Plateau (subdivision VB1) COD. Yield per recruit and spawning stock biomass (SSB) per recruit versus fishing mortality (left figure). Landings and SSB versus Fbar (3-7).

2.3 Faroe Bank Cod

Answers to terms of reference for the working group will be marked with square brackets.

Terms of reference which apply to the Faroe Bank Cod are:

b) assess the status of and provide effort options and expected corresponding catches for 2006 for cod, haddock, and saithe in Division Vb as these stocks are under effort control

(2) comment on the outcome of existing management measures including technical measures, TACs, effort control and management plans

(4) update the description of fisheries exploiting the stocks, including major regulatory changes and their potential effects. The description of the fisheries should include an enumeration of the number, capacity and effort of vessels prosecuting the fishery by country

(7) provide on a national basis an overview of the sampling of the basic assessment data for the stocks considered

(8) provide specific information on possible deficiencies in the 2006 assessments including, at least, any major inadequacies in the data on landings, effort or discards; any major inadequacies in research vessel surveys data, and any major difficulties in model formulation; including inadequacies in available software. The consequences of these deficiencies for both the assessment of the status of the stocks and the projection should be clarified.

2.3.1 Trends in landings and effort

[ToR 4] Total nominal catches of the Faroe Bank cod from 1986 to 2005 as officially reported to ICES are given in Table 2.3.1.1 and since 1965 in Figure 2.3.1.1. British catches reported to be taken on the Faroe Bank are all assumed to be taken on the Faroe Plateau and are therefore not used in the assessment. Landings have been highly irregular from 1965 to the mid 1980s, reflecting the opportunistic nature of the cod fishery on the Bank, with peak landings slightly exceeding 5 000t in 1973. The trend of landings has been smoother since 1987, declining from about 3 500t in 1987 to only 330 t in 1992 before increasing to 3 600t in 1997. In 2005 landings were estimated at 1 000t about 2 400 t less than in 2004 (Figure 2.3.1.1). Longline fishing effort increased substantially in 2003 and although it decreased in 2004 and 2005 the latter remains the second highest fishing effort observed since 1988 (Figure 2.3.1.1).

[ToR 8] There may be problems with the catch figures for Faroe Bank. The vessels may fish on both Faroe Plateau and Faroe Bank during the same trip. The catches of cod on Faroe Bank are sometimes reported on the landing slips and vessels larger than 15 GRT are obliged to have logbooks. The Faroes Coastal Guard is splitting the landings into Vb1 and Vb2 on the basis of landing slips and logbooks. Since small boats do not fill out logbooks and may not sell the catch, the catch figures on the Faroe Bank are actually estimates rather than absolute figures. The error in the catches of Faroe Bank cod may be in the order of some hundred tonnes, not thousand tonnes.

In 1990, the decreasing trend in cod landings from Faroe Bank lead ACFM to advise the

Faroese authorities to close the bank to all fishing. This advice was followed for depths shallower than 200 meters. In 1992 and 1993 longliners and jiggers were allowed to participate in an experimental fishery inside the 200 meters depth contour. For the quota year 1 September 1995 to 31 August 1996 a fixed quota of 1 050 t was set. The new management regime with fishing days was introduced on 1 June 1996 allowing longliners and jiggers to fish inside the 200 m contour. The trawlers are allowed to fish outside the 200 m contour.

[ToR 4] For the fishing year 1 Sep 2004 to 31 Aug 2005 the number of allocated fishing days has been reduced by 10%. However the reduction did not materialise in a decrease of realised fishing days. In 2005 the authorities have introduced a total fishing ban during the spawning period, i.e. 1 March to 1 May.

2.3.2 Stock assessment

[ToR 7] Biological samples have been taken from commercial landings since 1974 (the 2005 sampling intensity is shown in the text table below) and from the groundfish survey since 1983).

In 2000, an attempt was made to assess the stock using XSA with catch at age for 1992-1999, using the spring groundfish survey as a tuning series (1995-1999) but the WG and ACFM concluded that it could only be taken as indicative due to scarce catch-at-age data. No attempt was made to update the XSA in subsequent years given the poor sampling for age composition particularly for trawl landings.

Fleet	Size	Samples	Length	Otoliths	Weights
Longliners	>100 GRT	18	3,877	478	1,460
Pair trawlers	>1000 HP	2	351	0	0
Total		20	4,228	478	1,460

Table 2.3.2.1. Samples of lengths, otoliths, and individual weights of Faroe Bank cod in 2005

[ToR 7] The Faroese groundfish surveys (spring and summer) cover the Faroe Bank and cod is mainly taken within the 200 m depth contour. The catches of cod per trawl hour in depths shallower than 200 meter are shown in Figure 2.3.2.1.

The spring survey was initiated in 1983 and discontinued in 2003 and 2005. The summer survey has been carried out since 1996. The CPUE of the spring survey was low during 1988 to 1995 varying between 73 and 95 kg per tow. Although noisy, the survey suggests higher, possibly increasing biomass during 1995 - 2003. The 2006 index is 63 kg per tow, which is the lowest since 1994 and very similar to the 2005 summer index (62 kg per tow). The agreement between the summer and spring index is good during 1996 to 2001, but they diverged in 2002 and 2003.

The figure of length distributions (figure 2.3.2.2 and figure 2.3.2.3) show in general good recruitment of 1 year old in the summer survey from 2000 – 2002 (lengths 26 – 45 cm), corresponding to good recruitment of 2 years old in the spring surveys from 2001 to 2003 (40 – 60 cm). The spring index shows poor recruitment in 2006 reflecting the weak year classes observed in the summer survey since 2004.

The recruitment can be estimated by simply counting the number of fish in length groups in the surveys. In the spring index, recruitment was estimated as total number of fish below 60 cm (2-year old) and in the summer index as number of fish below 45 cm (1-year old). Figure 2.3.2.4 shows a fairly good correlation between spring and summer survey recruitment. According to the summer index the recruitment of 1 year old has been good from 2000 to 2002, while the recruitment has been relatively poor from 2003 to 2005.

Figure 2.3.2.5 shows a positive correlation between the survey indices and the landings in the same year, but the relationship between the summer survey and the landings deteriorates in 2003. The ratio of landings to the survey indices provides an exploitation ratio, which can be used as a proxy to relative changes in fishing mortality. For the summer survey, the results suggest that fishing mortality has been reasonably stable during 1996 to 2002, but that it increased steeply in 2003, consistent with the 160% increase in longline fishing days in that year (Figure 2.3.2.5). The exploitation ratio decreased in 2005 but it remains higher than average.

2.3.2.1 Comment on the assessment

An XSA was attempted in the 2000 assessment but not since. The NWWG concludes that the poor sampling for age composition, particularly for the trawler landings whose catch is not separated into Faroe Bank or Faroe Plateau during the same trips. Therefore, XSA is not considered useful until reliable coverage of the total catch at age can be obtained.

2.3.3 Reference points

There are not analytical basis to suggest reference points based on XSA or an accepted general production analysis.

2.3.4 Management considerations

The landing estimates are uncertain because since 1996 vessels are allowed to fish both on the Plateau and on Faroe Bank during the same trip, rendering landings from both areas uncertain. Given the relative size of the two fisheries, this is a bigger problem for Faroe Bank cod than for Faroe Plateau cod, but the magnitude remains unquantified for both. The ability to provide advice depends on the reliability of input data. If the cod landings from Faroe Bank are not known, it is difficult to provide advice on landings. If the fishery management agency intends to manage the two fisheries to protect the productive capacity of each individual unit, then it is necessary to regulate the catch removed from each stock. Simple measures should make it possible to identify if the catch is originating from the Bank or from the Plateau e.g. by storing in different section of the hold.

[Tor 2] The effort has been extremely high in 2003 and is still fairly high in 2005 (Fig. 2.3.1.1). An exploitation ratio can be calculated via the catches and cpue from the surveys. The very high effort since 2003, results in extremely high exploitation ratios. Even though there might be uncertainties due too poor data from the surveys, there is no doubt, that the exploitation rate is very high and may not be sustainable.

[ToR b] The recruitment of the 2001 years class seems to be good, while there are indications of bad recruitment of the 2002 to 2004 year classes.

2.3.5 Annex

Stock definition

The Faroe Bank cod is distributed in the Bank South-West of the Faroe Islands (60º15’ S, 61º30’ N, 9º 40’W, 7º40’ E). Inside the 200 m depth contour, the Faroe Bank covers an area of about 45 × 90 km and its shallowest part is less than 100 m deep. The cod stock on the Bank is regarded as an independent stock displaying a higher growth rate than that of cod in the Plateau. Tagging experiments show that exchanges between the two cod stocks are negligible. The stock spawns from March to May with the main spawning in the first-half of April in the shallow waters of the Bank (<200 m). The eggs and larvae are kept on the Bank by an anti-cyclonic circulation. The juveniles descend to the bottom of the Bank proper in July. No distinct nursery areas have been found on the Bank. It is anticipated that the juveniles are widely distributed on the Bank, finding shelter in areas difficult to access by fishing gear (Jákupsstovu, 1999).

References

Jákupsstovu, 1999. The Fisheries in Faroese waters. Fleets, Activities, distribution and potential conflicts of interest with an off-shore oil industry.

Table 2.3.1.1. Faroe Bank (sub-division Vb2) cod. Nominal catches (tonnes) by countries 1986-2005 as officially reported to ICES. From 1992 the catches by Faroe Islands and Norway are used in the assessment.

	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
Faroe Islands	1836	3409	2960	1270	289	297	122	264	717	561
Norway	6	23	94	128	72	38	32	2	8	40
UK (E/W/NI)	-	-	-	-	-	-	+	1	1	- [2]
UK (Scotland)	[1] 63	47	37	14	205	90	176	118	227	551 [3]
United Kingdom										
Total	1905	3479	3091	1412	566	425	330	385	953	1152
Used in assessment					289	297	154	266	725	601

	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005 *
Faroe Islands	2051	3459	3092	1001		1094	1840	5957	3607	1106
Norway	55	135	147	88	49	51	25	72	18	37 *
UK (E/W/NI)	- [2]	- [2]	- [2]	-	-	-	-	-	-	
UK (Scotland)	382	277	265	210	245	288	218	254	-	
United Kingdom				-	-	-	-	-	259 [3]	329 [3]
Total	2488	3871	3504	1299	294	1433	2083	6283	3884	1472
Correction of Faroese catches in Vb2						-65	-109	-353	-214	-66
Used in assessment	2106	3594	3239	1089	1194	1080	1756	5676	3411	1077

***) Preliminary**

1) Includes Vb1

2) Included in Vb1

3) Reported as Vb

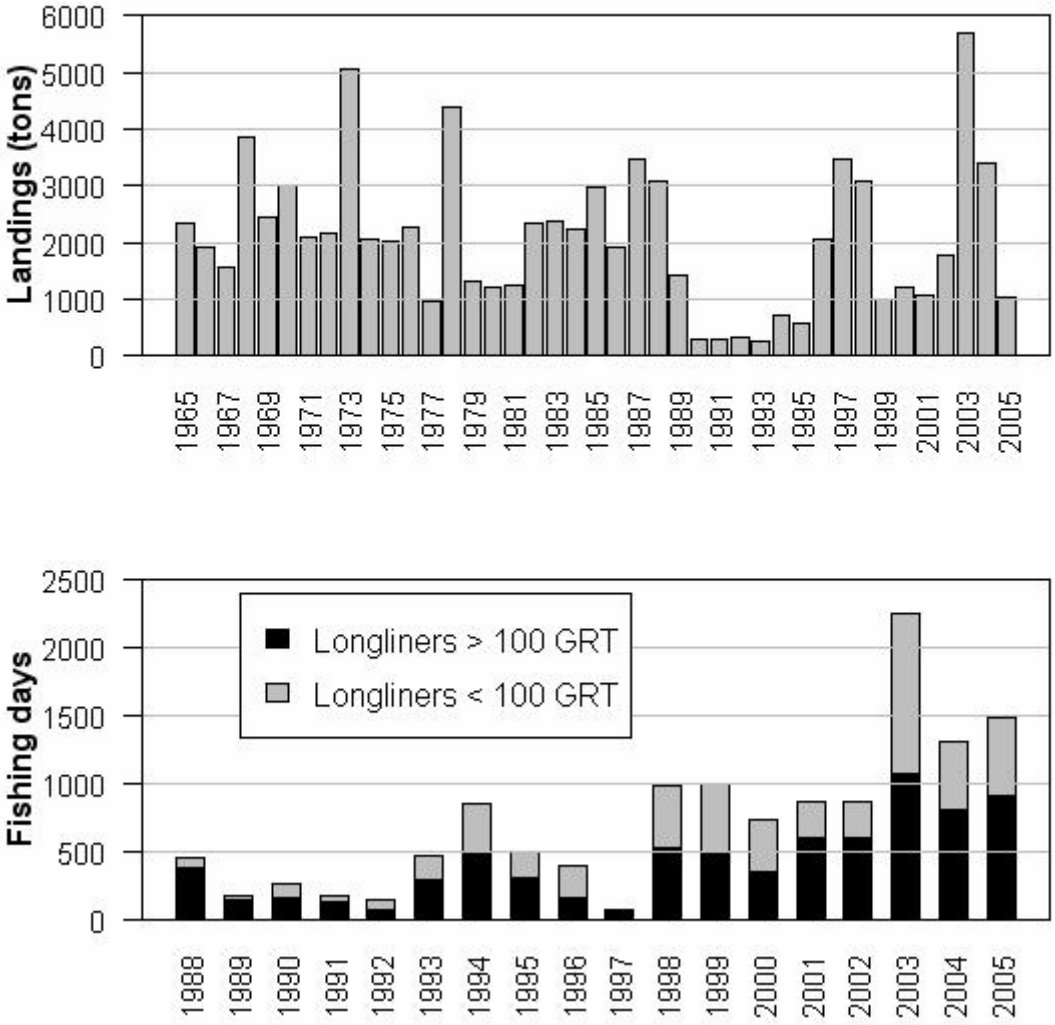


Figure 2.3.1.1. Faroe Bank (sub-division Vb2) cod. Reported landings 1965-2005. Since 1992 only catches from Faroese and Norwegian vessels are considered to be taken on Faroe Bank. Lower plot: fishing days 1988-2005 for long line gear type in the Faroe Bank (exerted).

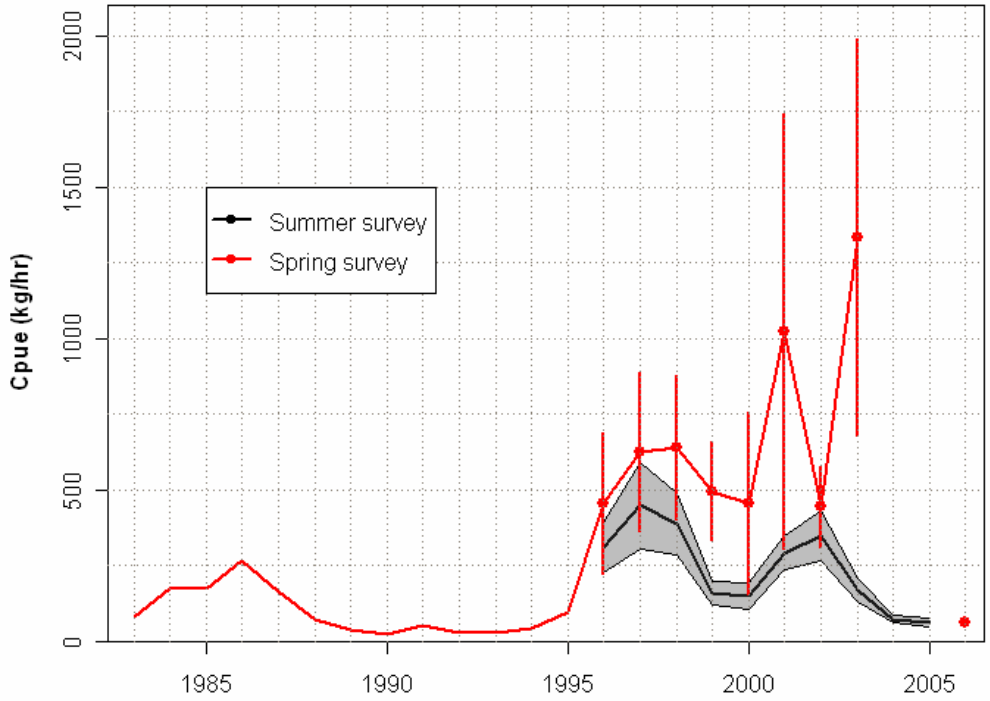


Figure 2.3.2.1. Faroe Bank (sub-division Vb2) cod. Catch per unit of effort in the spring groundfish survey and summer survey. Vertical bars and shaded areas show the standard error in the estimation of indexes.

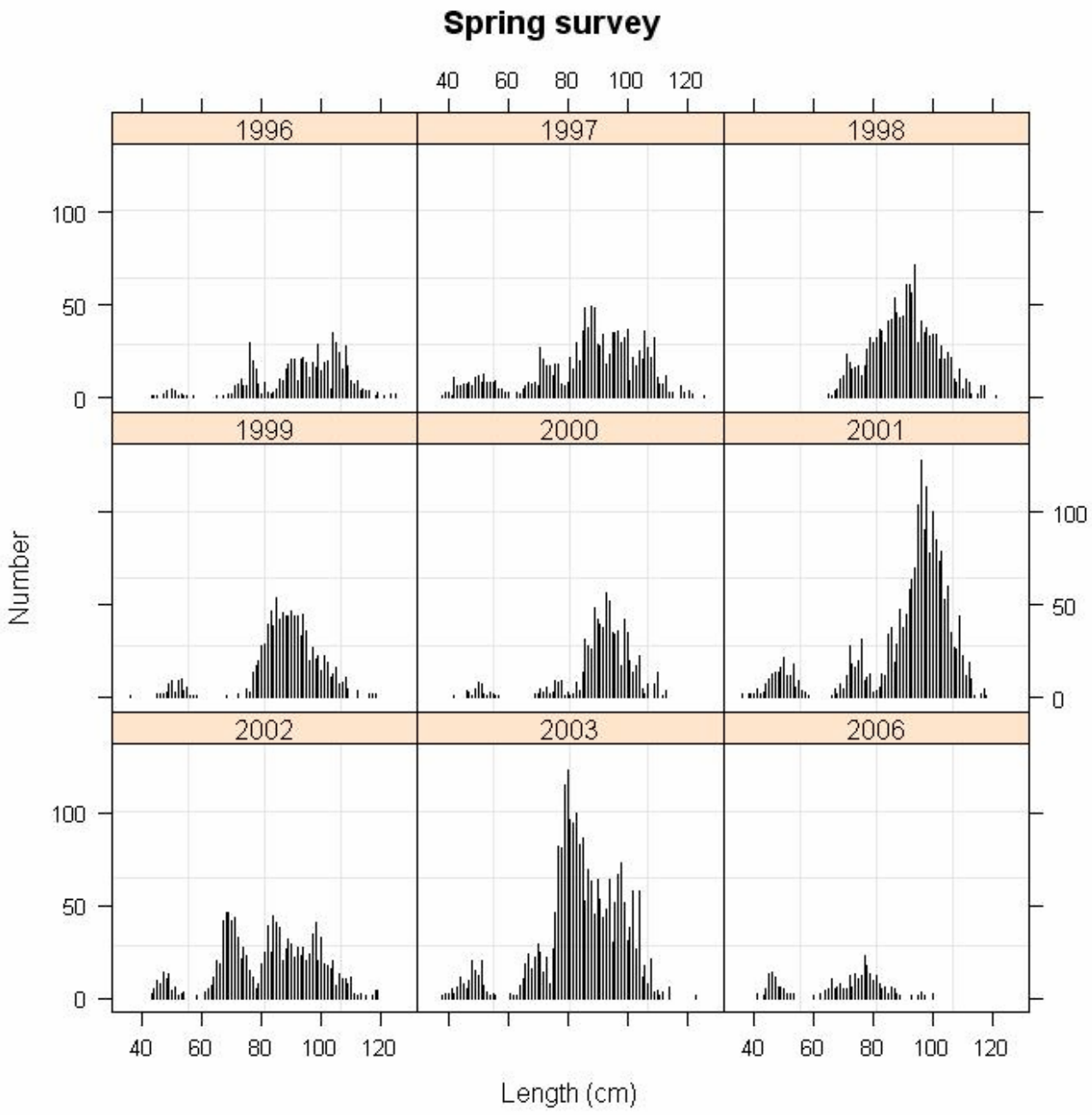


Figure 2.3.2.2. Faroe Bank (sub-division Vb2) cod. Length distributions in the spring survey.

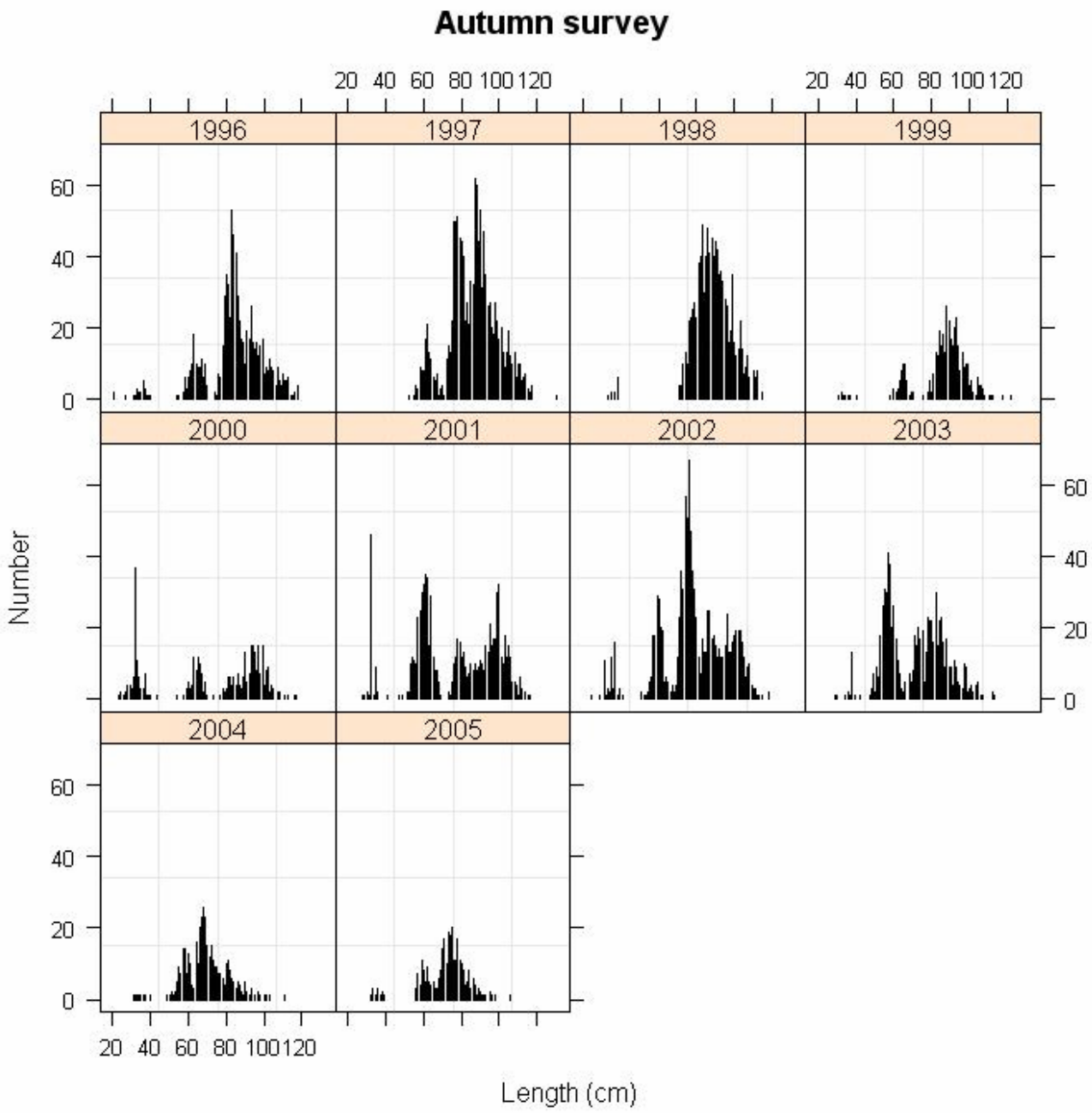


Figure 2.3.2.3. Faroe Bank (sub-division Vb2) cod. Length distributions in the summer survey.

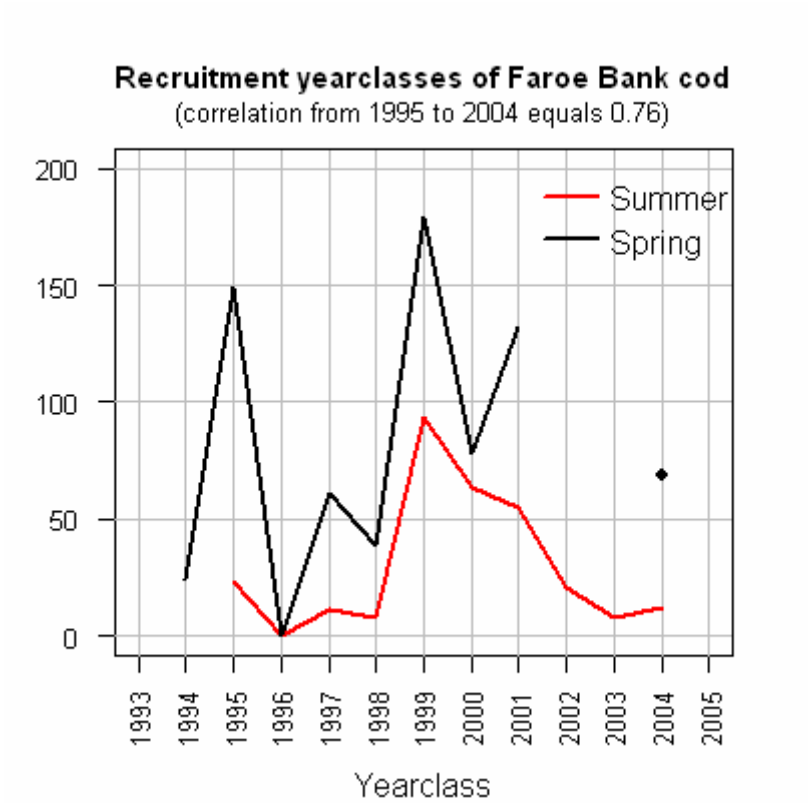


Figure 2.3.2.4. Estimated recruitment from surveys. In summer surveys the 1 year old recruitment is estimated. In spring surveys the recruitment of 2 year old is estimated.

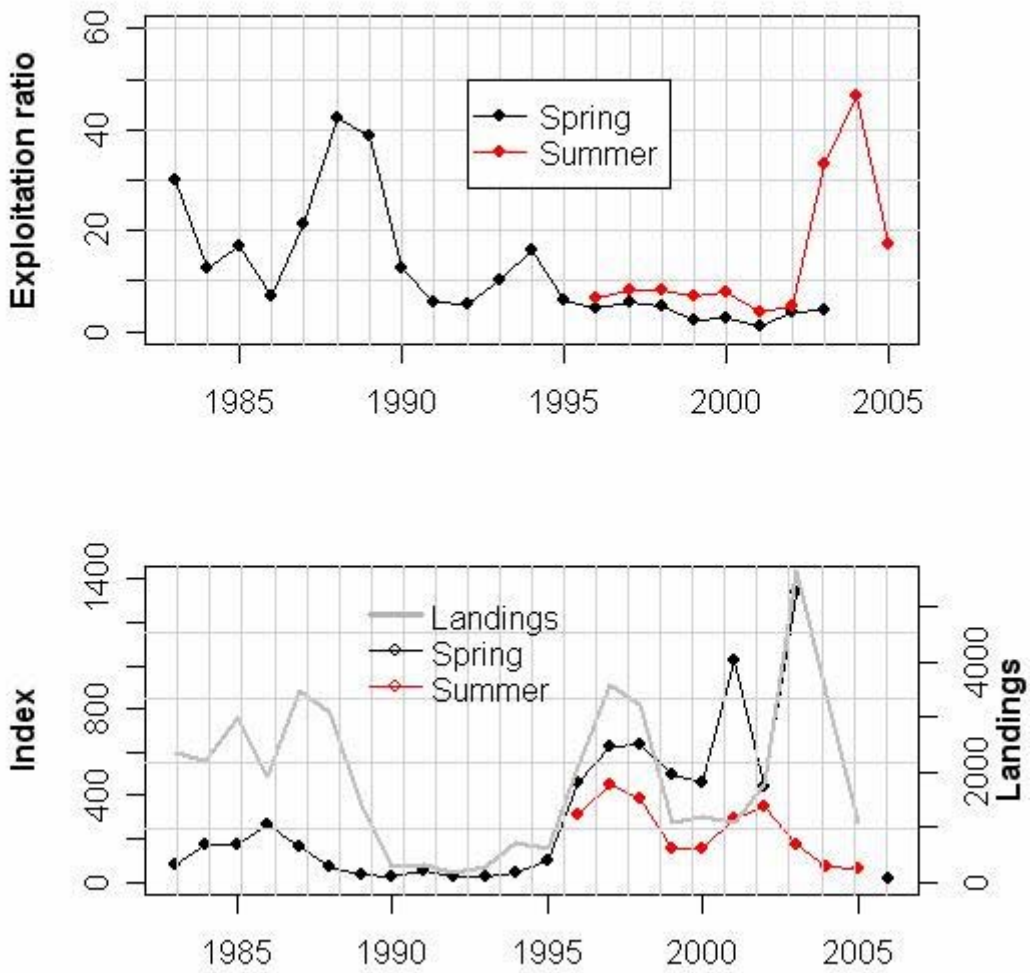


Figure 2.3.2.5. Faroe Bank (Sub-division Vb2) cod. Exploitation ratio (ratio of landings to survey interpreted as an index of exploitation rate). Lower plot: Landings and cpue (kg/hr) in spring and summer survey.

2.4 Faroe Haddock

2.4.1 Introduction

Haddock in Faroese Waters, i.e. ICES Sub-Divisions Vb1 and Vb2 and in the southern part of ICES Division IIa, close to the border of Sub-Division Vb1, are generally believed to belong to the same stock and are treated as one management unit named Faroe haddock. Haddock is distributed all over the Faroe Plateau and the Faroe Bank from shallow water down to more than 450 m. Spawning takes place from late March to the beginning of May with a peak in the middle of April and occurs in several areas on the Faroe Plateau and on the Faroe Bank. Haddock does not form as dense spawning aggregations as cod and saithe, nor does it perform ordinary spawning migrations. After spawning, eggs and fry are pelagic for about 4 months over the Plateau and Bank and settling starts in August. This is a prolonged process and pelagic juveniles can be found at least until September. Also during the first years of life they can be pelagic and this vertical distribution seems to be connected to year class strength, with some individuals from large year classes staying pelagic for a longer time period. No special nursery areas can be found, because young haddock are distributed all over the Plateau and Bank. After settling the haddock is regarded very stationary as seen in tagging experiments. Different growth in different parts of the distribution area as well as a large degree of heterogeneity in genetic investigations support this. Figures 2.1.9-2.4.10 show the age-aggregated distribution by year as seen in the two regular groundfish surveys in the area.

2.4.2 Trends in landings and fisheries

Nominal landings of Faroe haddock have in recent years increased very rapidly from only 4 000 t in 1993 to almost 27 000 t in 2003; they have declined somewhat since and amounted in 2005 to about 20 000t but are still wel above average. Most of the landings are taken from the Faroe Plateau; the landings from the Faroe Bank (Sub-Division Vb2) in 2005 were about 2 000 t (Tables 2.4.1 and 2.4.2). As can be seen from Figure 2.4.1, landings in 2002-2004 reached historical highs. The cumulative landings by month (Figure 2.4.2) suggest that landings in 2006 are expected to stay at the 2005 level.

Faroese vessels have taken almost the entire catch in recent years (Figure 2.4.1). Table 2.4.3 shows the Faroese landings since 1985 and the proportion taken by each fleet category. The longliners have been taken most of the catches in recent years followed by the pair trawlers.

The 2005 monthly Faroese landings of haddock by fleet category from Subdivisions Vb1 and Vb2, are shown in Figure 2.4.3. As usual, the landings from the Plateau were high in the first month of the year until the end of the spawning time in April/May, stayed low during the summer and increased again in late autumn. On the Faroe Bank, the monthly landings in 2005 were relatively low in the first months of the year, reflecting a closure of the Bank during the spawning time (1 March – 1 May), was in general high during summer and again in Nov-Dec.

2.4.3 Catch-at-age

For the Faroese landings, catch-at-age data were provided for fish taken from the Faroe Plateau and the Faroe Bank. The sampling intensity in 2005, which has decreased somewhat as compared to 2004 (except for weight measurements which have increased considerably), is shown in the table below.

	OPEN BOATS	LLINERS <100GRT	LLINERS <100GRT	OB TRAWL <400HP	OB TRAWL >400HP	PAIRTRAWL <1000HP	PAIRTRAWL >1000HP	TOTAL
No. of samples	11	61	76	1	22	10	37	218
No. of length measurements	2223	13911	16112	262	4540	2535	8395	47978
No. of age measurements	180	1440	1798	0	420	180	840	4858
No. of weighted fish	1025	9008	10470	0	3249	347	840	24939

As has been the practise in the past, samples from each fleet category were disaggregated by season and then raised by the catch proportions to give the 2005 catch-at-age in numbers for each fleet (Table 2.4.4). Catches of some minor fleets have been included under the "Others" heading. No catch-at-age data were available from other nations fishing in Faroese waters. Therefore, catches by UK and France trawlers were assumed to have the same age composition as Faroese otter board trawlers larger than 1 000 HP. The Norwegian longliners were assumed to have the same age distribution as the Faroese longliners greater than 100 GRT. The most recent data were revised according to the final catch figures. In addition, catch figures for age 1 have been added to the c@age matrix as well as some missing values for the 10+ group in earlier years, and the whole c@age series were extended back to 1957 included. No attempts were made in order to adjust total landings by adding these data for age 1 and 10+ because based on old/earlier ICES reports this never was made when the values were omitted originally. The SOP check was marginally improved by this procedure. The resulting total catch-at-age in numbers is given in Tables 2.4.4 and 2.4.5, and in Figure 2.4.4 the LN (catch-at-age in numbers) is shown for the whole period of analytical assessments.

In general the catch-at-age matrix in recent years appears consistent, except for the behaviour of a few small year classes, both in numbers and mean weights at age. Also there are some problems with what ages should be included in the plus group; there are some periods where only a few fishes are older than 9 years, and other period with a quite substantial plus group (10+). These problems have been addressed in former reports of this WG and will not be further dealt with here. No estimates of discards of haddock are available. However, since almost no quotas are used in the management of this stock, the incitement to discard in order to high grade the catches should be low. Moreover there is a ban on discarding. The landings statistics is therefore regarded as being adequate for assessment purposes.

2.4.4 Weight-at-age

Mean weight-at-age data are provided for the Faroese fishery (Table 2.4.6). Compared to last years report, values for age 1 and age 10+ have been added as explained in section 2.4.3. Figure 2.4.5 shows the mean weights-at-age in the landings for age groups 2-7 since 1976. During the period, weights have shown cyclical changes, and have decreased during the most recent 3-4 years except for age 2 and 3 to very low values in 2005.

The mean weight at age in the stock are assumed equal to those in the landings.

2.4.5 Maturity-at-age

Maturity-at-age data is available from the Faroese Spring Groundfish Surveys 1982–2006. The survey is carried out in February-March, so the maturity-at-age is determined just prior to the spawning of haddock in Faroese waters and the determinations of the different maturity stages is relatively easy.

In order to reduce eventual year-to-year effects due to possible inadequate sampling and at the same time allow for trends in the series, the routine by the WG has been to use a 3-year running average in the assessment. For the years prior to 1982, average maturity-at-age from the surveys 1982–1995 was adopted (Table 2.4.7 and Figure 2.4.6). The proportion mature for the youngest ages has been declining during the last 4-5 years.

2.4.6 Assessment

Since this is a benchmark assessment, input data for the VPA have been analysed and revised where appropriate (see sections 2.4.2-2.4.5) and so have the data from the two surveys. The settings of the XSA have also been explored. In addition, alternative assessment models have been investigated, see section 2.4.10.

2.4.6.1 Tuning and estimates of fishing mortality

Commercial cpue series. Several commercial catch per unit effort series are updated every year, but as discussed in previous reports of this WG they are not used directly for tuning of the VPA due to changes in catchability caused by e.g. productivity variations in the area (see Faroe Plateau cod), to a different behaviour of the fleets after the introduction of the management system and in years when haddock prices are low as compared to cod the fleets apparently try to avoid grounds with high abundances of haddock, especially the younger age groups. The opposite may also happen if prices of haddock become high as compared to other species. The distribution of fishing activities by year for some major fleets (selected vessels) can be seen in chapter 2.1.1; the data are based on logbooks.These are mixed fisheries and not directly targeting haddock. It is not possible to show the fishing activities for the longliners below 100 GRT because this fleet is not obliged to keep logbooks. The age-aggregated cpue series for longliners and pair trawlers are presented in Figure 2.4.7. In general there is agreement between the two series although in some periods the two series are conflicting; this has been explained by variations in catchability of the longlines due to the above mentioned changes in productivity of the ecosystem (see chapter 2.1).

Fisheries independent cpue series. Two annual groundfish surveys are available, one carried out in February-March since 1982 (100 stations per year down to 500 m depth), and the other in August-September since 1996 (200 stations per year down to 500 m depth). The distribution of haddock catches in the surveys are shown in Figure 2.4.9 (spring surveys 1994-2006) and Figure 2.4.10 (summer surveys 1996-2005). Biomass estimates (kg/hour) are available for both series since they were initiated (Figure 2.4.8), and in general, there is a good agreement between them. Age disaggregated data ara available for the whole summer series, but due to problems with the database (see earlier reports), age disaggregated data for the spring survey are only available since 1994.

A spaly run with 2005 data included and some minor revisions of recent catch figures gave almost identical 2004 estimates as the 2005 assessment. A similar run where the year range were expanded back to 1957 included, an the age range was expanded to include where possible age 1 and missing data for age 10+, gave almost the same estimates of F and B but some diagnostics like SOP's were marginally improved.

The survey series have been rather noisy for some ages. Especially for the youngest ages this has been disappointing because the length distribution for those ages are almost non-overlapping. This was looked after this year and some of the difficulties were detected. The calculation of indices at age is based on age-length keys and a smoother is applied. This is a useful method but by analyzing the number of otoliths for the youngest ages and comparing it with the length distributions some artifacts may be introduced because the smoothing can assign wrong ages to some lengths, especially for the youngest and oldest specimen. This year the length distributions have been used more directly for calculation of indices at age for ages

0-3. LN(numbers at age) for the surveys are presented in Figures 2.4.11-2.4.12 and show consistent patterns. Further analysis of the performances of the two series are shown in figures 2.4.13 – 2.4.15. In general there is a good relationship between the indices for one year class in two successive years (Figures 2.4.13-2.4.14). The same applies when comparing the corresponding indices at age from the two surveys (Figure 2.4.15).

The revised surveys give improved diagnostics, e.g. log q residuals, and it is proposed to keep the spring survey series for ages 0-6, and to include age 1 in the summer series so it now covers the ages 1-8.

The settings of the XSA were then explored; this has been done to some details every year and the results can be found in earlier NWWG reports.

Last year the age where catchability is independent of stock size was set at age zero meaning that catchability is independent of stock size for all ages. Trials this year with age 0, 1 and 2 were made and the VPA converged fastest in the case of 0, somewhat slower for age 1 but for age 2 the VPA didn't converge. The differences in diagnostics were small. The choice last year seems reasonable.

The ages where catchability is independent of age has been set at ages >= 6 in former years. By inspecting selection patterns in the SepVPA this seems reasonable since a younger age will result in dome shaped exploitation pattern where as for age 6 and older the selection pattern becomes almost flat for these ages.

An XSA with the same settings as in last years report and tuned with the two surveys combined were performed (Table 2.4.9). The retrospective pattern for fishing mortality, recruitment and spawning stock biomass of this XSA is shown in Figure 2.4.15. The recent estimates are consistent with each other. The retrospective pattern of the fishing mortality is hampered by strange values of some small poorly sampled year classes which in some years are included in the FBAR reference ages and consequently they will create problems for estimation of the stock (see the 2005 NWWG report; this is not a problem for the time being.

Results. The fishing mortalities from the final XSA run are given in Table 2.4.10 and in Figure 2.4.16B. According to this the fishing mortality showed an overall decline since the early 1960s and has been estimated to be below or at the natural mortality of 0.2 in several years from the late 1970s. Since 1993 it has been increasing again and in 1998 it was estimated above 0.5, but decreased again to being about 0.26 in 2005.

2.4.6.2 Stock estimates and recruitment

The stock size in numbers is given in Table 2.4.11 and a summary of the VPA with the biomass estimates is given in Tables 2.4.12 and 2.4.18 and in Figure 2.4.16. According to this assessment, the spawning stock biomass has shown big changes in recent years. It decreased from 68 000 t in 1987 to 24 000 t in 1994, increased again to 88 000 t in 1998, decreased to 59 000 t in 2000 and has increased since to above 114 000 t in 2003; the 2005 point estimate is 88 000t (Figure 2.4.22). The decline in the spawning stock began in the late 1970s due to very poor recruitment in the years before. The stabilization at relatively high SSB's in the mid–1980s was due to the relatively good 1982 and 1983 year classes, but the decline since was partly due to poor year classes since the mid–1980s, as well as the pronounced decline in the mean weights-at-age in the stock. The main reason for the very abrupt increase in the spawning stock biomass is the recruitment and growth of the very large 1993 year class and the well-above-average 1994 year class. The most recent increase in the spawning stock is due to new strong year classes entering the fishery of which the 1999 year class is the highest on record. In the past there have been considerable doubts about the sizes of incoming year classes. The 1999 YC is now confirmed being the highest on record at age 2 (124 mio.), the YC's from 2000 and 2001 are estimated above average and the 2002 YC slightly below

average, Tables 2.4.12, 2.4.18 and Figure 2.4.16. All more recent YC's are estimated or predicted to be small.

2.4.7 Prediction of catch and biomass

2.4.7.1 Input data

2.4.7.1.1 Short-term prediction

The input data for the short-term predictions are given in Tables 2.4.13-14. All year classes up to 2004 are from the final VPA, the 2005-2006 year classes at age 2 are estimated from the XSA at ages 0 and 1 and applying a natural mortality of 0.2 in a forward calculation of the numbers using basic VPA equations. The YC 2006 at age 2 in 2008 is estimated as the geometric mean of the 2-year-olds in 1980-2007. This period was selected, because the recruitment in earlier years was more stable and not characteristic for the recent years.

The exploitation pattern used in the prediction was derived from averaging the 2003–2005 fishing mortality matrices from the final VPA and rescale it to the recent value (2005). The same exploitation pattern was used for all three years.

The cohort approach as described in the 2003 WG report was not used this year because when comparing the model results with the observed values for 2005, the fit was poor. A tentative modelling of the weights in 2006 taking into account the primary production in 2005 indicate that weights will stay low in 2006. Correspondingly, the mean weight-at-age for ages 2-10 in 2006-2008 was simply set equal to the observed weights in 2005.

The maturity ogive for 2006 is based on samples from the Faroese Groundfish Spring Survey 2006 and the ogives in 2007-2008 are estimated as the average of the smoothed 2004-2006 values.

2.4.7.1.2 Long-term Prediction

The input data for the long-term yield and spawning stock biomass (yield-per-recruit calculations) are listed in Table 2.4.16. Mean weights-at-age (stock and catch) are averages for the 1977–2005 period. The maturity ogives are averages for the years 1982-2005. The exploitation pattern is the same as in the short term prediction.

2.4.7.2 Biological reference points

The yield- and spawning stock biomass per recruit (age 2) based on the long-term data are shown in Table 2.4.17 and Figure 2.4.18. $\mathbf{F}_{max}$ and $\mathbf{F}_{0.1}$ are indicated here as 0.64 and 0.16, respectively. From Figure 2.4.17, showing the recruit/spawning stock relationship, and from Table 2.4.17, $\mathbf{F}_{med}$, and $\mathbf{F}_{high}$ were calculated at 0.33 and 1.52, respectively.

In previous assessments of this stock the Minimum Biological Acceptable Limit (MBAL) was set at 40 000 t because the occurrence of good recruitment was considerably higher when the spawning stock biomass was above this value (Figure 2.4.18) and ACFM established $\mathbf{B}_{lim}$ = 40 000 t. In the 1998 assessment, the $\mathbf{B}_{pa}$ was calculated as the value lying 2 standard deviations above $\mathbf{B}_{lim}$, that is 65 000 t. By examining among other things the SSB-R plot, ACFM instead proposed $\mathbf{B}_{pa}$ = 55 000 t. The reference point $\mathbf{F}_{pa}$ was proposed by ACFM as the $\mathbf{F}_{med}$ value of 0.25. The $\mathbf{F}_{lim}$ is defined being two standard deviations above $\mathbf{F}_{pa}$ and was set by ACFM at 0.40. The SG on Precautionary Reference Points for Advice on Fishery Management (SGPRP – February 2003) suggested that B_{lim} for Faroe haddock could be decreased to 20 000t, considering that two strong year classes have been produced at SSB below $\mathbf{B}_{lim}$. The 2004 Working Group considered it premature to change $\mathbf{B}_{lim}$ at that time. Of

the 5 year classes produced at SSB below $\mathbf{B}_{lim}$, three were very small, and two strong. The strong year classes are believed to be due to favourable environmental conditions, and there are no guarantee that similarly good environmental conditions would occur again should the SSB decrease below $\mathbf{B}_{lim}$.

2.4.7.3 Projections of catch and biomass

2.4.7.3.1 Short-term prediction

In the light of the performance of the management system, it is not unrealistic to assume fishing mortalities in 2006 as the average of some recent years, here the scaled average of F(2003-2005); however, possible changes in the catchability of the fleets (which seem to be linked to productivity changes in the environment) could undermine this assumption. The fleet is almost the same and the number of fishing days per fleet was only reduced marginal for the fishing year 1 Sept 2005 – 31 Aug 2006. The landings in 2006 are then predicted to be about 22 000 t, and continuing with this fishing mortality will result in 2007 landings of about 20 000 t. The SSB will decrease to 83 000 t in 2006, 67 000 t in 2007, and to 51 000 t in 2008. The results of the short-term prediction are shown in Table 2.4.15 and in Figure 2.4.18. The contribution by yearclasses to the age composition of the predicted 2007 catch and the 2008 SSB is shown in Figure 2.4.21.

2.4.8 Medium-term projections

No such projections were made this year.

2.4.9 Management considerations

Since management of haddock also need to take into account measures for cod and saithe, management considerations are given in Chapter 1.2 for all 3 stocks.

2.4.10 Comments on the assessment

As explained previously in the report, e.g. in section 3.4.6.1, the tuning fleets this year have been revised. Also the input files for the VPA (c@age, w@age and mat@age) have been revised and data for the years 1957-60 have been added. No changes have been made in the settings of the XSA. Following differences in the 2004 estimates were observed as compared to last year:

ASSESSMENT YEAR	RECRUITMENT AGE 2	EXPLOITABLE BIOMASS	SPAWNING STOCK BIOMASS	FISHING MORTALITY (F_{3-7})
2005	36 000 000	153 000 t	115 000 t	0.40
2006	31 000 000	144 000 t	103 000 t	0.35

As in 2004-05, the ADAPT component of the assessment toolbox developed by the USA National Marine Fisheries Service (http://nft.nefsc.noaa.gov/) has been systematically applied to the main stocks in the Faroes (Faroe Plateau cod, haddock and saithe). One of the objectives of the exercise was to use the bootstrap feature of the toolbox to evaluate the uncertainties in the assessment. A second objective was to compare the absolute estimates obtained with the two assessment methods, using similar data and assumptions.

Figure 2.4.19 shows the F and SSB's from a 1000 bootstraps of the ADAPT. The figure also shows the F and SSB from the XSA assessment. F in both methods is the Fbar(3-7). The XSA results fall almost in the middle of the cloud of bootstrapped ADAPT results.

Figure 2.4.20 shows the retrospective pattern of the ADAPT. It is comparable with the XSA retro.

Although some time was spent examining model diagnostics, a more careful examination would be necessary if this approach were the main basis for providing advice. ADAPT, as implemented in the NMFS Toolbox, provides few knobs to tweak. Therefore the changes in assessment results from year to year are likely to results from changes in the data (or selection of data) rather than in changing the settings of the assessment software.

From the NFT Adapt results, there is zero probability that the Faroe haddock 2005 SSB was less than the existing Bpa = 55 000t and Blim = 40 000t. There is an 80% probability that the F(3-7) is greater than the existing Fpa = 0.25, a 99% probability that it is less than the existing Flim 0.40, and a 100% probability that it is less than Ftarget = 0.45.

Other alternative assessment models were also explored, e.g. a separable model in AD Model Builder (Lewy and Nielsen 2003) and AMCI. The working group wants to explore these models further next year.

Table 2.4.1 Faroe Plateau (Sub-division Vb1) HADDOCK. Nominal catches (tonnes) by countries 1982-2005, I.e. Working Group estimates in Vb1.

Country	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993
Denmark	-	-	-	-	1	8	4	-	-	-	4,655	
Faroe Islands	10,319	11,898	11,418	13,597	13,359	13,954	10,867	13,506	11,106	8,074	164	3,622
France[1]	2	2	20	23	8	22	14	-	-	-	-	-
Germany	1	+	+	+	1	1	-	+	+	+		-
Norway	12	12	10	21	22	13	54	111	94	125	71	28
UK (Engl. and Wales)	-	-	-	-	-	2	-	-	7	-	54	81
UK (Scotland)[3]	1	-	-	-	-	-	-	-	-	-	-	-
United Kingdom												
Total	10,335	11,912	11,448	13,641	13,391	14,000	10,939	13,617	11,207	8,199	4,944	3,731
Working Group estimate[4,5]	11,937	12,894	12,378	15,143	14,477	14,882	12,178	14,325	11,726	8,429	5,476	4,026

Country	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004 #	2005 [2]
Faroe Islands	3,675	4,549	9,152	16,585	19,135	16,643	13,620 [8]	13,457 [8]	20,776 [8]	21,615	18,995	18,022
France[1]					2 [2,]	- [2]	6	8 [7]	2	4	1	+
Germany		5	-	-		33	1	2	6	1	6	
Greenland						*30* [6]	*22* [6]	*0* [6]	*4* [6]			
Iceland									4			
Norway	22	28	45	45 [2]	71	411	355	257 [2]	227	292	229	212
UK (Engl. and Wales)	31	23	5	22	30 [1]	59 [7]	19 [7]	4 [7]	11 [7]	14 [7]	8	
UK (Scotland)[11]	-	-	…	…	…							
United Kingdom												127 [4]
Total	3,728	4,605	9,202	16,652	19,238	17,176	14,023	13,728	21,030	21,926	19,239	18,361
Working Group estimate[4,5,8]	4,252	4,948	9,642	17,924	22,210	18,482	15,821	15,890	24,933	26,970	23,036	20,305

1) Including catches from Sub-division Vb2. Quantity unknown 1989-1991, 1993 and 1995-2001.

2) Preliminary data

3)From 1983 to 1996 catches included in Sub-division Vb2.

4) Includes catches from Sub-division Vb2 and Division IIa in Faroese waters.

5)Includes French and Greenlandic catches from Division Vb, as reported to the Faroese coastal guard service

6) Reported as Division Vb, to the Faroese coastal guard service.

7) Reported as Division Vb.

8) Includes Faroese landings reported to the NWWG by the Faroese Fisheries Laboratory

9) Included in Vb2

10) Includes 14 reported as Vb

Table 2.4.2 Faroe Bank (Sub-division Vb2) HADDOCK. Nominal catches (tonnes) by countries, 1982-2005, I.e. Working Group estimates in Vb2.

Country	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993
Faroe Islands	1,533	967	925	1,474	1,050	832	1,160	659	325	217	338	185
France[1]	-	-	-	-	-	-	-	-	-	-	-	-
Norway	1	2	5	3	10	5	43	16	97	4	23	8
UK (Engl. and Wales)	-	-	-	-	-	-	-	-	-	-	+	+
UK (Scotland)[3]	48	13	+	25	26	45	15	30	725	287	869	102
Total	1,582	982	930	1,502	1,086	882	1,218	705	1,147	508	1,230	295

Country	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004 [2]	2005
Faroe Islands	353	303	338	1,133	2,810	1,110	1,565 [5]	1,948	3,698	4,804	3,594	1899
France[1]	-	-	-	-								+
Norway	1	1	40	4	60	3	48	66	28	55	17	45
UK (Engl. and Wales)	+	... [1]	… [1]	… [1]	… [1]	[1]	[1]	[1]		[1]	[1]	[1]
UK (Scotland)[3]	170	39	62	135	102	193	185	148	177	185 [4]	186 [1]	[4]
Total	524	343	440	1,272	2,972	1,306	1,798	2,162	3,903	5,044	3,797	1,944

1) Catches included in Sub-division Vb1.

2) Provisional data

3)From 1983 to 1996 includes also catches taken in Sub-division Vb1 (see Table 2.4.1)

4) Reported as Division Vb.

5) Provided by the NWWG

Table 2.4.3 Total Faroese landings of haddock from Division Vb 1985-2004 and the contribution (%) by each fleet category (metier). Total catch in this table may deviate from official landings.

	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Open boats	7	7	11	2	3	2	3	2	1	1	1	2	2	2	2	1	2	3	4	4	4
Longliners < 100GRT	39	39	39	49	58	60	56	46	24	18	23	28	31	30	23	24	29	31	34	40	41
Longliners > 100GRT	13	12	13	19	18	18	18	22	25	25	38	36	38	40	40	36	38	34	42	42	43
Otterboard trawlers < 400HP	1	2	2	2	1	1	2	2	8	8	7	6	3	2	2	4	2	2	1	1	1
Otter board trawlers 400-999HP	6	3	5	4	3	3	1	1	3	2	5	7	6	6	5	5	5	4	3	2	2
Otterboard trawlers > 1000HP	8	5	2	2	2	2	2	1	1	3	2	2	3	3	7	5	5	11	3	1	1
Pairtrawlers < 1000HP	19	20	17	11	7	5	7	11	13	10	8	7	6	5	6	7	6	4	4	2	2
Pairtrawlers > 1000HP	6	10	9	9	6	8	11	14	22	29	16	13	12	12	14	19	12	10	8	7	4
Nets	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Jigging	1	0	0	0	1	1	1	0	0	0	0	1	1	0	0	0	1	2	1	1	1
Other gears	0	1	1	2	1	1	1	1	3	3	0	0	0	0	0	0	0	0	0	0	0
Total catch, tonnes gutted	13570	12967	13829	10697	12866	10319	7469	4103	3275	3629	4371	8535	15890	19669	16062	13881	13555	21842	22516	19396	16328

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Table 2.4.4 **Haddock in ICES Division Vb 2005**

Catch at age in numbers by fleet category

Age	Vb1 Open Boats	Vb1 LLiners < 100GRT	Vb1 LLiners > 100GRT	Vb1 OB. trawl. < 400HP	Vb1 OB. trawl. 400-999HP	Vb1 OB. trawl. > 1000HP	Vb1 Pair trawl. < 1000HP	Vb1 Pair trawl. > 1000HP	Vb 1 Others	Vb1 All Faroese Fleets	Vb2 All Faroese LLiners	Vb2 All Faroese Pairtrawlers	Vb2 Others	Vb2 All Faroese Fleets	Vb Foreign Trawlers	Vb1 Foreign LLiners	Vb2 Foreign LLiners	Vb Total
1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	4	44	27	0	0	0	0	0	3	83	0	0	0	0	0	1	0	84
3	83	745	483	5	6	10	9	17	93	1508	97	30	0	127	6	14	6	1655
4	192	1715	993	25	51	46	59	117	354	3551	167	40	1	208	28	29	10	3817
5	266	2644	2311	51	106	67	124	234	615	6448	105	26	0	131	41	67	7	6688
6	190	1936	2331	69	140	70	148	261	648	5720	180	56	1	237	43	68	11	6068
7	22	184	221	3	6	6	8	16	57	519	6	2	0	8	4	6	0	537
8	3	41	60	1	2	2	4	9	16	136	5	2	0	7	1	2	0	146
9	1	7	11	0	1	1	1	2	6	27	0	0	0	1	1	0	0	28
10	0	3	11	0	0	0	1	1	3	19	2	1	0	3	0	0	0	22
11	1	13	27	0	1	1	2	4	9	55	1	1	0	2	1	1	0	59
12	1	10	44	1	1	1	1	2	9	68	1	1	0	1	1	1	0	72
13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total no.	763	7343	6517	155	314	204	357	665	1813	18134	564	159	3	726	125	190	35	19175
Catch, t.	694	6636	6548	135	272	186	324	584	1720	17098	654	191	4	849	114	191	41	18293

Notes: Numbers in 1000'
Catch, gutted weight in tonnes
Others includes netters, jiggers, other small categories and catches not otherwise accounted for
LLiners = Longliners OB.trawl. = Otterboard trawlers Pair Trawl. = Pair trawlers

Tabel 2.4.5 Faroe haddock. Catch number-at-age

Run title : FAROE HADDOCK (ICES DIVISION Vb) HAD1_IND

At 1/05/2006 19:29

Table 1 Catch numbers at age Numbers*10**-3

	YEAR,	1957,	1958,	1959,	1960,	1961,	1962,	1963,	1964,	1965,
	AGE									
	0,	0,	0,	0,	0,	0,	0,	0,	0,	0,
	1,	45,	116,	525,	854,	941,	784,	356,	46,	39,
	2,	4133,	6255,	3971,	6061,	7932,	9631,	13552,	2284,	1368,
	3,	7130,	8021,	7663,	10659,	7330,	13977,	8907,	7457,	4286,
	4,	8442,	5679,	4544,	6655,	5134,	5233,	7403,	3899,	5133,
	5,	1615,	3378,	2056,	2482,	1937,	2361,	2242,	2360,	1443,
	6,	894,	1299,	1844,	1559,	1305,	1407,	1539,	1120,	1209,
	7,	585,	817,	721,	1169,	838,	868,	860,	728,	673,
	8,	227,	294,	236,	243,	236,	270,	257,	198,	1345,
	9,	94,	125,	98,	85,	59,	72,	75,	49,	43,
	+gp,	58,	105,	47,	28,	13,	22,	23,	7,	8,
0	TOTALNUM,	23223,	26089,	21705,	29795,	25725,	34625,	35214,	18148,	15547,
	TONSLAND,	20995,	23871,	20239,	25727,	20831,	27151,	27571,	19490,	18479,
	SOPCOF %,	89,	90,	90,	88,	88,	89,	89,	101,	94,

Table 1 Catch numbers at age Numbers*10**-3

	YEAR,	1966,	1967,	1968,	1969,	1970,	1971,	1972,	1973,	1974,	1975,
	AGE										
	0,	0,	0,	0,	0,	0,	0,	0,	0,	0,	0,
	1,	90,	70,	49,	95,	57,	55,	43,	665,	253,	94,
	2,	1081,	1425,	5881,	2384,	1728,	717,	750,	3311,	5633,	7337,
	3,	3304,	2405,	4097,	7539,	4855,	4393,	3744,	8416,	2899,	7952,
	4,	4804,	2599,	2812,	4567,	6581,	4727,	4179,	1240,	3970,	2097,
	5,	2710,	1785,	1524,	1565,	1624,	3267,	2706,	2795,	451,	1371,
	6,	1112,	1426,	1526,	1485,	1383,	1292,	1171,	919,	976,	247,
	7,	740,	631,	923,	1224,	1099,	864,	696,	1054,	466,	352,
	8,	180,	197,	230,	378,	326,	222,	180,	150,	535,	237,
	9,	54,	52,	68,	114,	68,	147,	113,	68,	68,	419,
	+gp,	9,	13,	12,	20,	10,	102,	95,	11,	147,	187,
0	TOTALNUM,	14084,	10603,	17122,	19371,	17731,	15786,	13677,	18629,	15398,	20293,
	TONSLAND,	18766,	13381,	17852,	23272,	21361,	19393,	16485,	18035,	14773,	20715,
	SOPCOF %,	109,	101,	102,	108,	102,	97,	96,	97,	97,	117,

Table 1 Catch numbers at age Numbers*10**-3

	YEAR,	1976,	1977,	1978,	1979,	1980,	1981,	1982,	1983,	1984,	1985,
	AGE										
	0,	0,	0,	0,	0,	0,	0,	0,	0,	0,	0,
	1,	40,	0,	0,	1,	0,	0,	0,	0,	25,	0,
	2,	4396,	255,	32,	1,	143,	74,	539,	441,	1195,	985,
	3,	7858,	4039,	1022,	1162,	58,	455,	934,	1969,	1561,	4553,
	4,	6798,	5168,	4248,	1755,	3724,	202,	784,	383,	2462,	2196,
	5,	1251,	4918,	4054,	3343,	2583,	2586,	298,	422,	147,	1242,
	6,	1189,	2128,	1841,	1851,	2496,	1354,	2182,	93,	234,	169,
	7,	298,	946,	717,	772,	1568,	1559,	973,	1444,	42,	91,
	8,	720,	443,	635,	212,	660,	608,	1166,	740,	861,	61,
	9,	258,	731,	243,	155,	99,	177,	1283,	947,	388,	503,
	+gp,	318,	855,	312,	74,	86,	36,	214,	795,	968,	973,
0	TOTALNUM,	23126,	19483,	13104,	9326,	11417,	7051,	8373,	7234,	7883,	10773,
	TONSLAND,	26211,	25555,	19200,	12424,	15016,	12233,	11937,	12894,	12378,	15143,
	SOPCOF %,	107,	98,	99,	104,	100,	109,	92,	106,	106,	106,

Table 2.4.5 Faroe haddock. Catch number-at-age (cont.)

Table 1 Catch numbers at age Numbers*10**-3

YEAR,	1986,	1987,	1988,	1989,	1990,	1991,	1992,	1993,	1994,	1995,
AGE										
0,	0,	0,	0,	0,	0,	0,	0,	0,	0,	0,
1,	0,	0,	0,	0,	0,	0,	0,	43,	1,	0,
2,	230,	283,	655,	63,	105,	77,	40,	113,	277,	804,
3,	2549,	1718,	444,	1518,	1275,	1044,	154,	298,	191,	452,
4,	4452,	3565,	2463,	658,	1921,	1774,	776,	274,	307,	235,
5,	1522,	2972,	3036,	2787,	768,	1248,	1120,	554,	153,	226,
6,	738,	1114,	2140,	2554,	1737,	651,	959,	538,	423,	132,
7,	39,	529,	475,	1976,	1909,	1101,	335,	474,	427,	295,
8,	130,	83,	151,	541,	885,	698,	373,	131,	383,	290,
9,	71,	48,	18,	133,	270,	317,	401,	201,	125,	262,
+gp,	712,	334,	128,	81,	108,	32,	162,	185,	301,	295,
0 TOTALNUM,	10443,	10646,	9510,	10311,	8978,	6942,	4320,	2811,	2588,	2991,
TONSLAND,	14477,	14882,	12178,	14325,	11726,	8429,	5476,	4026,	4252,	4948,
SOPCOF %,	101,	102,	97,	100,	102,	106,	106,	103,	100,	103,

Table 1 Catch numbers at age Numbers*10**-3

YEAR,	1996,	1997,	1998,	1999,	2000,	2001,	2002,	2003,	2004,	2005,
AGE										
0,	0,	0,	0,	0,	0,	0,	0,	0,	0,	0,
1,	1,	0,	0,	9,	73,	19,	0,	0,	3,	0,
2,	326,	77,	106,	174,	1461,	4380,	1515,	133,	243,	84,
3,	5234,	2913,	1055,	1142,	3061,	3128,	14039,	3423,	2002,	1658,
4,	1019,	10517,	5269,	942,	210,	2423,	2879,	13599,	4789,	3823,
5,	179,	710,	9856,	4677,	682,	173,	1200,	2216,	10397,	6702,
6,	163,	116,	446,	6619,	2685,	451,	133,	946,	1159,	6081,
7,	161,	123,	99,	226,	2846,	1151,	239,	162,	407,	538,
8,	270,	93,	87,	26,	79,	1375,	843,	333,	89,	146,
9,	234,	220,	95,	20,	1,	17,	1095,	855,	165,	28,
+gp,	394,	516,	502,	192,	71,	18,	33,	934,	809,	152,
0 TOTALNUM,	7981,	15285,	17515,	14027,	11169,	13135,	21976,	22601,	20063,	19212,
TONSLAND,	9642,	17924,	22210,	18482,	15821,	15890,	24933,	26970,	23036,	20305,
SOPCOF %,	100,	103,	101,	100,	103,	100,	100,	100,	99,	100,

Table 2.4.6 Faroe haddock. Catch weight-at-age.

Run title : FAROE HADDOCK (ICES DIVISION Vb) HAD1_IND

At 1/05/2006 19:29

Table 2 Catch weights at age (kg)

YEAR,	1957,	1958,	1959,	1960,	1961,	1962,	1963,	1964,	1965,
AGE									
0,	.0000,	.0000,	.0000,	.0000,	.0000,	.0000,	.0000,	.0000,	.0000,
1,	.2500,	.2500,	.2500,	.2500,	.2500,	.2500,	.2500,	.2500,	.2500,
2,	.4700,	.4700,	.4700,	.4700,	.4700,	.4700,	.4700,	.4700,	.4700,
3,	.7300,	.7300,	.7300,	.7300,	.7300,	.7300,	.7300,	.7300,	.7300,
4,	1.1300,	1.1300,	1.1300,	1.1300,	1.1300,	1.1300,	1.1300,	1.1300,	1.1300,
5,	1.5500,	1.5500,	1.5500,	1.5500,	1.5500,	1.5500,	1.5500,	1.5500,	1.5500,
6,	1.9700,	1.9700,	1.9700,	1.9700,	1.9700,	1.9700,	1.9700,	1.9700,	1.9700,
7,	2.4100,	2.4100,	2.4100,	2.4100,	2.4100,	2.4100,	2.4100,	2.4100,	2.4100,
8,	2.7600,	2.7600,	2.7600,	2.7600,	2.7600,	2.7600,	2.7600,	2.7600,	2.7600,
9,	3.0700,	3.0700,	3.0700,	3.0700,	3.0700,	3.0700,	3.0700,	3.0700,	3.0700,
+gp,	3.5500,	3.5500,	3.5500,	3.5500,	3.5500,	3.5500,	3.5500,	3.5500,	3.5500,
0 SOPCOFAC,	.8937,	.8983,	.9034,	.8832,	.8832,	.8929,	.8915,	1.0111,	.9383,

Table 2.4.6 Faroe haddock. Catch weight-at-age (cont.)

Table 2 Catch weights at age (kg)

	YEAR,	1966,	1967,	1968,	1969,	1970,	1971,	1972,	1973,	1974,	1975,
	AGE										
	0,	.0000,	.0000,	.0000,	.0000,	.0000,	.0000,	.0000,	.0000,	.0000,	.0000,
	1,	.2500,	.2500,	.2500,	.2500,	.2500,	.2500,	.2500,	.2500,	.2500,	.2500,
	2,	.4700,	.4700,	.4700,	.4700,	.4700,	.4700,	.4700,	.4700,	.4700,	.4700,
	3,	.7300,	.7300,	.7300,	.7300,	.7300,	.7300,	.7300,	.7300,	.7300,	.7300,
	4,	1.1300,	1.1300,	1.1300,	1.1300,	1.1300,	1.1300,	1.1300,	1.1300,	1.1300,	1.1300,
	5,	1.5500,	1.5500,	1.5500,	1.5500,	1.5500,	1.5500,	1.5500,	1.5500,	1.5500,	1.5500,
	6,	1.9700,	1.9700,	1.9700,	1.9700,	1.9700,	1.9700,	1.9700,	1.9700,	1.9700,	1.9700,
	7,	2.4100,	2.4100,	2.4100,	2.4100,	2.4100,	2.4100,	2.4100,	2.4100,	2.4100,	2.4100,
	8,	2.7600,	2.7600,	2.7600,	2.7600,	2.7600,	2.7600,	2.7600,	2.7600,	2.7600,	2.7600,
	9,	3.0700,	3.0700,	3.0700,	3.0700,	3.0700,	3.0700,	3.0700,	3.0700,	3.0700,	3.0700,
	+gp,	3.5500,	3.5500,	3.5500,	3.5500,	3.5500,	3.5500,	3.5500,	3.5500,	3.5500,	3.5500,
0	SOPCOFAC,	1.0885,	1.0117,	1.0246,	1.0787,	1.0249,	.9688,	.9597,	.9690,	.9678,	1.1696,

Table 2 Catch weights at age (kg)

	YEAR,	1976,	1977,	1978,	1979,	1980,	1981,	1982,	1983,	1984,	1985,
	AGE										
	0,	.0000,	.0000,	.0000,	.0000,	.0000,	.0000,	.0000,	.0000,	.0000,	.0000,
	1,	.2500,	.0000,	.0000,	.3000,	.0000,	.0000,	.0000,	.0000,	.3590,	.0000,
	2,	.4700,	.3110,	.3570,	.3570,	.6430,	.4520,	.7000,	.4700,	.6810,	.5280,
	3,	.7300,	.6330,	.7900,	.6720,	.7130,	.7250,	.8960,	.7400,	1.0110,	.8590,
	4,	1.1300,	1.0440,	1.0350,	.8940,	.9410,	.9570,	1.1500,	1.0100,	1.2550,	1.3910,
	5,	1.5500,	1.4260,	1.3980,	1.1560,	1.1570,	1.2370,	1.4440,	1.3200,	1.8120,	1.7770,
	6,	1.9700,	1.8250,	1.8700,	1.5900,	1.4930,	1.6510,	1.4980,	1.6600,	2.0610,	2.3260,
	7,	2.4100,	2.2410,	2.3500,	2.0700,	1.7390,	2.0530,	1.8290,	2.0500,	2.0590,	2.4400,
	8,	2.7600,	2.2050,	2.5970,	2.5250,	2.0950,	2.4060,	1.8870,	2.2600,	2.1370,	2.4010,
	9,	3.0700,	2.5700,	3.0140,	2.6960,	2.4650,	2.7250,	1.9610,	2.5400,	2.3680,	2.5320,
	+gp,	3.5500,	2.5910,	2.9200,	3.5190,	3.3100,	3.2500,	2.8560,	3.0400,	2.6860,	2.6860,
0	SOPCOFAC,	1.0741,	.9784,	.9947,	1.0380,	1.0017,	1.0870,	.9238,	1.0554,	1.0593,	1.0559,

Table 2 Catch weights at age (kg)

	YEAR,	1986,	1987,	1988,	1989,	1990,	1991,	1992,	1993,	1994,	1995,
	AGE										
	0,	.0000,	.0000,	.0000,	.0000,	.0000,	.0000,	.0000,	.0000,	.0000,	.0000,
	1,	.0000,	.0000,	.0000,	.0000,	.0000,	.0000,	.0000,	.3600,	.0000,	.0000,
	2,	.6080,	.6050,	.5010,	.5800,	.4380,	.5470,	.5250,	.7550,	.7540,	.6660,
	3,	.8870,	.8310,	.7810,	.7790,	.6990,	.6930,	.7240,	.9820,	1.1030,	1.0540,
	4,	1.1750,	1.1260,	.9740,	.9230,	.9390,	.8840,	.8170,	1.0270,	1.2540,	1.4890,
	5,	1.6310,	1.4620,	1.3630,	1.2070,	1.2040,	1.0860,	1.0380,	1.1920,	1.4650,	1.7790,
	6,	1.9840,	1.9410,	1.6800,	1.5640,	1.3840,	1.2760,	1.2490,	1.3780,	1.5930,	1.9400,
	7,	2.5190,	2.1730,	1.9750,	1.7460,	1.5640,	1.4770,	1.4300,	1.6430,	1.8040,	2.1820,
	8,	2.5830,	2.3470,	2.3440,	2.0860,	1.8180,	1.5740,	1.5640,	1.7960,	2.0490,	2.3570,
	9,	2.5700,	3.1180,	2.2480,	2.4240,	2.1680,	1.9300,	1.6330,	1.9710,	2.2250,	2.4900,
	+gp,	2.9220,	2.9330,	3.2950,	2.5140,	2.3350,	2.1530,	2.1260,	2.2400,	2.4230,	2.6780,
0	SOPCOFAC,	1.0141,	1.0197,	.9695,	1.0025,	1.0195,	1.0635,	1.0554,	1.0320,	.9969,	1.0331,

Table 2.4.6 Faroe haddock. Catch weight-at-age.

Table 2 Catch weights at age (kg)

YEAR,	1996,	1997,	1998,	1999,	2000,	2001,	2002,	2003,	2004,	2005,
AGE										
0,	.0000,	.0000,	.0000,	.0000,	.0000,	.0000,	.0000,	.0000,	.0000,	.0000,
1,	.3600,	.0000,	.0000,	.2780,	.2800,	.2800,	.0000,	.0000,	.3670,	.0000,
2,	.5340,	.5190,	.6220,	.5040,	.6610,	.6080,	.5840,	.5710,	.5740,	.5380,
3,	.8580,	.7710,	.8460,	.6240,	.9360,	.9400,	.8570,	.7150,	.7700,	.6490,
4,	1.4590,	1.0660,	1.0160,	.9740,	1.1660,	1.3740,	1.4050,	1.0080,	.8870,	.7970,
5,	1.9930,	1.7990,	1.2830,	1.2200,	1.4830,	1.7790,	1.7990,	1.5370,	1.1590,	1.0200,
6,	2.3300,	2.2700,	2.0800,	1.4900,	1.6160,	1.9710,	1.9740,	1.9110,	1.6380,	1.2450,
7,	2.3510,	2.3400,	2.5560,	2.4560,	1.8930,	2.1190,	2.3010,	2.0910,	1.8700,	1.8430,
8,	2.4690,	2.4750,	2.5720,	2.6580,	2.8210,	2.3730,	2.3700,	2.3010,	2.4380,	2.0610,
9,	2.7770,	2.5010,	2.4520,	2.5980,	3.7490,	2.7500,	2.6260,	2.4060,	2.3570,	2.2630,
+gp,	2.5820,	2.6760,	2.7530,	2.9530,	3.1960,	3.9660,	3.1300,	2.5350,	2.4170,	2.5790,
0 SOPCOFAC,	1.0043,	1.0250,	1.0106,	.9973,	1.0349,	.9960,	1.0010,	.9998,	.9929,	.9991,

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Table 2.4.7 Faroe haddock. Proportion mature-at-age.

Run title : FAROE HADDOCK (ICES DIVISION Vb) HAD1_IND

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Table 5 Proportion mature at age

YEAR,	1957,	1958,	1959,	1960,	1961,	1962,	1963,	1964,	1965,
AGE									
0,	.0000,	.0000,	.0000,	.0000,	.0000,	.0000,	.0000,	.0000,	.0000,
1,	.0000,	.0000,	.0000,	.0000,	.0000,	.0000,	.0000,	.0000,	.0000,
2,	.0600,	.0600,	.0600,	.0600,	.0600,	.0600,	.0600,	.0600,	.0600,
3,	.4800,	.4800,	.4800,	.4800,	.4800,	.4800,	.4800,	.4800,	.4800,
4,	.9100,	.9100,	.9100,	.9100,	.9100,	.9100,	.9100,	.9100,	.9100,
5,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,
6,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,
7,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,
8,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,
9,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,
+gp,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,

Table 5 Proportion mature at age

YEAR,	1966,	1967,	1968,	1969,	1970,	1971,	1972,	1973,	1974,	1975,
AGE										
0,	.0000,	.0000,	.0000,	.0000,	.0000,	.0000,	.0000,	.0000,	.0000,	.0000,
1,	.0000,	.0000,	.0000,	.0000,	.0000,	.0000,	.0000,	.0000,	.0000,	.0000,
2,	.0600,	.0600,	.0600,	.0600,	.0600,	.0600,	.0600,	.0600,	.0600,	.0600,
3,	.4800,	.4800,	.4800,	.4800,	.4800,	.4800,	.4800,	.4800,	.4800,	.4800,
4,	.9100,	.9100,	.9100,	.9100,	.9100,	.9100,	.9100,	.9100,	.9100,	.9100,
5,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,
6,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,
7,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,
8,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,
9,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,
+gp,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,

Table 2.4.7 Faroe haddock. Proportion mature-at-age (cont.).

Table 5 Proportion mature at age

YEAR,	1976,	1977,	1978,	1979,	1980,	1981,	1982,	1983,	1984,	1985,
AGE										
0,	.0000,	.0000,	.0000,	.0000,	.0000,	.0000,	.0000,	.0000,	.0000,	.0000,
1,	.0000,	.0000,	.0000,	.0000,	.0000,	.0000,	.0000,	.0000,	.0000,	.0000,
2,	.0600,	.0600,	.0600,	.0600,	.0600,	.0600,	.0800,	.0800,	.0800,	.0300,
3,	.4800,	.4800,	.4800,	.4800,	.4800,	.4800,	.6200,	.6200,	.7600,	.6200,
4,	.9100,	.9100,	.9100,	.9100,	.9100,	.9100,	.8900,	.8900,	.9800,	.9600,
5,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,
6,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,
7,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,
8,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,
9,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,
+gp,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,

Table 5 Proportion mature at age

YEAR,	1986,	1987,	1988,	1989,	1990,	1991,	1992,	1993,	1994,	1995,
AGE										
0,	.0000,	.0000,	.0000,	.0000,	.0000,	.0000,	.0000,	.0000,	.0000,	.0000,
1,	.0000,	.0000,	.0000,	.0000,	.0000,	.0000,	.0000,	.0000,	.0000,	.0000,
2,	.0300,	.0500,	.0500,	.0200,	.0800,	.1600,	.1800,	.1100,	.0500,	.0300,
3,	.4300,	.3200,	.2400,	.2200,	.3700,	.5800,	.6500,	.5000,	.4200,	.4700,
4,	.9500,	.9100,	.8900,	.8700,	.9000,	.9300,	.9100,	.8500,	.8600,	.9100,
5,	.9900,	.9800,	.9800,	.9900,	1.0000,	1.0000,	1.0000,	.9700,	.9600,	.9600,
6,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	.9900,	.9900,	.9900,
7,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,
8,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,
9,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,
+gp,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,

Table 5 Proportion mature at age

YEAR,	1996,	1997,	1998,	1999,	2000,	2001,	2002,	2003,	2004,	2005,
AGE										
0,	.0000,	.0000,	.0000,	.0000,	.0000,	.0000,	.0000,	.0000,	.0000,	.0000,
1,	.0000,	.0000,	.0000,	.0000,	.0000,	.0000,	.0000,	.0000,	.0000,	.0000,
2,	.0300,	.0100,	.0100,	.0100,	.0200,	.0900,	.0800,	.0700,	.0000,	.0100,
3,	.4700,	.4700,	.3600,	.3500,	.3600,	.5400,	.4900,	.4500,	.3500,	.3400,
4,	.9300,	.9100,	.8700,	.8600,	.8700,	.9300,	.9700,	.9700,	.9400,	.9100,
5,	.9800,	1.0000,	.9900,	.9900,	.9900,	1.0000,	1.0000,	.9900,	.9900,	.9900,
6,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,
7,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,
8,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,
9,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,
+gp,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,

Table 2.4.8 Faroe haddock. 2006 tuning file.

```
FAROE Haddock (ICES SUBDIVISION VB)       COMB-SURVEY-SPALY-REV06-jr.txt
102
SUMMER SURVEY
1996 2005
1 1 0.6 0.7
1 8
200   42362.00 38050.46 60866.49   1138.05   210.25   286.72  238.48  416.44
200    6851.83 12379.93 24184.20  47016.45   852.22   177.11   81.49  163.30
200   18825.00  2793.18  2545.32  14600.59 18399.09   285.78   89.61   73.64
200   24115.03  9521.26  5553.74   1548.70  8698.75  9829.62  204.06    7.89
200  161583.90 18837.41  7340.20    371.40  1301.41  4638.88 5699.14   85.81
200   98708.03 96675.44 11962.07   4424.74   174.57   629.27 2615.71 3209.95
200   89340.23 52092.34 57922.78   5538.84  1909.63   162.47  395.07 1256.27
200   47450.28 36196.89 22847.00  35941.83  3962.64   621.93  101.63  428.87
200    9049.95 33653.00 15117.67  15117.67 16561.09   885.34  185.66   24.20
200   14574.15  7694.99 12936.61  16513.01 11635.42 11938.45  493.44   35.53
SPRING SURVEY SHIFTED
1993 2005
1 1 0.95 1.0
0 6
100  16009.60   1958.70    216.70    338.10    172.80   305.30    399.60
100  35395.20  19462.60    702.20    216.60    150.70    48.80    141.10
100   6611.80  33206.50  19338.50    663.10     98.20    73.90     56.00
100    371.70   8095.00  15618.00  25478.90    628.10   146.10     37.00
100   3481.60   1545.80   3353.40  10120.10  12687.60   336.20      9.90
100   4459.50   6739.70    112.20   1517.30   4412.30  3139.20     48.70
100  25964.40   8354.40   4858.70    198.10    443.90  1669.60   1940.70
100  25283.30  36311.20   3384.70   1056.60     26.70   106.60    427.70
100  21111.90  17809.30  25760.60   1934.70    684.90    40.60    101.70
100   9391.10  22335.10  13272.70  12734.40    776.10   230.10     19.30
100   1823.10  16068.30  10327.10   7487.70  11212.50   487.50     79.10
100   5798.80   6022.70   7742.00   6165.00   4565.90  4912.80    238.60
100    705.50   6284.80   1574.60   4457.00   3250.40  3267.50   1577.20
```

Table 2.4.9 Faroe haddock 2005 xsa.

```
Lowestoft VPA Version 3.1                                          1/05/2006  19:27

Extended Survivors Analysis

 FAROE HADDOCK (ICES DIVISION Vb)                 HAD1_IND

 CPUE data from file D:\Vpa\vpa2006\Tuning\comb-survey-spaly-rev06-jr.txt

 Catch data for  49 years. 1957 to 2005. Ages  0 to  10.

      Fleet,            First, Last, First, Last, Alpha,  Beta
                   ,     year, year,  age ,  age
 SUMMER SURVEY       ,   1996, 2005,   1,     8,   .600,   .700
 SPRING SURVEY SHIFTE,   1993, 2005,   0,     6,   .950,  1.000


 Time series weights :

      Tapered time weighting not applied


 Catchability analysis :

      Catchability independent of stock size for all ages

      Catchability independent of age for ages >=    6


 Terminal population estimation :

      Survivor estimates shrunk towards the mean F
      of the final   5 years or the   5 oldest ages.

      S.E. of the mean to which the estimates  are shrunk =    .500

      Minimum standard error for population
      estimates derived from each fleet =    .300

      Prior weighting not applied


 Tuning converged after   36 iterations


 Regression weights
       , 1.000, 1.000, 1.000, 1.000, 1.000, 1.000, 1.000, 1.000, 1.000, 1.000


 Fishing mortalities
    Age,  1996,  1997,  1998,  1999,  2000,  2001,  2002,  2003,  2004,  2005

      0,  .000,  .000,  .000,  .000,  .000,  .000,  .000,  .000,  .000,  .000
      1,  .000,  .000,  .000,  .000,  .001,  .000,  .000,  .000,  .000,  .000
      2,  .008,  .009,  .032,  .013,  .074,  .040,  .028,  .003,  .009,  .013
      3,  .072,  .089,  .168,  .553,  .318,  .225,  .173,  .082,  .063,  .076
      4,  .361,  .203,  .229,  .223,  .181,  .449,  .334,  .254,  .158,  .164
      5,  .417,  .462,  .298,  .327,  .250,  .223,  .420,  .466,  .314,  .346
      6,  .374,  .527,  .600,  .335,  .317,  .260,  .267,  .699,  .477,  .306
      7,  .342,  .541, 1.287,  .711,  .235,  .217,  .214,  .609,  .758,  .426
      8,  .310,  .340,  .968, 1.841,  .583,  .170,  .245,  .520,  .827,  .687
      9,  .239,  .449,  .702,  .613,  .287,  .233,  .198,  .420,  .532,  .682
```

Table 2.4.9 Faroe haddock 2005 xsa (cont.).

XSA population numbers (Thousands)

YEAR ,	AGE 0,	1,	2,	3,	4,	5,	6,	7,	8,	9,
1996 ,	5.59E+03,	1.13E+04,	4.67E+04,	8.30E+04,	3.71E+03,	5.80E+02,	5.77E+02,	6.14E+02,	1.12E+03,	1.22E+03,
1997 ,	2.29E+04,	4.58E+03,	9.28E+03,	3.80E+04,	6.32E+04,	2.12E+03,	3.13E+02,	3.25E+02,	3.57E+02,	6.72E+02,
1998 ,	3.37E+04,	1.88E+04,	3.75E+03,	7.53E+03,	2.84E+04,	4.23E+04,	1.09E+03,	1.51E+02,	1.55E+02,	2.08E+02,
1999 ,	1.85E+05,	2.76E+04,	1.54E+04,	2.97E+03,	5.21E+03,	1.85E+04,	2.57E+04,	4.91E+02,	3.42E+01,	4.82E+01,
2000 ,	9.00E+04,	1.51E+05,	2.26E+04,	1.24E+04,	1.40E+03,	3.41E+03,	1.09E+04,	1.50E+04,	1.98E+02,	4.44E+00,
2001 ,	6.64E+04,	7.37E+04,	1.24E+05,	1.71E+04,	7.40E+03,	9.56E+02,	2.18E+03,	6.52E+03,	9.74E+03,	9.02E+01,
2002 ,	4.58E+04,	5.44E+04,	6.03E+04,	9.75E+04,	1.12E+04,	3.87E+03,	6.26E+02,	1.37E+03,	4.29E+03,	6.73E+03,
2003 ,	1.09E+04,	3.75E+04,	4.45E+04,	4.80E+04,	6.71E+04,	6.57E+03,	2.08E+03,	3.93E+02,	9.08E+02,	2.75E+03,
2004 ,	1.90E+04,	8.91E+03,	3.07E+04,	3.63E+04,	3.62E+04,	4.26E+04,	3.38E+03,	8.46E+02,	1.75E+02,	4.42E+02,
2005 ,	3.50E+03,	1.56E+04,	7.29E+03,	2.49E+04,	2.79E+04,	2.53E+04,	2.55E+04,	1.72E+03,	3.25E+02,	6.26E+01,

Estimated population abundance at 1st Jan 2006

,	0.00E+00,	2.87E+03,	1.28E+04,	5.89E+03,	1.89E+04,	1.94E+04,	1.47E+04,	1.54E+04,	9.17E+02,	1.34E+02,

Taper weighted geometric mean of the VPA populations:

,	2.92E+04,	2.53E+04,	2.11E+04,	1.66E+04,	1.09E+04,	6.29E+03,	3.59E+03,	1.89E+03,	9.16E+02,	4.35E+02,

Standard error of the weighted Log(VPA populations) :

,	1.0506,	1.0084,	1.0073,	.9748,	.9826,	.9709,	.9547,	.9595,	1.1411,	1.4224,

Log catchability residuals.

Fleet : SUMMER SURVEY

Age ,	1996,	1997,	1998,	1999,	2000,	2001,	2002,	2003,	2004,	2005
0 ,	No data for this fleet at this age									
1 ,	1.06,	.14,	-.26,	-.40,	-.20,	.03,	.23,	-.03,	-.25,	-.33
2 ,	-.08,	.41,	-.16,	-.35,	-.01,	-.10,	-.01,	-.09,	.21,	.18
3 ,	.11,	-.02,	-.60,	1.36,	.05,	.16,	-.04,	-.32,	-.46,	-.23
4 ,	-.32,	.46,	.11,	-.44,	-.58,	.40,	.14,	.17,	-.14,	.21
5 ,	-.06,	.07,	.04,	.14,	-.12,	-.87,	.25,	.48,	-.06,	.13
6 ,	.30,	.54,	-.19,	.02,	.11,	-.31,	-.41,	.01,	-.27,	.20
7 ,	.04,	-.27,	1.07,	.35,	-.06,	-.01,	-.34,	-.19,	-.26,	-.21
8 ,	-.02,	.20,	.65,	.49,	.31,	-.24,	-.31,	.35,	-.68,	-1.00

Mean log catchability and standard error of ages with catchability
independent of year class strength and constant w.r.t. time

Age ,	1,	2,	3,	4,	5,	6,	7,	8
Mean Log q,	-4.9052,	-5.2860,	-5.5403,	-5.7950,	-5.8504,	-5.9300,	-5.9300,	-5.9300,
S.E(Log q),	.4248,	.2167,	.5390,	.3555,	.3527,	.2995,	.4245,	.5309,

Table 2.4.9 Faroe haddock 2005 xsa (cont.).

Regression statistics :

Ages with q independent of year class strength and constant w.r.t. time.

Age,	Slope ,	t-value ,	Intercept,	RSquare,	No Pts,	Reg s.e,	Mean Q
1,	1.08,	-.557,	4.47,	.85,	10,	.48,	-4.91,
2,	1.04,	-.545,	5.10,	.96,	10,	.23,	-5.29,
3,	1.32,	-1.578,	4.09,	.75,	10,	.66,	-5.54,
4,	.84,	2.880,	6.41,	.97,	10,	.22,	-5.80,
5,	.92,	1.256,	6.10,	.96,	10,	.31,	-5.85,
6,	1.01,	-.128,	5.91,	.96,	10,	.32,	-5.93,
7,	1.14,	-1.246,	5.78,	.91,	10,	.47,	-5.92,
8,	1.11,	-.917,	5.93,	.90,	10,	.59,	-5.96,

Fleet : SPRING SURVEY SHIFTED

Age ,	1993,	1994,	1995
0 ,	-.65,	.92,	.86
1 ,	-.37,	-.84,	.48
2 ,	-.39,	-.49,	.02
3 ,	.03,	.02,	-.20
4 ,	-.16,	-.02,	.05
5 ,	-.11,	-.90,	-.05
6 ,	.49,	-.10,	-.01
7 ,	No data for this fleet at this age		
8 ,	No data for this fleet at this age		

Age ,	1996,	1997,	1998,	1999,	2000,	2001,	2002,	2003,	2004,	2005
0 ,	-1.11,	-.28,	-.42,	-.36,	.33,	.46,	.02,	-.18,	.41,	.00
1 ,	.69,	-.06,	.00,	-.17,	-.40,	-.40,	.13,	.18,	.63,	.12
2 ,	.59,	.67,	-1.80,	.54,	-.15,	.15,	.19,	.22,	.31,	.16
3 ,	.61,	.49,	.29,	-.45,	-.43,	-.24,	-.14,	-.06,	.01,	.08
4 ,	.61,	.63,	.40,	-.21,	-1.75,	.09,	-.31,	.49,	.12,	.05
5 ,	1.24,	.82,	-.10,	.12,	-1.01,	-.73,	-.20,	.06,	.36,	.50
6 ,	.21,	-.35,	.07,	.34,	-.34,	-.22,	-.63,	.01,	.41,	.11
7 ,	No data for this fleet at this age									
8 ,	No data for this fleet at this age									

Mean log catchability and standard error of ages with catchability
independent of year class strength and constant w.r.t. time

Age ,	0,	1,	2,	3,	4,	5,	6
Mean Log q,	-6.0124,	-5.4345,	-6.0867,	-6.1331,	-6.4461,	-6.6212,	-7.0037,
S.E(Log q),	.5892,	.4431,	.6432,	.3173,	.6063,	.6482,	.3239,

Table 2.4.9 Faroe haddock 2005 xsa (cont.).

```
Regression statistics :


 Ages with q independent of year class strength and constant w.r.t. time.

 Age, Slope , t-value , Intercept, RSquare, No Pts, Reg s.e,  Mean Q

  0,     .95,     .392,      6.24,     .83,     13,     .58,   -6.01,
  1,    1.22,   -1.696,      4.36,     .84,     13,     .50,   -5.43,
  2,     .80,    1.899,      6.83,     .89,     13,     .47,   -6.09,
  3,     .92,    1.278,      6.39,     .96,     13,     .29,   -6.13,
  4,     .83,    2.046,      6.89,     .93,     13,     .45,   -6.45,
  5,     .96,     .340,      6.70,     .85,     13,     .64,   -6.62,
  6,     .92,    1.413,      7.07,     .96,     13,     .29,   -7.00,



 Terminal year survivor and F summaries :

 Age  0   Catchability constant w.r.t. time and dependent on age

 Year class = 2005

 Fleet,                 Estimated,    Int,       Ext,    Var,    N, Scaled,  Estimated
      ,                 Survivors,    s.e,       s.e,   Ratio,    , Weights,    F
 SUMMER SURVEY       ,         1.,   .000,       .000,    .00,   0,  .000,     .000
 SPRING SURVEY SHIFTE,      2867.,   .611,       .000,    .00,   1, 1.000,     .000

   F shrinkage mean  ,         0.,    .50,,,,                        .000,     .000

 Weighted prediction :

 Survivors,        Int,      Ext,    N,    Var,     F
 at end of year,   s.e,      s.e,     ,   Ratio,
      2867.,       .61,      .00,    1,    .000,   .000


 Age  1   Catchability constant w.r.t. time and dependent on age

 Year class = 2004

 Fleet,                 Estimated,    Int,       Ext,    Var,    N, Scaled,  Estimated
      ,                 Survivors,    s.e,       s.e,   Ratio,    , Weights,    F
 SUMMER SURVEY       ,      9172.,   .445,       .000,    .00,   1,  .405,     .000
 SPRING SURVEY SHIFTE,     15957.,   .367,       .143,    .39,   2,  .595,     .000

   F shrinkage mean  ,         0.,    .50,,,,                        .000,     .000

 Weighted prediction :

 Survivors,        Int,      Ext,    N,    Var,     F
 at end of year,   s.e,      s.e,     ,   Ratio,
     12752.,       .28,      .21,    3,    .732,   .000
```

Table 2.4.9 Faroe haddock 2005 xsa (cont.).

Age 2 Catchability constant w.r.t. time and dependent on age

Year class = 2003

Fleet,	Estimated, Survivors,	Int, s.e,	Ext, s.e,	Var, Ratio,	N,	Scaled, Weights,	Estimated F
SUMMER SURVEY ,	6175.,	.249,	.198,	.80,	2,	.541,	.012
SPRING SURVEY SHIFTE,	7921.,	.322,	.249,	.77,	3,	.323,	.010
F shrinkage mean ,	2419.,	.50,,,,				.136,	.031

Weighted prediction :

Survivors, at end of year,	Int, s.e,	Ext, s.e,	N,	Var, Ratio,	F
5893.,	.18,	.21,	6,	1.140,	.013

Age 3 Catchability constant w.r.t. time and dependent on age

Year class = 2002

Fleet,	Estimated, Survivors,	Int, s.e,	Ext, s.e,	Var, Ratio,	N,	Scaled, Weights,	Estimated F
SUMMER SURVEY ,	20441.,	.228,	.122,	.53,	3,	.453,	.071
SPRING SURVEY SHIFTE,	21321.,	.230,	.050,	.22,	4,	.445,	.068
F shrinkage mean ,	7943.,	.50,,,,				.102,	.173

Weighted prediction :

Survivors, at end of year,	Int, s.e,	Ext, s.e,	N,	Var, Ratio,	F
18910.,	.15,	.13,	8,	.823,	.076

Age 4 Catchability constant w.r.t. time and dependent on age

Year class = 2001

Fleet,	Estimated, Survivors,	Int, s.e,	Ext, s.e,	Var, Ratio,	N,	Scaled, Weights,	Estimated F
SUMMER SURVEY ,	19660.,	.194,	.130,	.67,	4,	.503,	.162
SPRING SURVEY SHIFTE,	21856.,	.216,	.072,	.33,	5,	.403,	.147
F shrinkage mean ,	10852.,	.50,,,,				.094,	.277

Weighted prediction :

Survivors, at end of year,	Int, s.e,	Ext, s.e,	N,	Var, Ratio,	F
19403.,	.14,	.09,	10,	.656,	.164

Table 2.4.9 Faroe haddock 2005 xsa (cont.).

```
Age  5   Catchability constant w.r.t. time and dependent on age

Year class = 2000

Fleet,                 Estimated,    Int,       Ext,    Var,    N, Scaled,  Estimated
     ,                 Survivors,    s.e,       s.e,   Ratio,    , Weights,    F
SUMMER SURVEY       ,     14308.,   .173,       .066,    .38,   5,  .534,     .353
SPRING SURVEY SHIFTE,     15088.,   .207,       .123,    .60,   6,  .359,     .338

  F shrinkage mean  ,     15146.,    .50,,,,                        .107,     .337

Weighted prediction :

Survivors,        Int,      Ext,    N,    Var,     F
at end of year,   s.e,      s.e,     ,   Ratio,
    14672.,       .13,      .06,   12,    .447,   .346
```

```
Age  6   Catchability constant w.r.t. time and dependent on age

Year class = 1999

Fleet,                 Estimated,    Int,       Ext,    Var,    N, Scaled,  Estimated
     ,                 Survivors,    s.e,       s.e,   Ratio,    , Weights,    F
SUMMER SURVEY       ,     16126.,   .159,       .066,    .42,   6,  .521,     .294
SPRING SURVEY SHIFTE,     15708.,   .187,       .101,    .54,   7,  .379,     .300

  F shrinkage mean  ,     10957.,    .50,,,,                        .100,     .407

Weighted prediction :

Survivors,        Int,      Ext,    N,    Var,     F
at end of year,   s.e,      s.e,     ,   Ratio,
    15364.,       .12,      .06,   14,    .512,   .306
```

```
Age  7   Catchability constant w.r.t. time and age (fixed at the value for age)  6

Year class = 1998

Fleet,                 Estimated,    Int,       Ext,    Var,    N, Scaled,  Estimated
     ,                 Survivors,    s.e,       s.e,   Ratio,    , Weights,    F
SUMMER SURVEY       ,       855.,   .167,       .109,    .65,   7,  .540,     .451
SPRING SURVEY SHIFTE,      1015.,   .197,       .130,    .66,   7,  .297,     .392

  F shrinkage mean  ,       962.,    .50,,,,                        .164,     .409

Weighted prediction :

Survivors,        Int,      Ext,    N,    Var,     F
at end of year,   s.e,      s.e,     ,   Ratio,
      917.,       .14,      .07,   15,    .540,   .426
```

Table 2.4.9 Faroe haddock 2005 xsa (cont.).

```
Age  8   Catchability constant w.r.t. time and age (fixed at the value for age)  6

Year class = 1997

Fleet,                 Estimated,    Int,       Ext,    Var,    N, Scaled,  Estimated
     ,                 Survivors,    s.e,       s.e,   Ratio,    , Weights,    F
SUMMER SURVEY       ,        96.,   .205,       .180,    .88,   8,  .483,     .863
SPRING SURVEY SHIFTE,       124.,   .203,       .086,    .43,   7,  .173,     .723

  F shrinkage mean  ,       219.,    .50,,,,                          .345,     .473

Weighted prediction :

Survivors,        Int,      Ext,    N,    Var,     F
at end of year,   s.e,      s.e,     ,   Ratio,
      134.,       .20,      .15,   16,    .724,   .687
```

```
Age  9   Catchability constant w.r.t. time and age (fixed at the value for age)  6

Year class = 1996

Fleet,                 Estimated,    Int,       Ext,    Var,    N, Scaled,  Estimated
     ,                 Survivors,    s.e,       s.e,   Ratio,    , Weights,    F
SUMMER SURVEY       ,        17.,   .164,       .152,    .93,   8,  .402,     .906
SPRING SURVEY SHIFTE,        13.,   .193,       .185,    .96,   7,  .185,    1.105

  F shrinkage mean  ,        53.,    .50,,,,                          .413,     .388

Weighted prediction :

Survivors,        Int,      Ext,    N,    Var,     F
at end of year,   s.e,      s.e,     ,   Ratio,
       26.,       .22,      .22,   16,   1.013,   .682
```

Table 2.4.10 Faroe haddock. Fishing mortality (F) at age.

```
Run title : FAROE HADDOCK (ICES DIVISION Vb)                HAD1_IND

At  1/05/2006  19:29

                   Terminal Fs derived using XSA (With F shrinkage)

       Table  8    Fishing mortality (F) at age
       YEAR,       1957,    1958,    1959,    1960,    1961,    1962,    1963,    1964,    1965,

       AGE
         0,        .0000,   .0000,   .0000,   .0000,   .0000,   .0000,   .0000,   .0000,   .0000,
         1,        .0010,   .0024,   .0132,   .0150,   .0219,   .0149,   .0106,   .0018,   .0017,
         2,        .1394,   .1939,   .1066,   .2074,   .1875,   .3232,   .3801,   .0876,   .0691,
         3,        .3707,   .4378,   .3860,   .4599,   .4162,   .5866,   .5639,   .3723,   .2354,
         4,        .6163,   .5737,   .4782,   .6926,   .4209,   .5980,   .7261,   .5193,   .4767,
         5,        .3909,   .5386,   .4195,   .5260,   .4387,   .3480,   .5591,   .5369,   .3678,
         6,        .4380,   .6346,   .6458,   .6591,   .5879,   .6706,   .4026,   .6107,   .5882,
         7,        .6340,   .9504,   .9184,  1.2130,   .9483,  1.0499,  1.2493,   .3375,   .9618,
         8,        .5599,   .7839,   .8206,   .9667,   .8742,   .9736,  1.1139,  1.2027,  2.3618,
         9,        .5321,   .7028,   .6625,   .8198,   .6600,   .7351,   .8185,   .6472,   .9619,
        +gp,       .5321,   .7028,   .6625,   .8198,   .6600,   .7351,   .8185,   .6472,   .9619,
0  FBAR  3- 7,     .4900,   .6270,   .5696,   .7101,   .5624,   .6506,   .7002,   .4753,   .5260,
```

Table 2.4.10 Faroe haddock. Fishing mortality (F) at age (cont.).

Table 8 Fishing mortality (F) at age

YEAR,	1966,	1967,	1968,	1969,	1970,	1971,	1972,	1973,	1974,	1975,
AGE										
0,	.0000,	.0000,	.0000,	.0000,	.0000,	.0000,	.0000,	.0000,	.0000,	.0000,
1,	.0032,	.0012,	.0014,	.0024,	.0033,	.0015,	.0016,	.0114,	.0033,	.0015,
2,	.0610,	.0641,	.1261,	.0860,	.0551,	.0526,	.0253,	.1677,	.1266,	.1229,
3,	.2370,	.1873,	.2647,	.2363,	.2528,	.1936,	.4224,	.4319,	.2172,	.2649,
4,	.4515,	.2971,	.3483,	.5320,	.3343,	.4185,	.2852,	.2391,	.3729,	.2412,
5,	.5006,	.2997,	.2847,	.3330,	.3639,	.2754,	.4516,	.3142,	.1278,	.2115,
6,	.5421,	.5406,	.4540,	.4975,	.5561,	.5560,	.1494,	.2702,	.1713,	.0956,
7,	.9128,	.6906,	.8367,	.8276,	.8739,	.8384,	.6719,	.1950,	.2134,	.0859,
8,	.7509,	.6634,	.5851,	1.0631,	.5430,	.4223,	.4065,	.2906,	.1433,	.1599,
9,	.6373,	.5022,	.5057,	.6566,	.5386,	.5061,	.3956,	.2632,	.2067,	.1595,
+gp,	.6373,	.5022,	.5057,	.6566,	.5386,	.5061,	.3956,	.2632,	.2067,	.1595,
0 FBAR 3- 7,	.5288,	.4031,	.4377,	.4853,	.4762,	.4564,	.3961,	.2901,	.2205,	.1798,

Table 8 Fishing mortality (F) at age

YEAR,	1976,	1977,	1978,	1979,	1980,	1981,	1982,	1983,	1984,	1985,
AGE										
0,	.0000,	.0000,	.0000,	.0000,	.0000,	.0000,	.0000,	.0000,	.0000,	.0000,
1,	.0014,	.0000,	.0000,	.0002,	.0000,	.0000,	.0000,	.0000,	.0006,	.0000,
2,	.0907,	.0108,	.0010,	.0004,	.0324,	.0237,	.0382,	.0250,	.0327,	.0276,
3,	.1876,	.1127,	.0546,	.0457,	.0284,	.1371,	.4606,	.1910,	.1159,	.1681,
4,	.3809,	.1812,	.1663,	.1253,	.2021,	.1309,	.3700,	.3468,	.3879,	.2372,
5,	.2216,	.5270,	.2112,	.1910,	.2745,	.2107,	.2904,	.3486,	.2161,	.3452,
6,	.2870,	.7243,	.3816,	.1406,	.2131,	.2259,	.2767,	.1375,	.3320,	.4135,
7,	.1600,	.3901,	.5755,	.2718,	.1698,	.2000,	.2517,	.2979,	.0848,	.2071,
8,	.2537,	.3785,	.4963,	.3298,	.3947,	.0917,	.2259,	.3090,	.2914,	.1707,
9,	.2620,	.4434,	.3686,	.2127,	.2521,	.1726,	.2845,	.2896,	.2638,	.2762,
+gp,	.2620,	.4434,	.3686,	.2127,	.2521,	.1726,	.2845,	.2896,	.2638,	.2762,
0 FBAR 3- 7,	.2474,	.3871,	.2778,	.1549,	.1776,	.1809,	.3299,	.2644,	.2273,	.2742,

Table 8 Fishing mortality (F) at age

YEAR,	1986,	1987,	1988,	1989,	1990,	1991,	1992,	1993,	1994,	1995,
AGE										
0,	.0000,	.0000,	.0000,	.0000,	.0000,	.0000,	.0000,	.0000,	.0000,	.0000,
1,	.0000,	.0000,	.0000,	.0000,	.0000,	.0000,	.0000,	.0060,	.0000,	.0000,
2,	.0095,	.0330,	.0386,	.0045,	.0122,	.0283,	.0166,	.0708,	.0486,	.0087,
3,	.0927,	.0912,	.0664,	.1182,	.1176,	.1616,	.0728,	.1647,	.1643,	.1045,
4,	.2466,	.1813,	.1830,	.1327,	.2155,	.2384,	.1734,	.1792,	.2553,	.3124,
5,	.2569,	.2588,	.2317,	.3251,	.2260,	.2117,	.2326,	.1805,	.1437,	.3032,
6,	.3556,	.3037,	.3009,	.3118,	.3459,	.3046,	.2502,	.1669,	.2039,	.1778,
7,	.1559,	.4682,	.2043,	.5040,	.4065,	.3856,	.2534,	.1883,	.1936,	.2140,
8,	.5132,	.5772,	.2334,	.3788,	.4439,	.2536,	.2165,	.1482,	.2287,	.1951,
9,	.3074,	.3602,	.2318,	.3325,	.3296,	.2803,	.2263,	.1733,	.2060,	.2417,
+gp,	.3074,	.3602,	.2318,	.3325,	.3296,	.2803,	.2263,	.1733,	.2060,	.2417,
0 FBAR 3- 7,	.2215,	.2607,	.1973,	.2783,	.2623,	.2604,	.1965,	.1759,	.1922,	.2224,

Table 2.4.10 Faroe haddock. Fishing mortality (F) at age (cont.).

Table 8 Fishing mortality (F) at age

YEAR,	1996,	1997,	1998,	1999,	2000,	2001,	2002,	2003,	2004,	2005,
AGE										
0,	.0000,	.0000,	.0000,	.0000,	.0000,	.0000,	.0000,	.0000,	.0000,	.0000,
1,	.0001,	.0000,	.0000,	.0004,	.0005,	.0003,	.0000,	.0000,	.0004,	.0000,
2,	.0077,	.0092,	.0318,	.0126,	.0743,	.0399,	.0281,	.0033,	.0088,	.0128,
3,	.0722,	.0886,	.1684,	.5528,	.3180,	.2251,	.1734,	.0820,	.0629,	.0763,
4,	.3612,	.2031,	.2291,	.2231,	.1812,	.4493,	.3339,	.2537,	.1579,	.1641,
5,	.4173,	.4625,	.2980,	.3273,	.2498,	.2231,	.4202,	.4662,	.3142,	.3459,
6,	.3739,	.5274,	.5999,	.3352,	.3169,	.2603,	.2674,	.6989,	.4772,	.3061,
7,	.3423,	.5411,	1.2873,	.7107,	.2346,	.2172,	.2137,	.6090,	.7582,	.4257,
8,	.3103,	.3396,	.9681,	1.8412,	.5835,	.1696,	.2446,	.5200,	.8273,	.6873,
9,	.2386,	.4495,	.7023,	.6134,	.2866,	.2335,	.1982,	.4204,	.5324,	.6824,
+gp,	.2386,	.4495,	.7023,	.6134,	.2866,	.2335,	.1982,	.4204,	.5324,	.6824,
0 FBAR 3- 7,	.3134,	.3645,	.5165,	.4298,	.2601,	.2750,	.2817,	.4220,	.3541,	.2636,

Table 2.4.11 Faroe haddock. Stock number (N) at age.

Run title : FAROE HADDOCK (ICES DIVISION Vb) HAD1_IND

At 1/05/2006 19:29

Terminal Fs derived using XSA (With F shrinkage)

Table 10 Stock number at age (start of year) Numbers*10**-3

YEAR,	1957,	1958,	1959,	1960,	1961,	1962,	1963,	1964,	1965,
AGE									
0,	64927,	54061,	77651,	58761,	71715,	45400,	33844,	30193,	37949,
1,	47944,	53158,	44261,	63576,	48110,	58715,	37170,	27709,	24720,
2,	35106,	39212,	43417,	35763,	51279,	38537,	47362,	30110,	22644,
3,	25440,	25003,	26445,	31954,	23796,	34806,	22837,	26515,	22586,
4,	20280,	14377,	13213,	14717,	16517,	12850,	15850,	10638,	14961,
5,	5517,	8965,	6632,	6706,	6028,	8877,	5786,	6278,	5182,
6,	2786,	3055,	4284,	3570,	3245,	3182,	5132,	2708,	3005,
7,	1377,	1472,	1326,	1839,	1512,	1476,	1332,	2809,	1204,
8,	585,	598,	466,	433,	448,	480,	423,	313,	1641,
9,	252,	274,	224,	168,	135,	153,	148,	114,	77,
+gp,	154,	227,	106,	54,	29,	46,	45,	16,	14,
0 TOTAL,	204367,	200401,	218024,	217540,	222812,	204522,	169929,	137403,	133982,

Table 10 Stock number at age (start of year) Numbers*10**-3

YEAR,	1966,	1967,	1968,	1969,	1970,	1971,	1972,	1973,	1974,	1975,
AGE										
0,	81929,	47771,	53244,	23141,	49629,	35423,	78987,	104943,	83710,	39176,
1,	31070,	67078,	39111,	43593,	18946,	40633,	29002,	64669,	85920,	68536,
2,	20203,	25356,	54856,	31977,	35605,	15460,	33218,	23706,	52345,	70116,
3,	17302,	15563,	19471,	39591,	24024,	27587,	12009,	26518,	16413,	37760,
4,	14613,	11176,	10566,	12234,	25592,	15276,	18612,	6444,	14096,	10814,
5,	7605,	7618,	6798,	6106,	5884,	14999,	8230,	11457,	4154,	7948,
6,	2937,	3774,	4622,	4187,	3583,	3348,	9324,	4289,	6851,	2993,
7,	1366,	1398,	1800,	2403,	2084,	1682,	1572,	6574,	2680,	4726,
8,	377,	449,	574,	638,	860,	712,	596,	657,	4429,	1773,
9,	127,	146,	189,	262,	180,	409,	382,	325,	402,	3142,
+gp,	21,	36,	33,	45,	26,	281,	319,	52,	866,	1396,
0 TOTAL,	177550,	180364,	191264,	164177,	166414,	155810,	192249,	249634,	271865,	248380,

Table 2.4.11 Faroe haddock. Stock number (N) at age (cont.).

Table 10 Stock number at age (start of year) Numbers*10**-3

YEAR,	1976,	1977,	1978,	1979,	1980,	1981,	1982,	1983,	1984,	1985,
AGE										
0,	52445,	4167,	7389,	5217,	23689,	29451,	61240,	59665,	40064,	14383,
1,	32074,	42938,	3412,	6049,	4272,	19395,	24113,	50139,	48849,	32802,
2,	56027,	26224,	35155,	2794,	4952,	3497,	15879,	19742,	41050,	39972,
3,	50768,	41894,	21240,	28753,	2286,	3925,	2796,	12513,	15764,	32528,
4,	23720,	34455,	30645,	16465,	22490,	1819,	2802,	1444,	8463,	11494,
5,	6957,	13269,	23533,	21246,	11892,	15044,	1307,	1584,	836,	4702,
6,	5267,	4564,	6414,	15599,	14370,	7399,	9977,	800,	915,	551,
7,	2227,	3236,	1811,	3585,	11096,	9507,	4833,	6194,	571,	538,
8,	3551,	1554,	1794,	834,	2237,	7666,	6373,	3076,	3765,	430,
9,	1237,	2256,	871,	894,	491,	1234,	5726,	4163,	1849,	2303,
+gp,	1516,	2615,	1110,	425,	424,	250,	949,	3472,	4586,	4427,
0 TOTAL,	235788,	177171,	133373,	101862,	98200,	99188,	135995,	162792,	166713,	144129,

Table 10 Stock number at age (start of year) Numbers*10**-3

YEAR,	1986,	1987,	1988,	1989,	1990,	1991,	1992,	1993,	1994,	1995,
AGE										
0,	28509,	23245,	14263,	4544,	4017,	2725,	9692,	152627,	69693,	13840,
1,	11776,	23341,	19031,	11678,	3721,	3289,	2231,	7935,	124960,	57060,
2,	26856,	9641,	19110,	15581,	9561,	3046,	2693,	1827,	6458,	102308,
3,	31835,	21780,	7637,	15054,	12700,	7733,	2424,	2169,	1393,	5037,
4,	22512,	23758,	16277,	5851,	10951,	9244,	5387,	1846,	1506,	968,
5,	7424,	14403,	16225,	11098,	4195,	7228,	5963,	3708,	1263,	955,
6,	2725,	4701,	9103,	10537,	6564,	2740,	4789,	3869,	2535,	896,
7,	299,	1564,	2841,	5516,	6316,	3803,	1654,	3053,	2681,	1692,
8,	358,	209,	802,	1896,	2728,	3444,	2117,	1051,	2070,	1808,
9,	296,	175,	96,	520,	1063,	1433,	2188,	1396,	742,	1349,
+gp,	2953,	1211,	680,	314,	422,	144,	879,	1279,	1778,	1510,
0 TOTAL,	135542,	124027,	106066,	82590,	62239,	44829,	40017,	180758,	215079,	187422,

Table 10 Stock number at age (start of year) Numbers*10**-3

YEAR,	1996,	1997,	1998,	1999,	2000,	2001,	2002,	2003,	2004,	2005,	2006,
AGE											
0,	5590,	22919,	33666,	184888,	90042,	66397,	45824,	10881,	19023,	3502,	0,
1,	11331,	4577,	18764,	27563,	151373,	73720,	54361,	37517,	8908,	15575,	2867,
2,	46717,	9276,	3747,	15363,	22559,	123868,	60340,	44507,	30717,	7291,	12752,
3,	83035,	37953,	7525,	2972,	12421,	17148,	97451,	48031,	36319,	24929,	5893,
4,	3715,	63247,	28438,	5206,	1400,	7399,	11209,	67083,	36227,	27924,	18910,
5,	580,	2119,	42266,	18515,	3410,	956,	3866,	6572,	42618,	25327,	19403,
6,	577,	313,	1093,	25687,	10927,	2175,	626,	2079,	3376,	25485,	14672,
7,	614,	325,	151,	491,	15041,	6517,	1373,	393,	846,	1715,	15364,
8,	1119,	357,	155,	34,	198,	9740,	4294,	908,	175,	325,	917,
9,	1218,	672,	208,	48,	4,	90,	6730,	2753,	442,	63,	134,
+gp,	2040,	1561,	1085,	457,	313,	95,	202,	2981,	2143,	335,	165,
0 TOTAL,	156536,	143320,	137099,	281226,	307689,	308105,	286276,	223706,	180795,	132471,	91077,

Table 2.4.12 Faroe haddock. Stock summary of the VPA 2006.

	Table	16	Summary	(without	SOP	correction)	
Terminal	Fs	derived	using	XSA	(With F shrinkage)		
	Recruits	**Recruits**	**Total**	**Total**	**Landings**	**Yield/SSB**	**FBAR(3-7)**
Year	**Age 0**	**Age 2**	**Biomass**	**SSB**			
1957	64927	35106	90264	51049	20995	0.4113	0.49
1958	54061	39212	92975	51409	23871	0.4643	0.627
1959	77651	43417	89969	48340	20239	0.4187	0.5696
1960	58761	35763	96422	51101	25727	0.5035	0.7101
1961	71715	51279	93296	47901	20831	0.4349	0.5624
1962	45400	38537	98262	52039	27151	0.5217	0.6506
1963	33844	47362	90205	49706	27571	0.5547	0.7002
1964	30193	30110	75561	44185	19490	0.4411	0.4753
1965	37949	22644	71885	45605	18479	0.4052	0.526
1966	81929	20203	68774	44027	18766	0.4262	0.5288
1967	47771	25356	77103	42086	13381	0.3179	0.4031
1968	53244	54856	87974	45496	17852	0.3924	0.4377
1969	23141	31977	94884	53585	23272	0.4343	0.4853
1970	49629	35605	92151	59962	21361	0.3562	0.4762
1971	35423	15460	92942	63928	19393	0.3034	0.4564
1972	78987	33218	91521	63144	16485	0.2611	0.3961
1973	104943	23706	98997	61635	18035	0.2926	0.2901
1974	83710	52345	116918	64648	14773	0.2285	0.2205
1975	39176	70116	138974	75429	20715	0.2746	0.1798
1976	52445	56027	143719	89263	26211	0.2936	0.2474
1977	4167	26224	121145	96452	25555	0.265	0.3871
1978	7389	35155	120721	97344	19200	0.1972	0.2778
1979	5217	2794	99649	85524	12424	0.1453	0.1549
1980	23689	4952	87788	82042	15016	0.183	0.1776
1981	29451	3497	79130	76008	12233	0.1609	0.1809
1982	61240	15879	68480	56947	11937	0.2096	0.3299
1983	59665	19742	64195	51980	12894	0.2481	0.2644
1984	40064	41050	101369	54076	12378	0.2289	0.2273
1985	14383	39972	94738	63009	15143	0.2403	0.2742
1986	28509	26856	99600	66222	14477	0.2186	0.2215
1987	23245	9641	88852	68175	14882	0.2183	0.2607
1988	14263	19110	78747	62932	12178	0.1935	0.1973
1989	4544	15581	71676	52837	14325	0.2711	0.2783
1990	4017	9561	55613	45139	11726	0.2598	0.2623
1991	2725	3046	40655	36433	8429	0.2314	0.2604
1992	9692	2693	30859	28690	5476	0.1909	0.1965
1993	152627	1827	30532	24913	4026	0.1616	0.1759
1994	69693	6458	29220	23324	4252	0.1823	0.1922
1995	13840	102308	93680	24559	4948	0.2015	0.2224
1996	5590	46717	121046	54606	9642	0.1766	0.3134
1997	22919	9276	113522	87179	17924	0.2056	0.3645
1998	33666	3747	98373	87693	22210	0.2533	0.5165
1999	184888	15363	85966	68496	18482	0.2698	0.4298
2000	90042	22559	123317	58616	15821	0.2699	0.2601
2001	66397	123868	165774	68472	15890	0.2321	0.275
2002	45824	60340	174334	98849	24933	0.2522	0.2817
2003	10881	44507	158541	113889	26970	0.2368	0.422
2004	19023	30717	144155	102654	23036	0.2244	0.3541
2005	3502	7291	104756	87933	20305	0.2309	0.2636
Arith.							
Mean	44409	30878	94882	61827	17170	0.2877	0.3562
Units	(Thousands)	(Thousands)	(Tonnes)	(Tonnes)	(Tonnes)		

Table 2.4.13 **Management option tables INPUT DATA** **FAROE HADDOCK**

Stock size

The yearclasses up to 2004 included are derived from the final 2006 XSA.
The yearclasses 2006-2007 at age 2 are estimated from the 2006 XSA
applying a natural mortality of 0.2 in forward calculations of the numbers using standard VPA equations
The yearclass 2006 at age 2 in 2008 is estimated as the geomean of the yearclasses since 1980

	Age0	Age1	Age2
YC2004	19023	15576	12752
YC2005	3502	2867	2347
YC2006			
0.818731			

Age	2006	2007	2008
2	12752	2350	13795
3	5893		
4	18910		
5	19403		
6	14672		
7	15364		
8	917		
9	134		
10+	165		

Predicted values rounded

Year	age 2	Geomean(1980-2007)
1980	4952	
1981	3497	
1982	15879	
1983	19742	
1984	41050	
1985	39972	
1986	26856	
1987	9641	
1988	19110	13795
1989	15581	
1990	9561	
1991	3046	
1992	2693	
1993	1827	
1994	6458	
1995	102308	
1996	46717	
1997	9276	
1998	3747	
1999	15363	
2000	22559	
2001	123868	
2002	60340	
2003	44507	
2004	30717	
2005	7291	
2006	12752	
2007	2350	
2008	13795	

Proportion mature at age

Age	2006	2007	2008	2004	2005	2006	Avg(04-06)
2	0.02	0.01	0.01	0.00	0.01	0.02	0.01
3	0.31	0.33	0.33	0.35	0.34	0.31	0.33
4	0.88	0.91	0.91	0.94	0.91	0.88	0.91
5	0.99	0.99	0.99	0.99	0.99	0.99	0.99
6	1.00	1.00	1.00	1.00	1.00	1.00	1.00
7	1.00	1.00	1.00	1.00	1.00	1.00	1.00
8	1.00	1.00	1.00	1.00	1.00	1.00	1.00
9	1.00	1.00	1.00	1.00	1.00	1.00	1.00
10+	1.00	1.00	1.00	1.00	1.00	1.00	1.00

The maturity at age 2007-2008 is estimated as the
average of the maturity at age 2004-2006

Catch/stock weights at age

Age	2006	2007	2008
2	0.538	0.538	0.538
3	0.649	0.649	0.649
4	0.797	0.797	0.797
5	1.020	1.020	1.020
6	1.245	1.245	1.245
7	1.843	1.843	1.843
8	2.061	2.061	2.061
9	2.263	2.263	2.263
10+	2.579	2.579	2.579

Prediction using 2005 mean catch weight at age from the 2006 assessment

	2005	2006	2007	2008
2	0.538	0.538	0.538	0.538
3	0.649	0.649	0.649	0.649
4	0.797	0.797	0.797	0.797
5	1.02	1.02	1.02	1.02
6	1.245	1.245	1.245	1.245
7	1.843	1.843	1.843	1.843
8	2.061	2.061	2.061	2.061
9	2.263	2.263	2.263	2.263
10+	2.579	2.579	2.579	2.579

Exploitation pattern

Age	2006	2007	2008	2003	2004	2005	Average F for 2003-05	Age	Rescaled to Fbar2005 Average F for 2003-05
2	0.0063	0.0063	0.0063	0.0033	0.0088	0.0128	0.0083	2	0.0063
3	0.0561	0.0561	0.0561	0.082	0.0629	0.0763	0.0737	3	0.0561
4	0.1460	0.1460	0.1460	0.2537	0.1579	0.1641	0.1919	4	0.1460
5	0.2856	0.2856	0.2856	0.4662	0.3142	0.3459	0.3754	5	0.2856
6	0.3758	0.3758	0.3758	0.6989	0.4772	0.3061	0.4941	6	0.3758
7	0.4546	0.4546	0.4546	0.609	0.7582	0.4257	0.5976	7	0.4546
8	0.5159	0.5159	0.5159	0.52	0.8273	0.6873	0.6782	8	0.5159
9	0.4146	0.4146	0.4146	0.4204	0.5324	0.6824	0.5451	9	0.4146
10+	0.4146	0.4146	0.4146	0.4204	0.5324	0.6824	0.5451	10+	0.4146
Avg3-7	0.2636	0.2636	0.2636	0.422	0.3541	0.2636	Fbar(3-7) 0.3466	Fbar(3-7)	0.2636

The exploitation pattern is estimated from the average fishing mortality matrix 2003-2005 from the final VPA in 2006 (re-scaled to 2005)

Table 2.4.14 Faroe haddock. Management option table - Input data

MFDP version 1
Run: STP2006
Time and date: 22:05 5/1/2006
Fbar age range: 3-7

2006

Age	N	M	Mat	PF	PM	SWt	Sel	CWt
2	12752	0.2	0.02	0	0	0.538	0.0063	0.538
3	5893	0.2	0.31	0	0	0.649	0.0561	0.649
4	18910	0.2	0.88	0	0	0.797	0.1460	0.797
5	19403	0.2	0.99	0	0	1.020	0.2856	1.020
6	14672	0.2	1.00	0	0	1.245	0.3758	1.245
7	15364	0.2	1.00	0	0	1.843	0.4546	1.843
8	917	0.2	1.00	0	0	2.061	0.5159	2.061
9	134	0.2	1.00	0	0	2.263	0.4146	2.263
10	165	0.2	1.00	0	0	2.579	0.4146	2.579

2007

Age	N	M	Mat	PF	PM	SWt	Sel	CWt
2	2350	0.2	0.01	0	0	0.538	0.0063	0.538
3	.	0.2	0.33	0	0	0.649	0.0561	0.649
4	.	0.2	0.91	0	0	0.797	0.1460	0.797
5	.	0.2	0.99	0	0	1.020	0.2856	1.020
6	.	0.2	1.00	0	0	1.245	0.3758	1.245
7	.	0.2	1.00	0	0	1.843	0.4546	1.843
8	.	0.2	1.00	0	0	2.061	0.5159	2.061
9	.	0.2	1.00	0	0	2.263	0.4146	2.263
10	.	0.2	1.00	0	0	2.579	0.4146	2.579

2008

Age	N	M	Mat	PF	PM	SWt	Sel	CWt
2	13795	0.2	0.01	0	0	0.538	0.0063	0.538
3	.	0.2	0.33	0	0	0.649	0.0561	0.649
4	.	0.2	0.91	0	0	0.797	0.1460	0.797
5	.	0.2	0.99	0	0	1.020	0.2856	1.020
6	.	0.2	1.00	0	0	1.245	0.3758	1.245
7	.	0.2	1.00	0	0	1.843	0.4546	1.843
8	.	0.2	1.00	0	0	2.061	0.5159	2.061
9	.	0.2	1.00	0	0	2.263	0.4146	2.263
10	.	0.2	1.00	0	0	2.579	0.4146	2.579

Input units are thousands and kg - output in tonnes

Table 2.4.15 Faroe haddock. Management option table - Results

MFDP version 1
Run: STP2006
Index file 01/05/2006
Time and date: 22:05 5/1/2006
Fbar age range: 3-7

2006				
Biomass	**SSB**	**FMult**	**FBar**	**Landings**
94749	83380	1	0.2636	22153

2007					2008	
Biomass	**SSB**	**FMult**	**FBar**	**Landings**	**Biomass**	**SSB**
73234	67007	0	0	0	80879	72071
.	67007	0.1	0.0264	2344	78321	69518
.	67007	0.2	0.0527	4596	75868	67069
.	67007	0.3	0.0791	6758	73513	64719
.	67007	0.4	0.1054	8836	71253	62463
.	67007	0.5	0.1318	10831	69084	60298
.	67007	0.6	0.1582	12749	67001	58220
.	67007	0.7	0.1845	14591	65002	56225
.	67007	0.8	0.2109	16362	63082	54310
.	67007	0.9	0.2373	18064	61239	52470
.	67007	1	0.2636	19701	59468	50704
.	67007	1.1	0.29	21274	57768	49008
.	67007	1.2	0.3163	22787	56134	47379
.	67007	1.3	0.3427	24242	54565	45814
.	67007	1.4	0.3691	25642	53058	44310
.	67007	1.5	0.3954	26988	51609	42866
.	67007	1.6	0.4218	28284	50217	41478
.	67007	1.7	0.4482	29530	48878	40144
.	67007	1.8	0.4745	30730	47592	38861
.	67007	1.9	0.5009	31885	46356	37629
.	67007	2	0.5272	32997	45167	36444

Input units are thousands and kg - output in tonnes

Table 2.4.16 Faroe haddock. Long-term Prediction - Input data

MFYPR version 1
Run: YPR2006
Index file 01/05/2006
Time and date: 21:42 5/1/2006
Fbar age range: 3-7

Age	M	Mat	PF	PM	SWt	Sel	CWt	
2	0.2	0.06	0	0	0.558	0.0063	0.558
3	0.2	0.46	0	0	0.812	0.0561	0.812
4	0.2	0.91	0	0	1.084	0.1460	1.084
5	0.2	0.99	0	0	1.422	0.2856	1.422
6	0.2	1.00	0	0	1.741	0.3758	1.741
7	0.2	1.00	0	0	2.040	0.4546	2.040
8	0.2	1.00	0	0	2.261	0.5159	2.261
9	0.2	1.00	0	0	2.487	0.4146	2.487
10	0.2	1.00	0	0	2.802	0.4146	2.802

Weights in kilograms

Table 2.4.17 **Faroe haddock. Long-term Prediction - Results**

MFYPR version 1
Run: YPR2006
Time and date: 21:42 5/1/2006
Yield per results

FMult	Fbar	CatchNos	Yield	StockNos	Biomass	SpwnNosJan	SSBJan	SpwnNosSpwn	SSBSpwn
0	0	0	0	5.5167	8.6779	4.0638	7.7173	4.0638	7.7173
0.1	0.0264	0.1024	0.2089	5.0069	7.3529	3.5548	6.3932	3.5548	6.3932
0.2	0.0527	0.1749	0.3429	4.646	6.4369	3.1947	5.478	3.1947	5.478
0.3	0.0791	0.2292	0.433	4.3764	5.7695	2.9259	4.8114	2.9259	4.8114
0.4	0.1054	0.2715	0.4958	4.1667	5.2637	2.717	4.3064	2.717	4.3064
0.5	0.1318	0.3055	0.5408	3.9985	4.8683	2.5496	3.9118	2.5496	3.9118
0.6	0.1582	0.3335	0.5737	3.8601	4.5512	2.412	3.5955	2.412	3.5955
0.7	0.1845	0.3571	0.5981	3.7439	4.2915	2.2965	3.3366	2.2965	3.3366
0.8	0.2109	0.3772	0.6166	3.6445	4.075	2.1978	3.1209	2.1978	3.1209
0.9	0.2373	0.3948	0.6307	3.5583	3.8917	2.1124	2.9384	2.1124	2.9384
1	0.2636	0.4102	0.6416	3.4826	3.7344	2.0375	2.7819	2.0375	2.7819
1.1	0.29	0.4239	0.6501	3.4155	3.5978	1.971	2.6461	1.971	2.6461
1.2	0.3163	0.4362	0.6567	3.3552	3.478	1.9116	2.5271	1.9116	2.5271
1.3	0.3427	0.4473	0.662	3.3009	3.3719	1.8579	2.4217	1.8579	2.4217
1.4	0.3691	0.4574	0.6661	3.2514	3.2772	1.8091	2.3278	1.8091	2.3278
1.5	0.3954	0.4667	0.6693	3.206	3.1921	1.7645	2.2434	1.7645	2.2434
1.6	0.4218	0.4753	0.6719	3.1643	3.115	1.7235	2.167	1.7235	2.167
1.7	0.4482	0.4832	0.6739	3.1257	3.0447	1.6856	2.0975	1.6856	2.0975
1.8	0.4745	0.4906	0.6754	3.0897	2.9804	1.6504	2.0339	1.6504	2.0339
1.9	0.5009	0.4975	0.6766	3.0562	2.9213	1.6175	1.9755	1.6175	1.9755
2	0.5272	0.504	0.6775	3.0248	2.8666	1.5868	1.9215	1.5868	1.9215

Reference point	F multiplier	Absolute F
Fbar(3-7)	1	0.2636
FMax	2.4588	0.6482
F0.1	0.6233	0.1643
F35%SPR	1.0579	0.2789
Flow	-99	
Fmed	1.2567	0.3313
Fhigh	5.7608	1.5187

Weights in kilograms

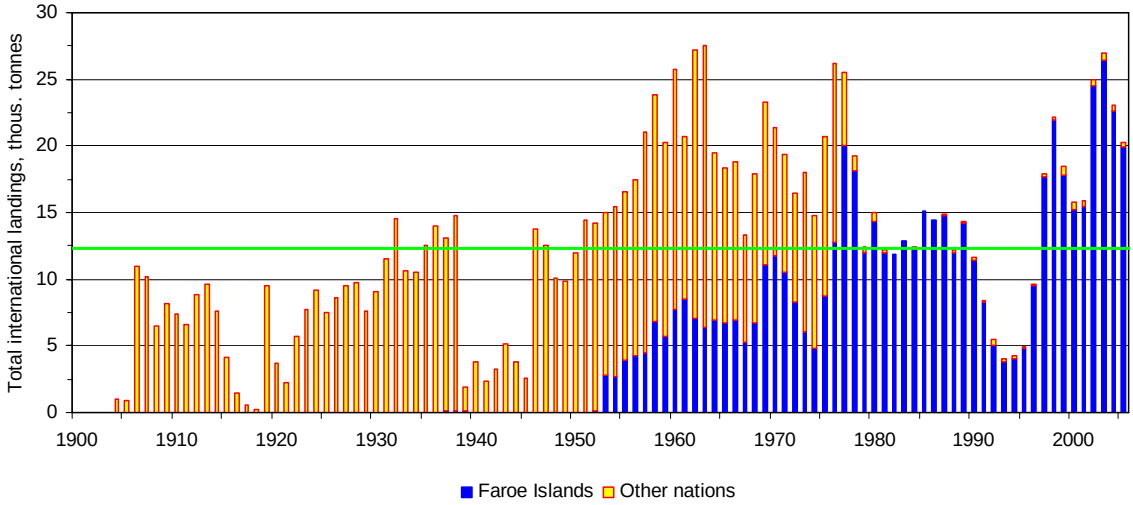

Figure 2.4.1. Haddock in ICES Division Vb. Landings by all nations 1904-2005.

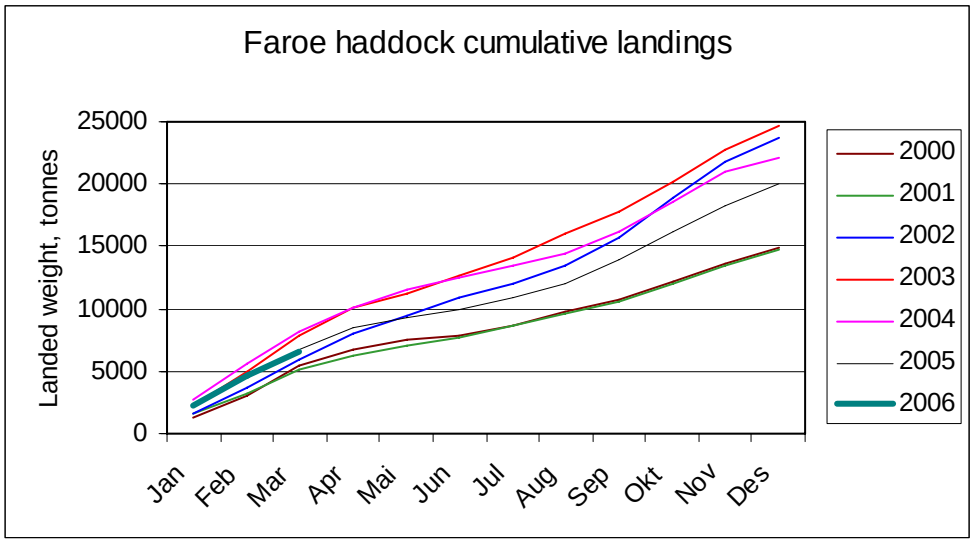

Figure 2.4.2. Faroe haddock. Cumulative Faroese landings from Vb.

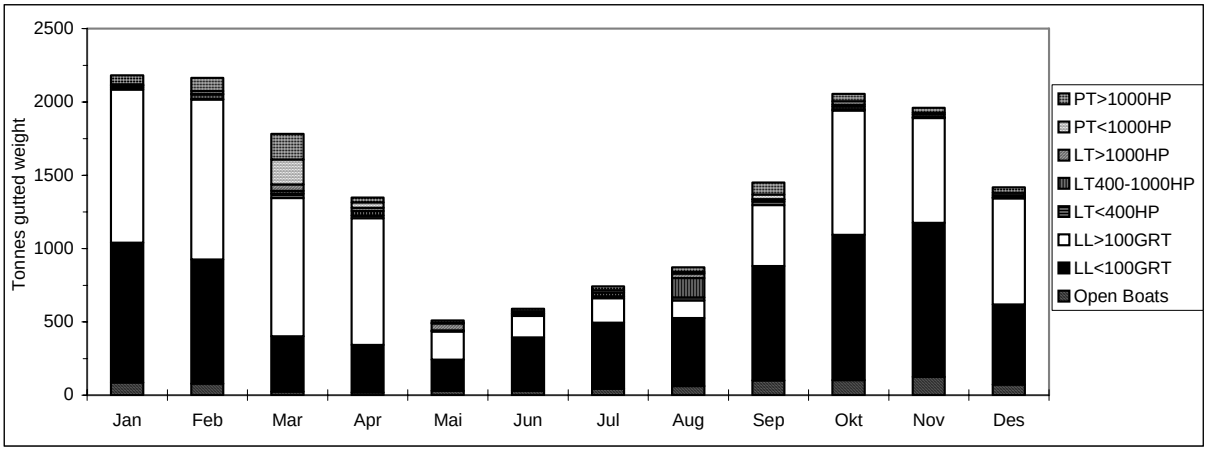

Figure 2.4.3.A. Faroese landings of haddock from Vb1 in 2005 by fleet. Tonnes ungutted weight.

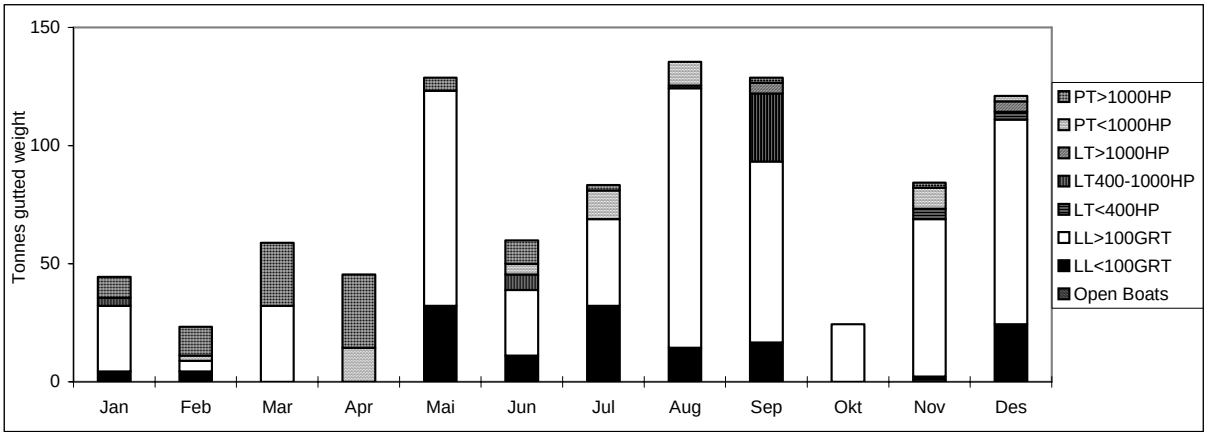

Figure 2.4.3.B. Faroese landings of haddock from Vb2 in 2005 by fleet. Tonnes ungutted weight.

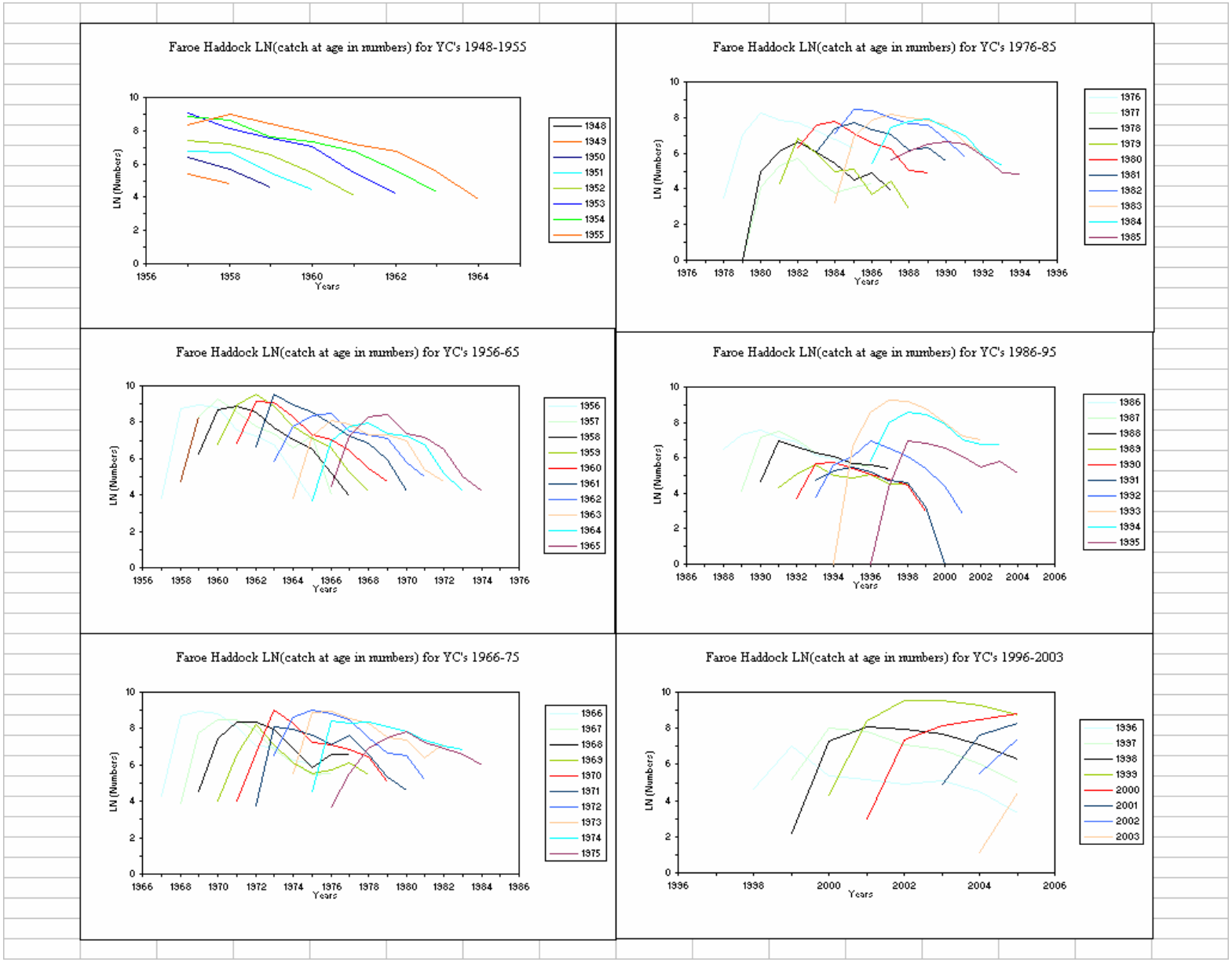

Figure 2.4.4. Faroe haddock. LN(catch@age in numbers) for YC's 1953 onwards.

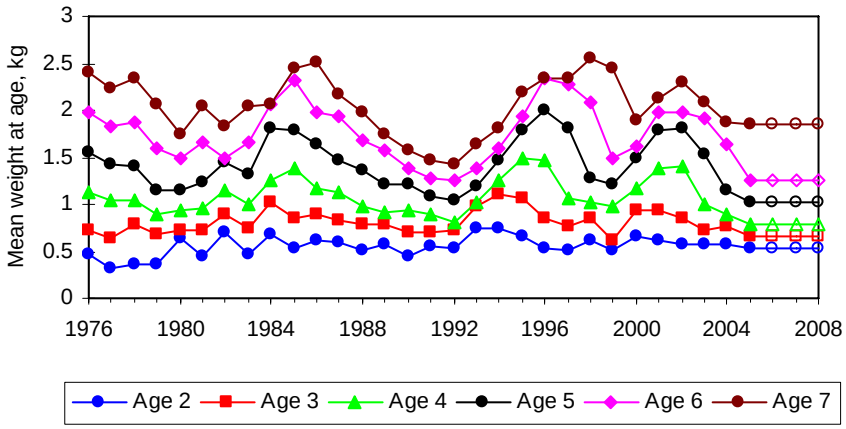

Figure 2.4.5. Faroe haddock. Mean weight at age (2-7). 2006-2008 are predicted values used in the short term prediction (open symbols).

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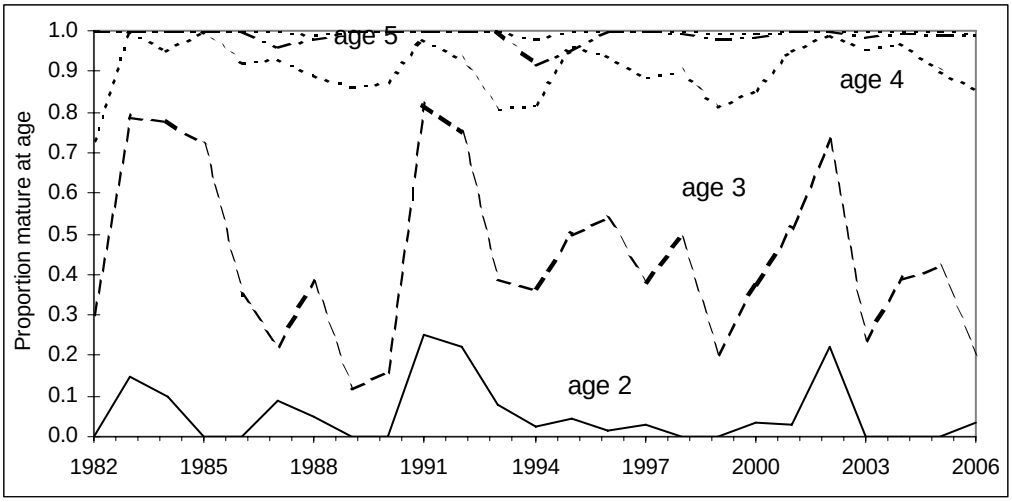


Figure 2.4.6A. Faroe haddock. Maturity at age. Observed values from the spring survey.

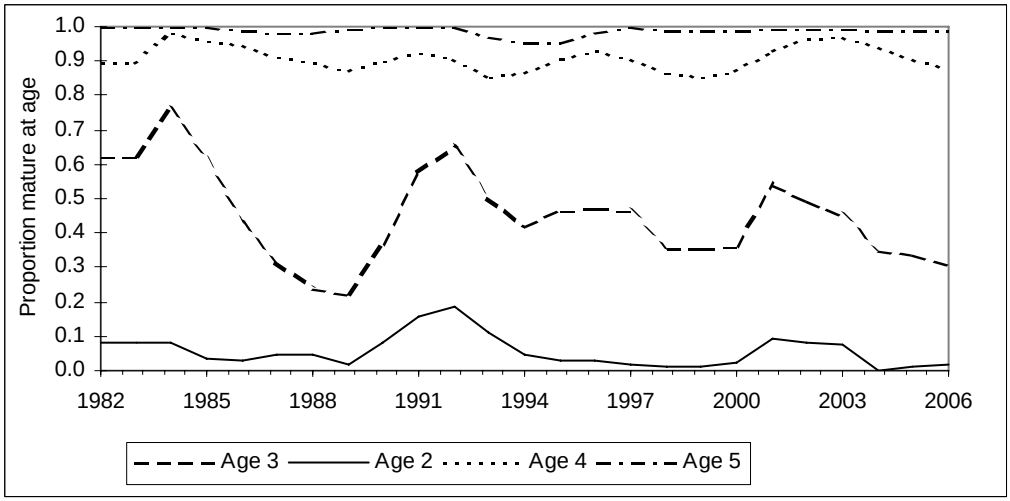


Figure 2.4.6B. Faroe haddock. Maturity at age. Running 3 years average from the spring survey.

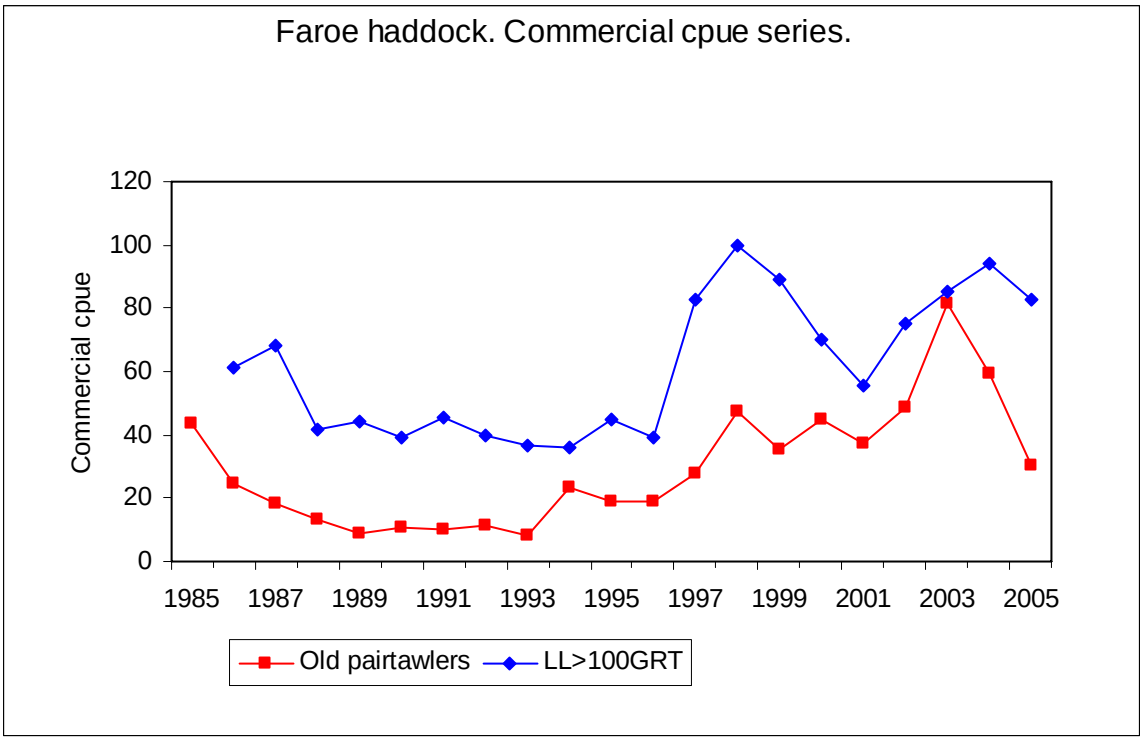


Figure 2.4.7. Pair trawlers > 1000HP and longliners > 100 HP.

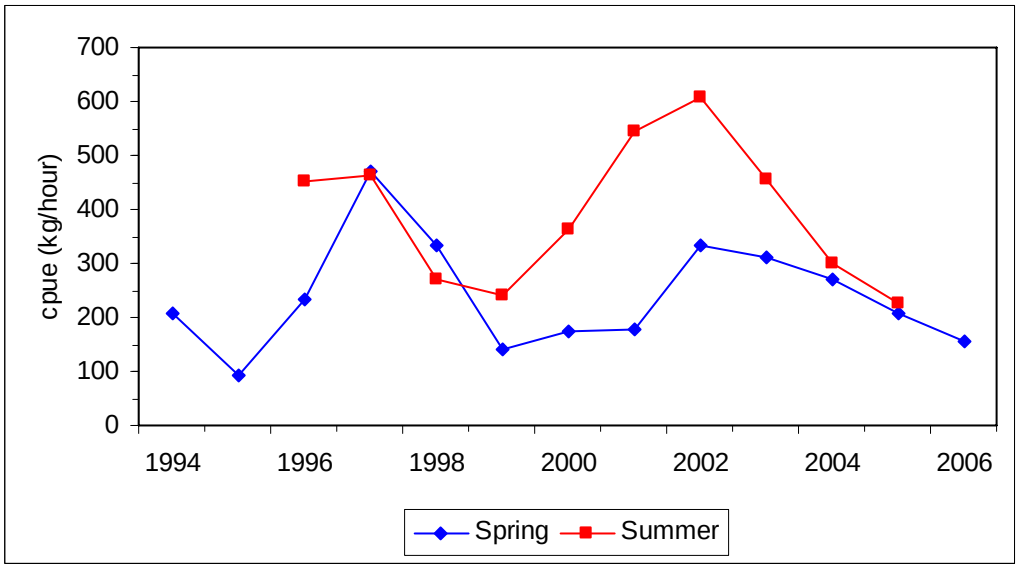
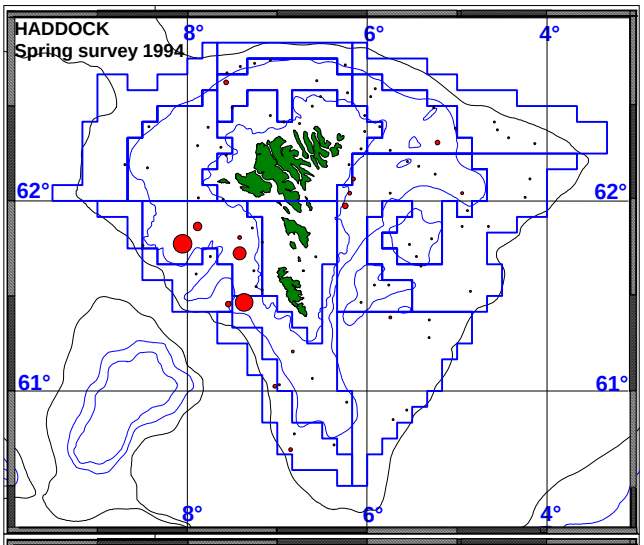
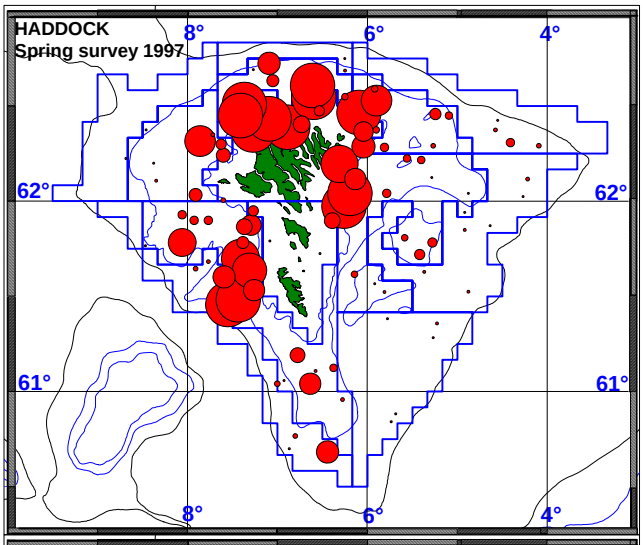
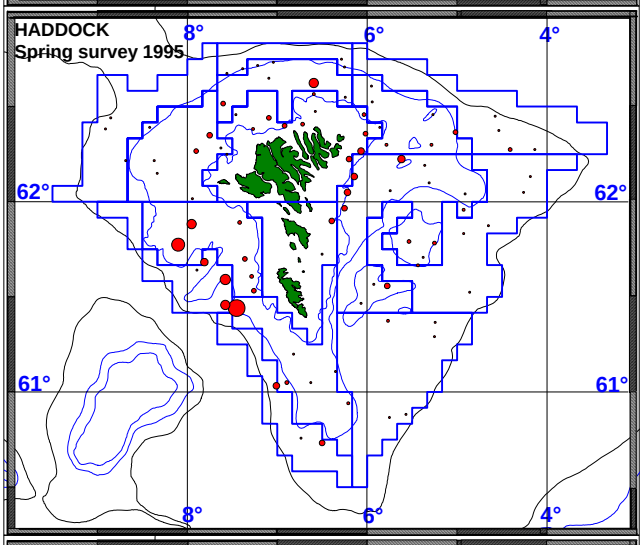


Figure 2.4.8. Faroe haddock. CPUE (kg/trawlhour) in the spring and summer surveys.


HADDOCK
Spring survey 1994
8°
6°
4°
62°
61°


HADDOCK
Spring survey 1997
8°
6°
4°
62°
61°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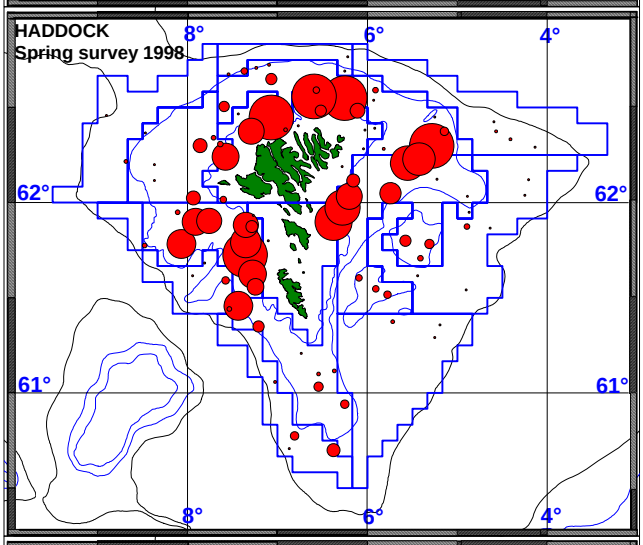
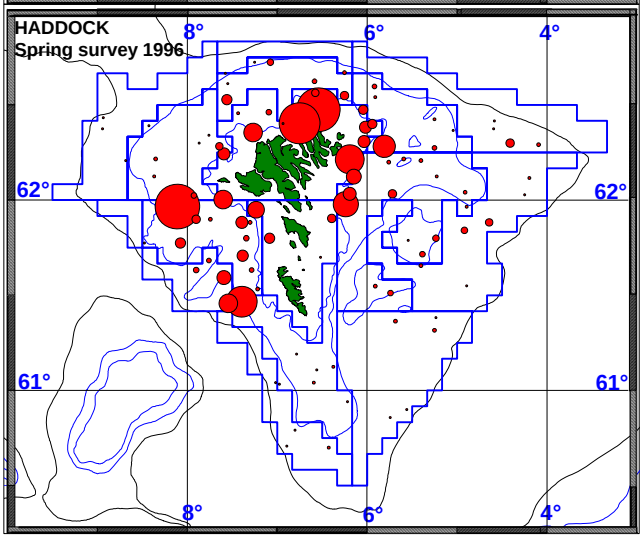
Spring survey 1995
8°
6°
4°
62°
61°


HADDOCK
Spring survey 1998
8°
6°
4°
62°
61°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Spring survey 1996
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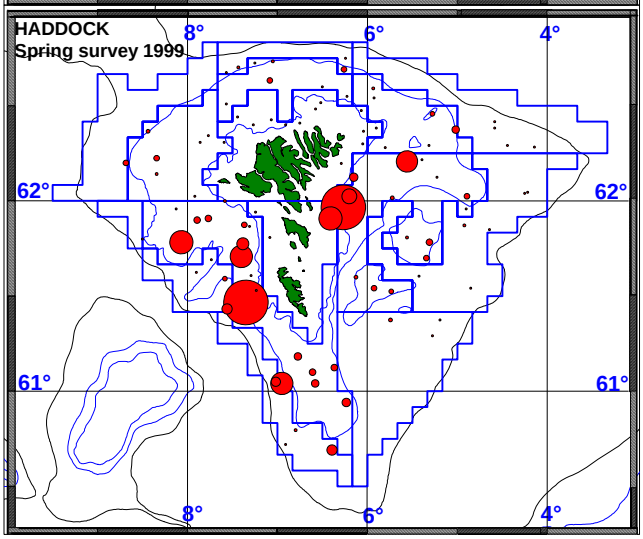
6°
4°
62°
61°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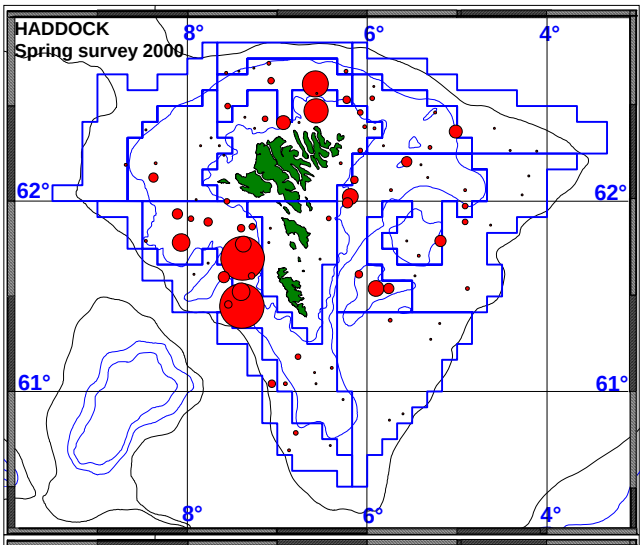
Spring survey 1999
8°
6°
4°
62°
61°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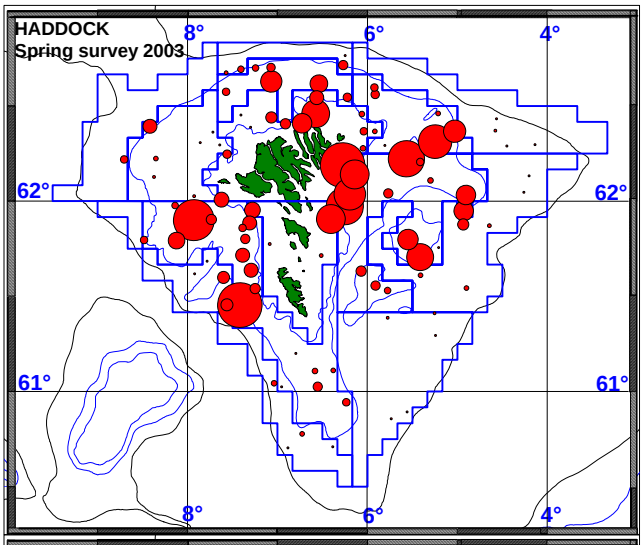
Spring survey 2000
8°
6°
4°
62°
61°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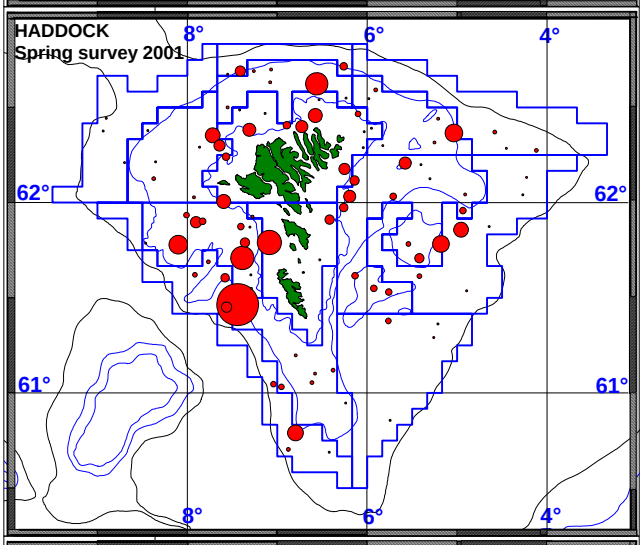
Spring survey 2003
8°
6°
4°
62°
61°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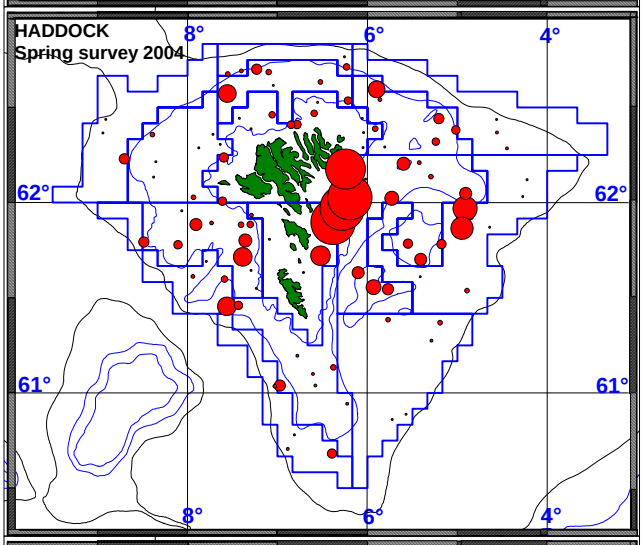
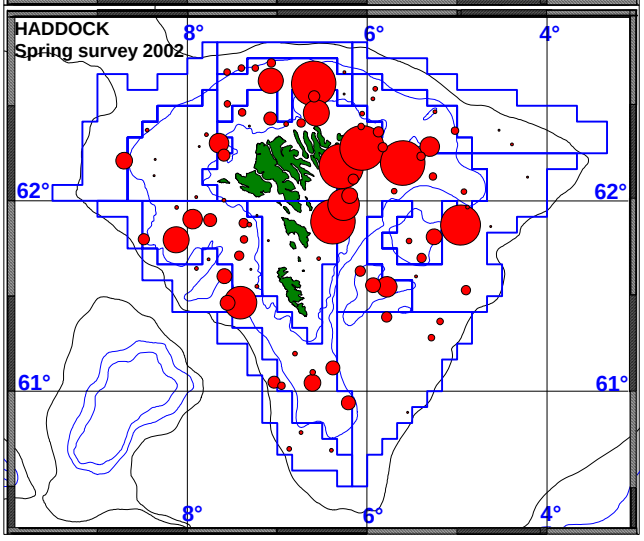
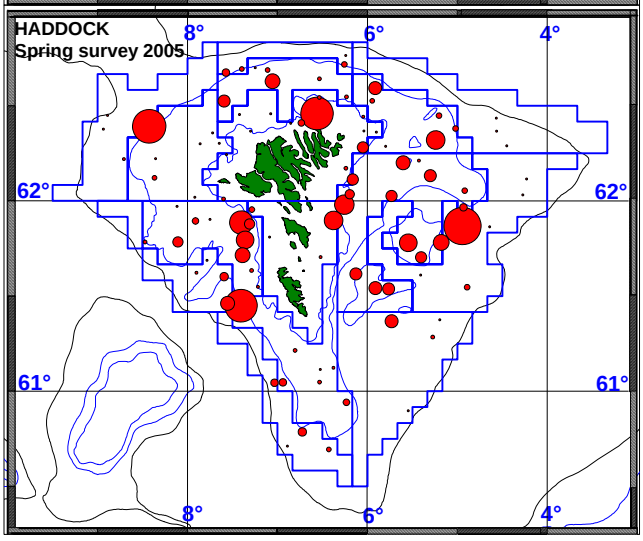
Spring survey 2001
8°
6°
4°
62°
61°


HADDOCK
Spring survey 2004
8°
6°
4°
62°
61°


HADDOCK
Spring survey 2002
8°
6°
4°
62°
61°


HADDOCK
Spring survey 2005
8°
6°
4°
62°
61°

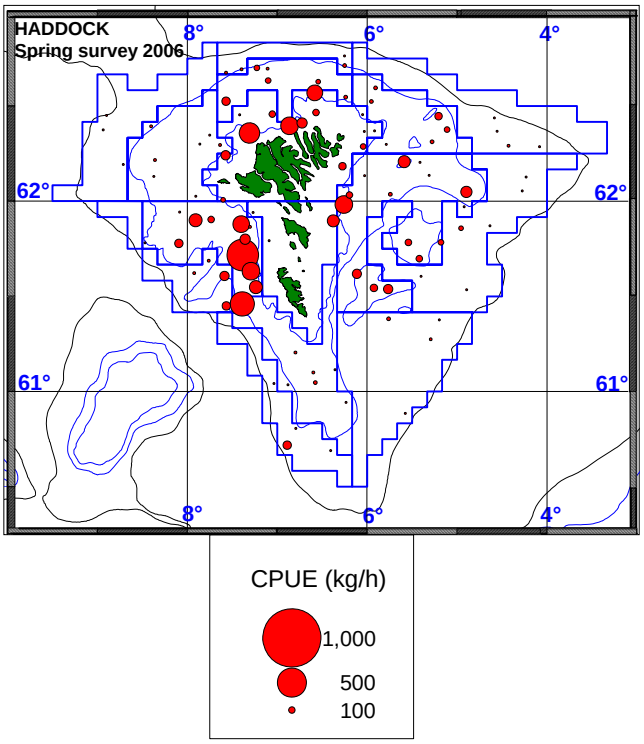
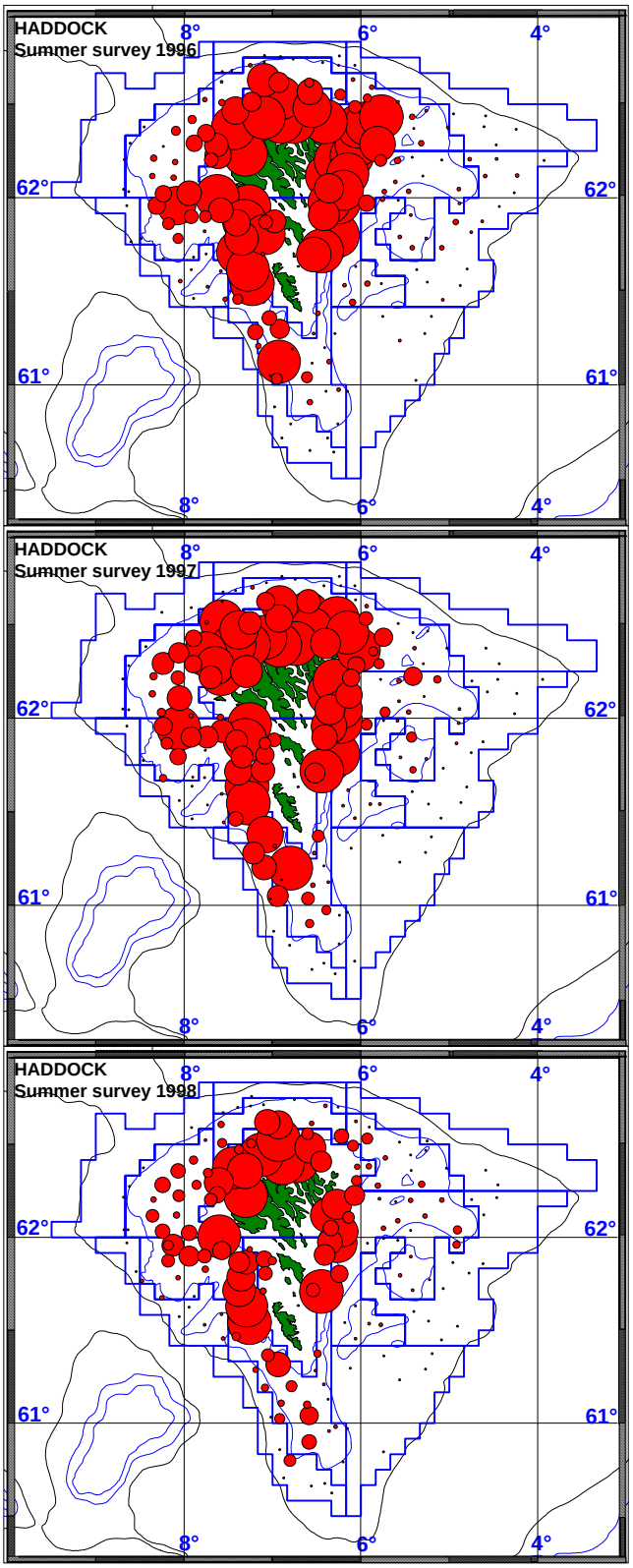


Figure 2.4.9. Distribution of Faroe haddock catches by year in the spring surveys.


HADDOCK
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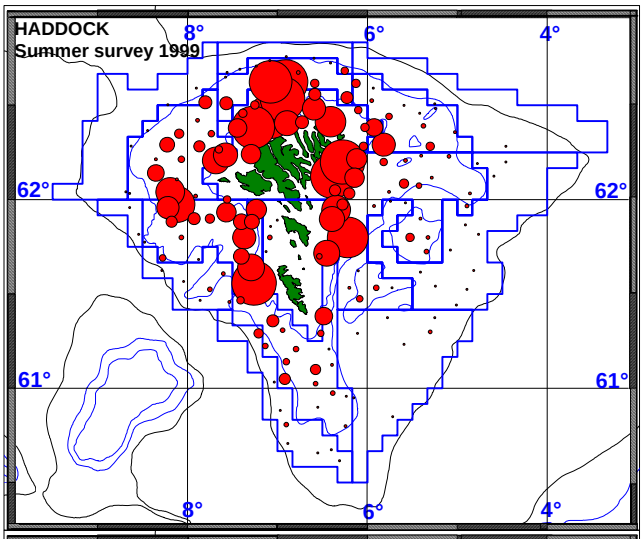
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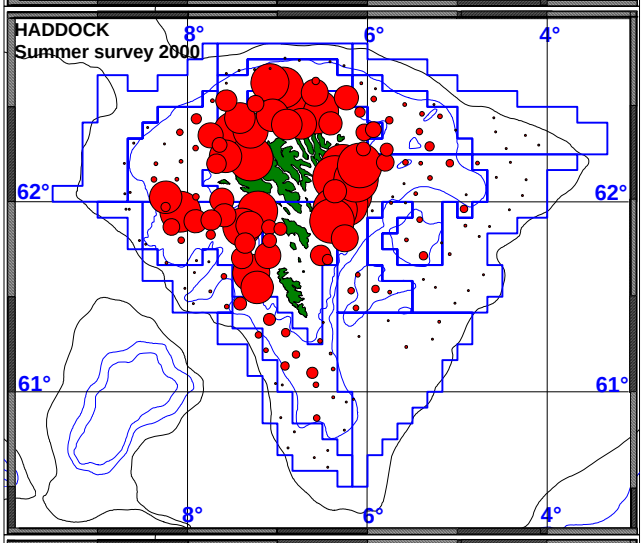
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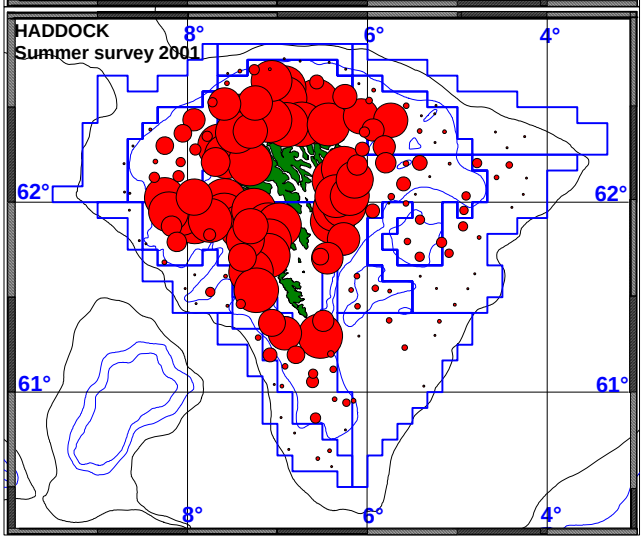
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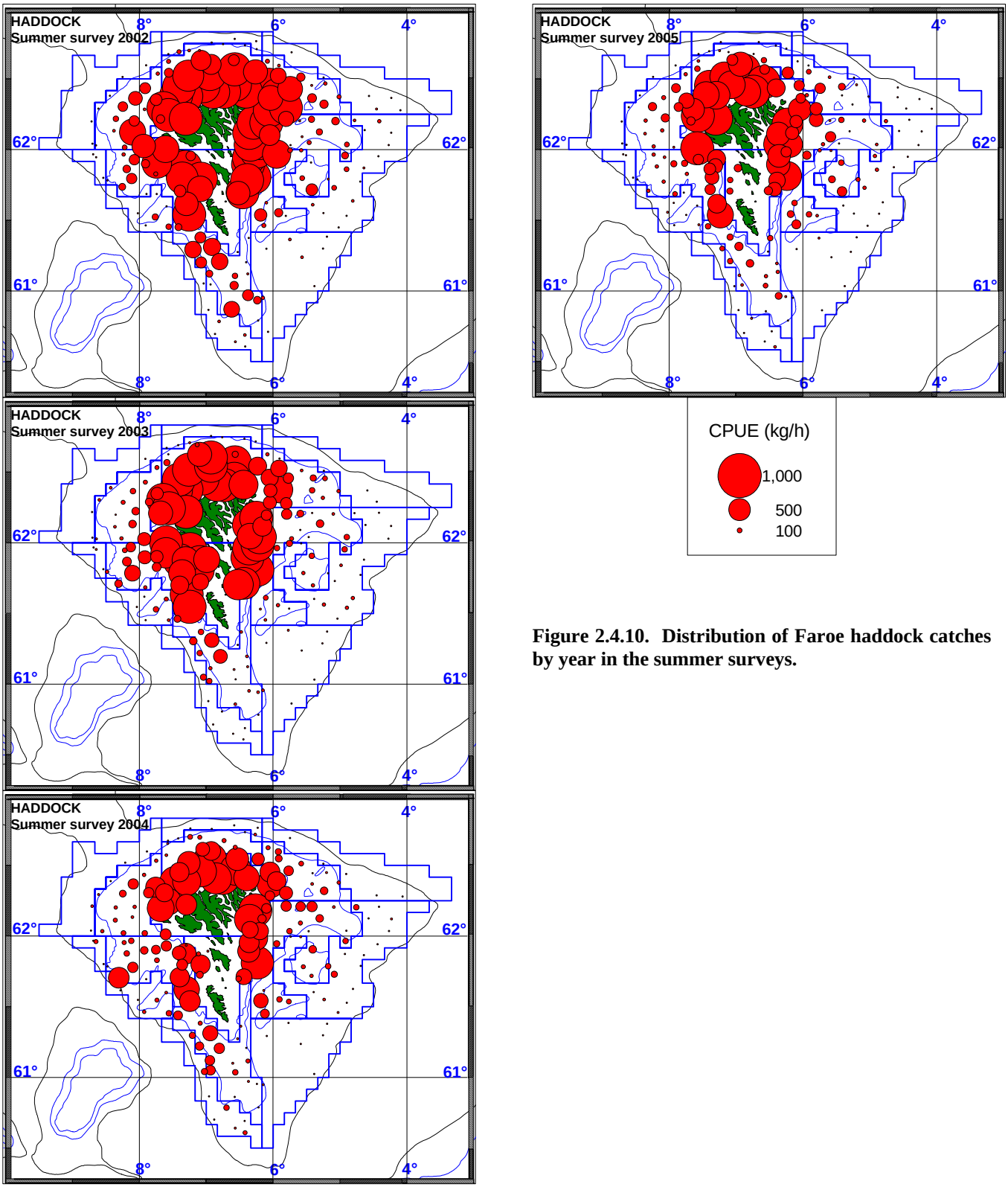


Figure 2.4.10. Distribution of Faroe haddock catches by year in the summer surveys.

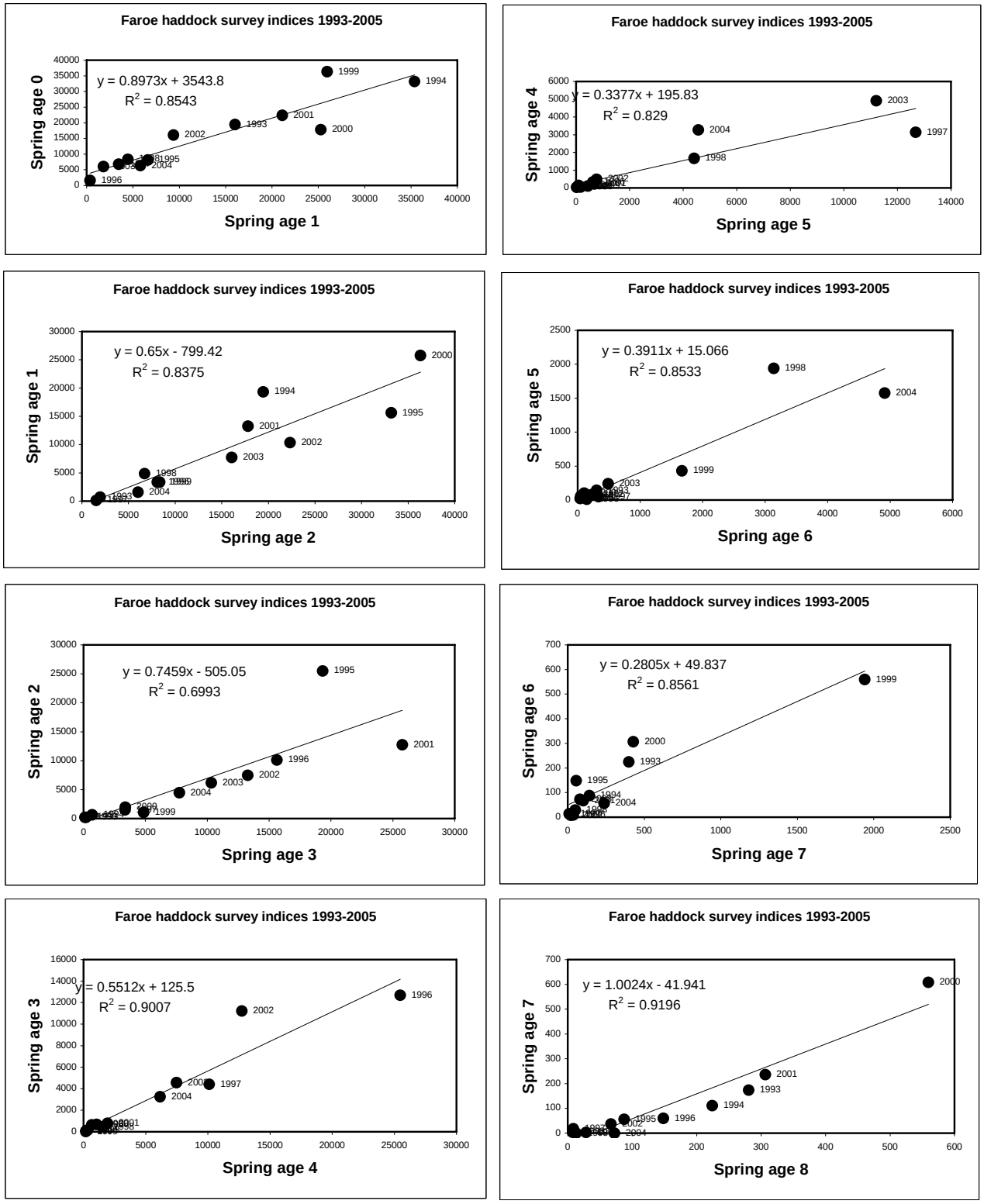


Figure 2.4.11. Faroe haddock. Comparison between spring survey indices at age and the indices of the same YC one year later.

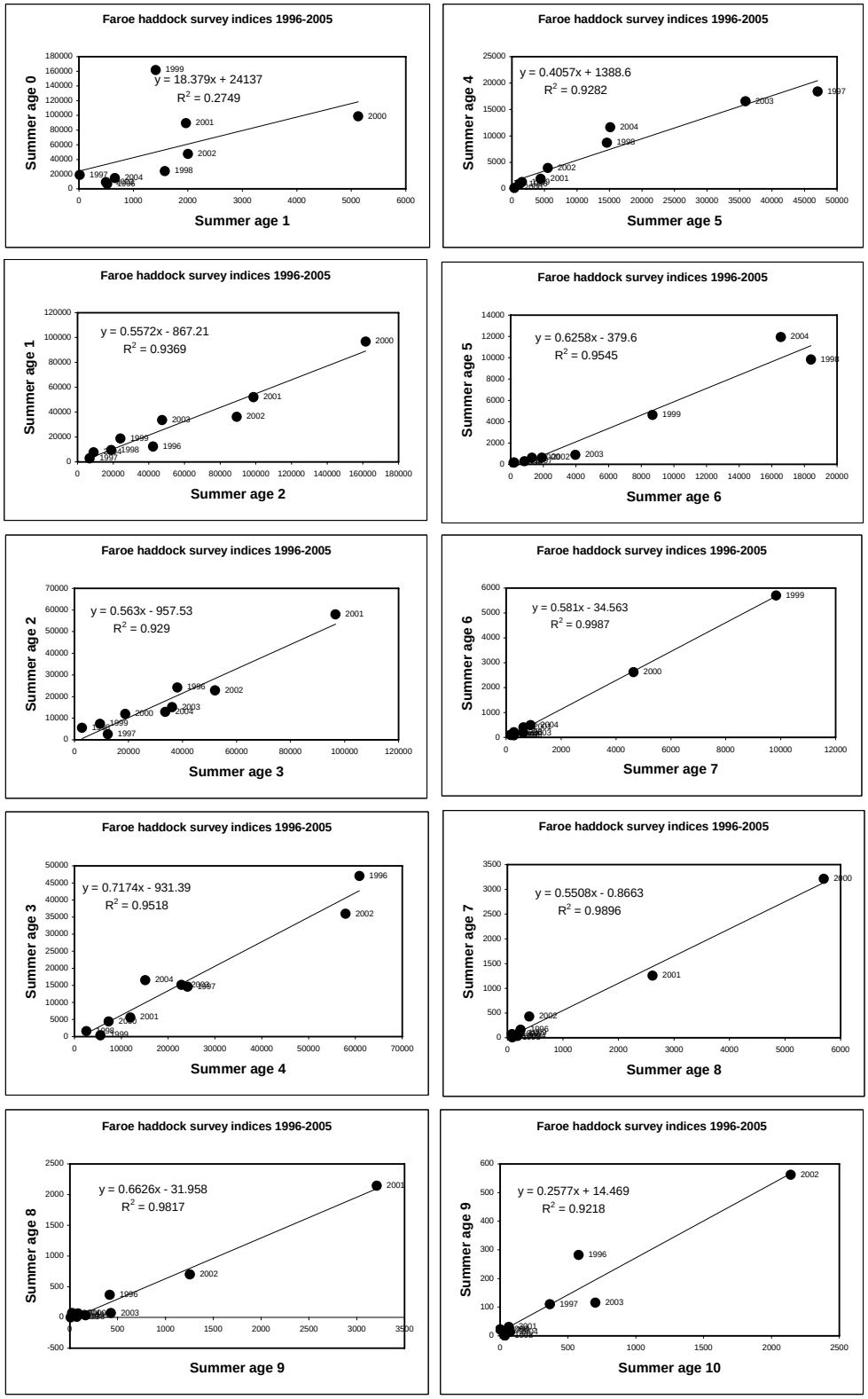


Figure 2.4.12. Faroe haddock. Comparison between summer survey indices at age and the indices of the same YC one year later.

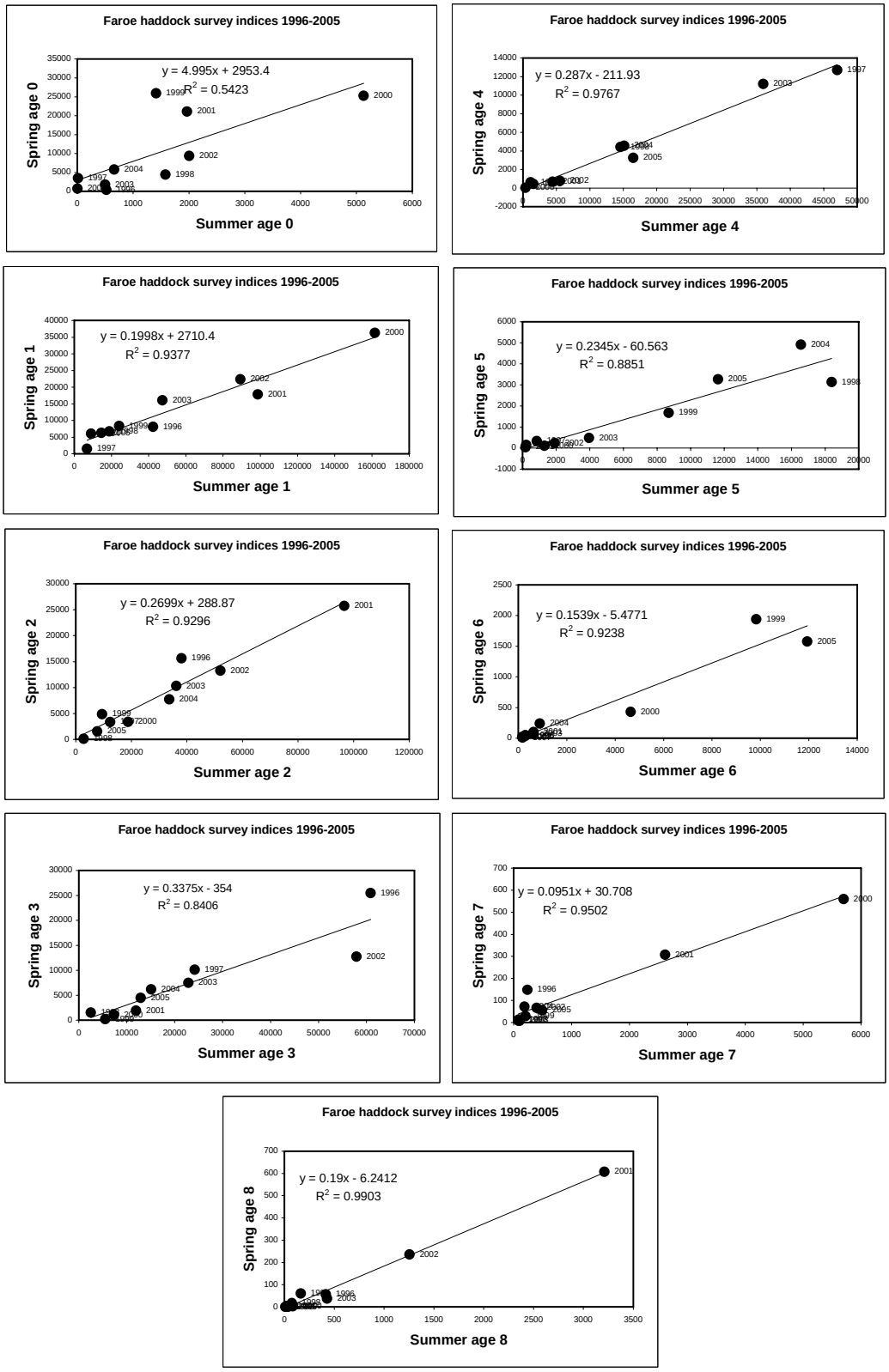
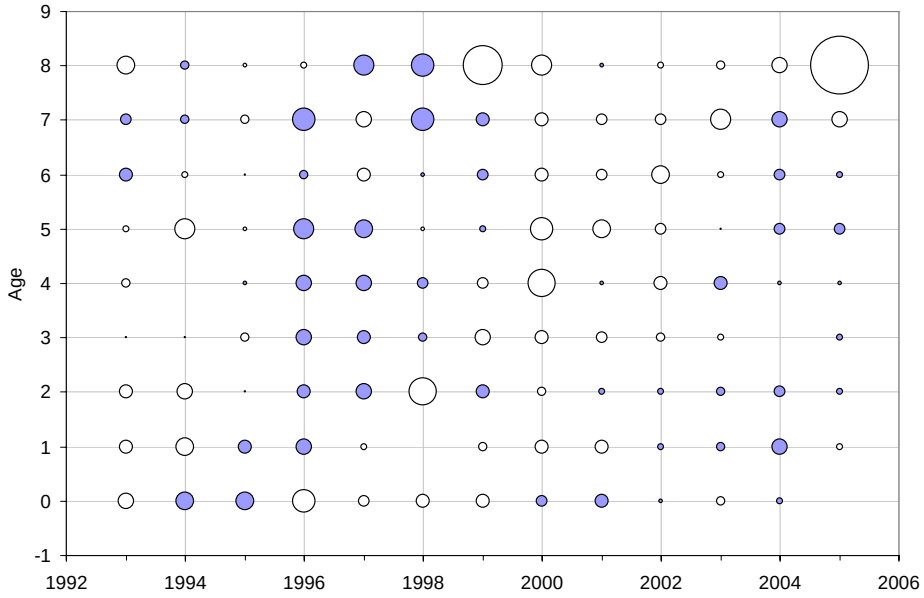


Figure 2.4.13. Faroe haddock. Comparison between indices at age from the spring and summer surveys.

Faroe haddock. Spring survey log q residuals.



Faroe haddock. Summer survey log q residuals.

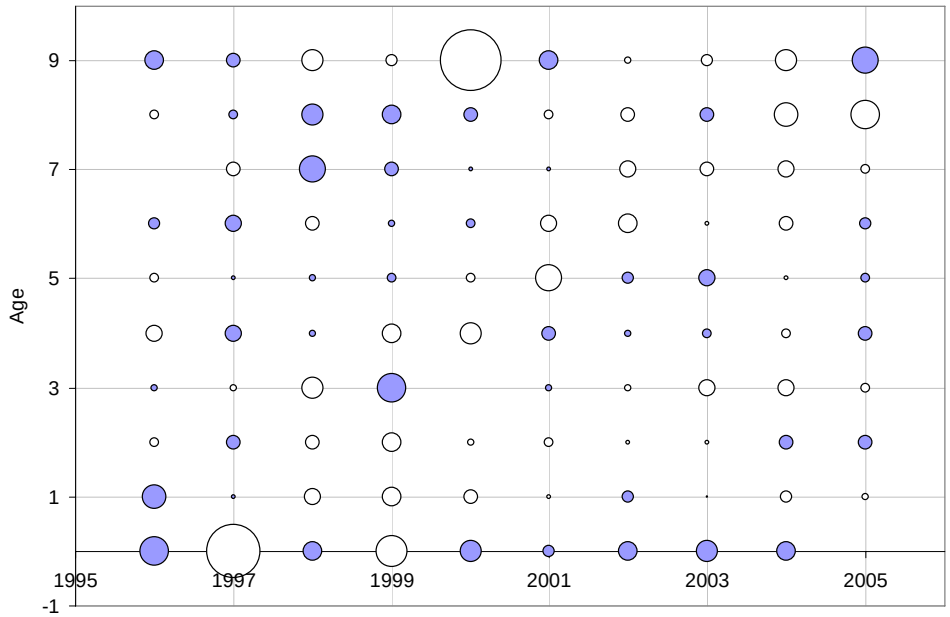


Figure 2.4.14. Faroe haddock survey log q residuals.

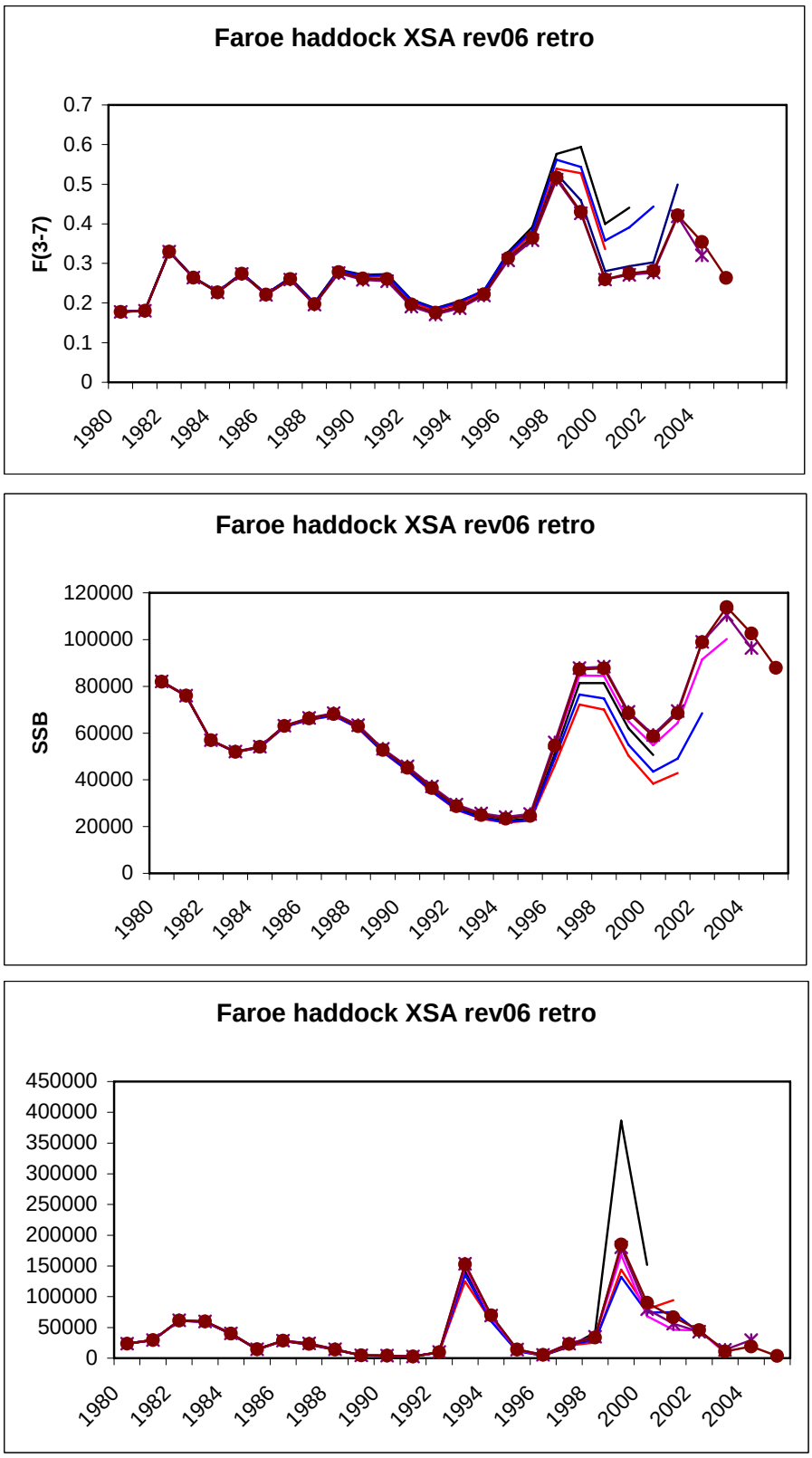


Figure 2.4.15. Faroe haddock. Retrospective analysis on the 2006 XSA.

Figure 2.4.16. Faroe haddock (Division Vb) standard graphs from the 2006 assessment

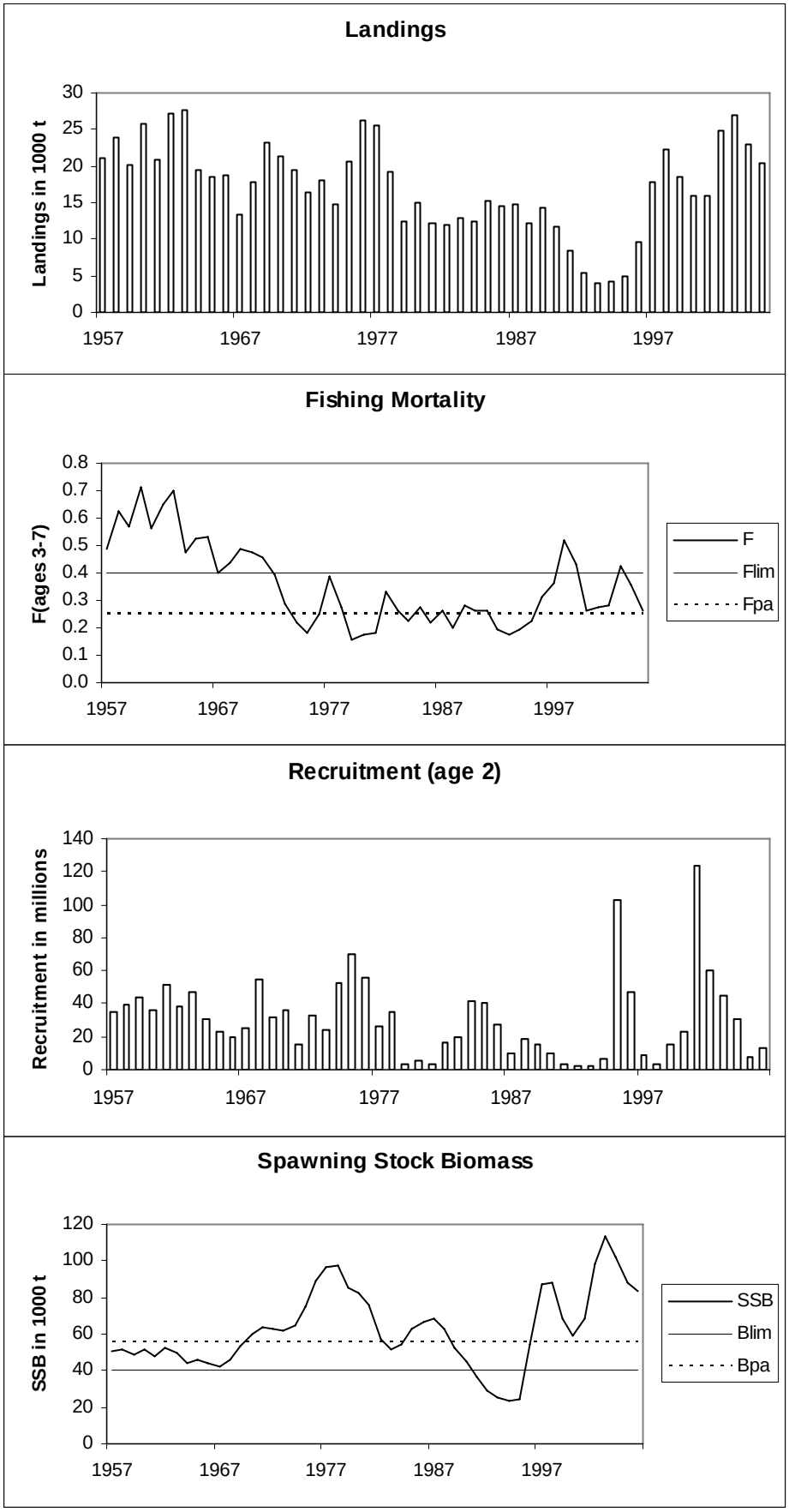
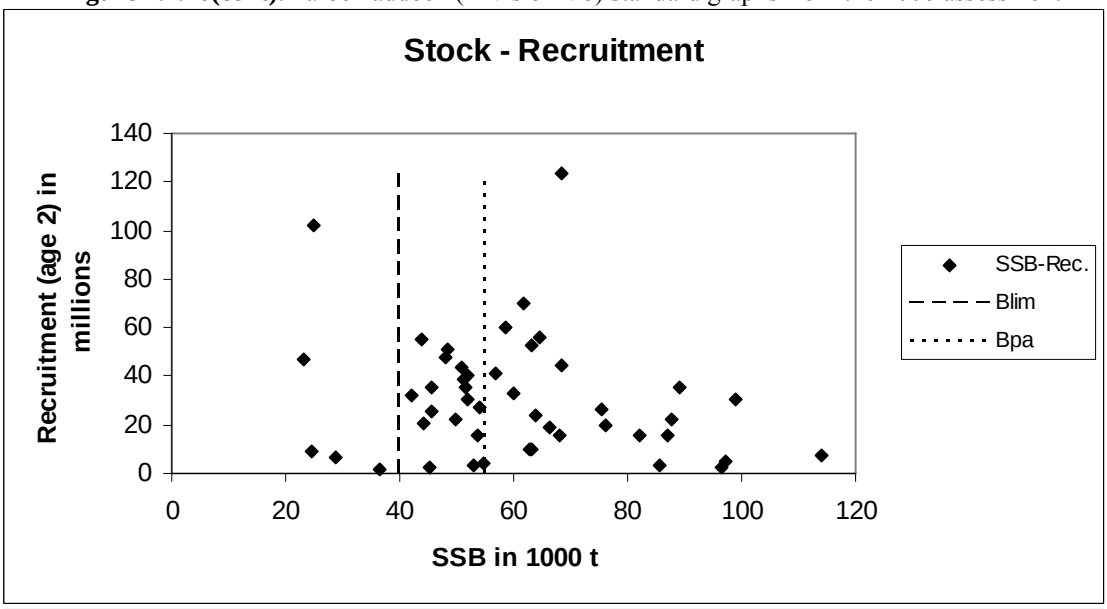
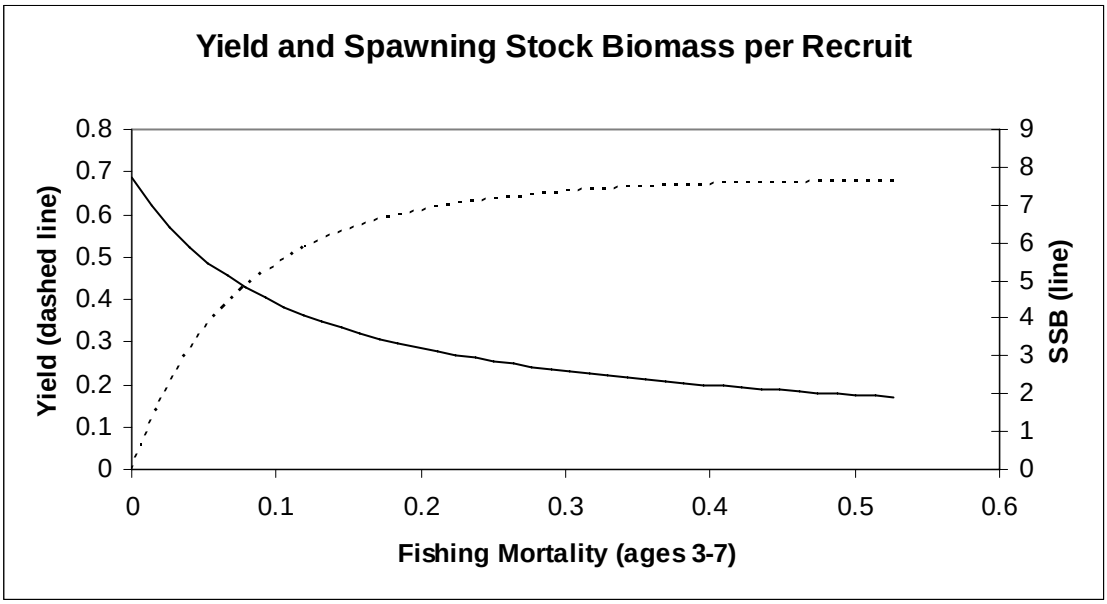
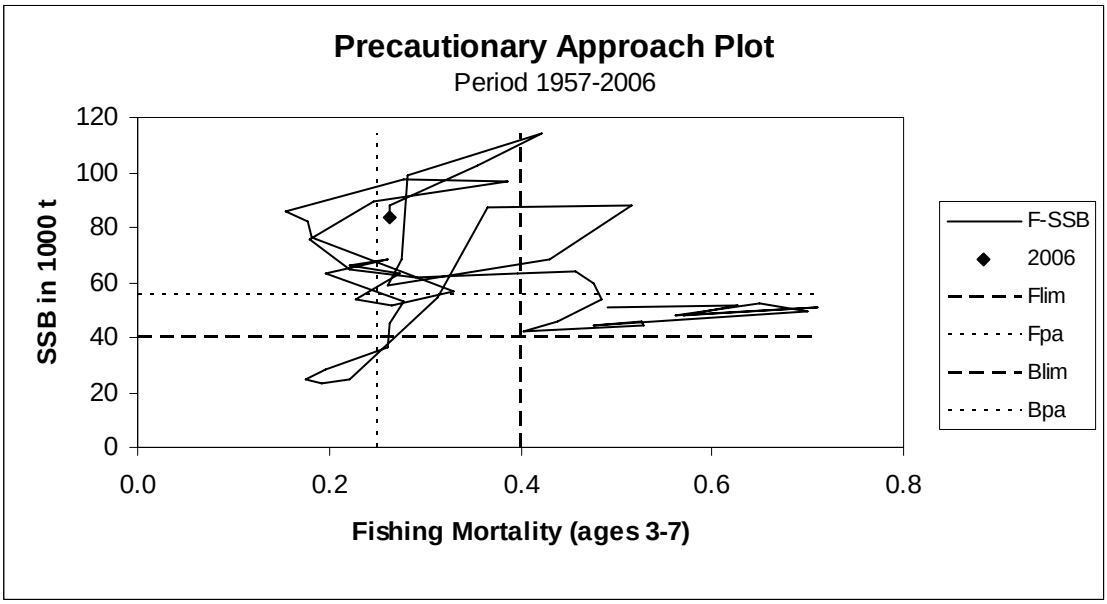


Figure 2.4.16(cont). Faroe haddock (Division Vb) standard graphs from the 2006 assessment







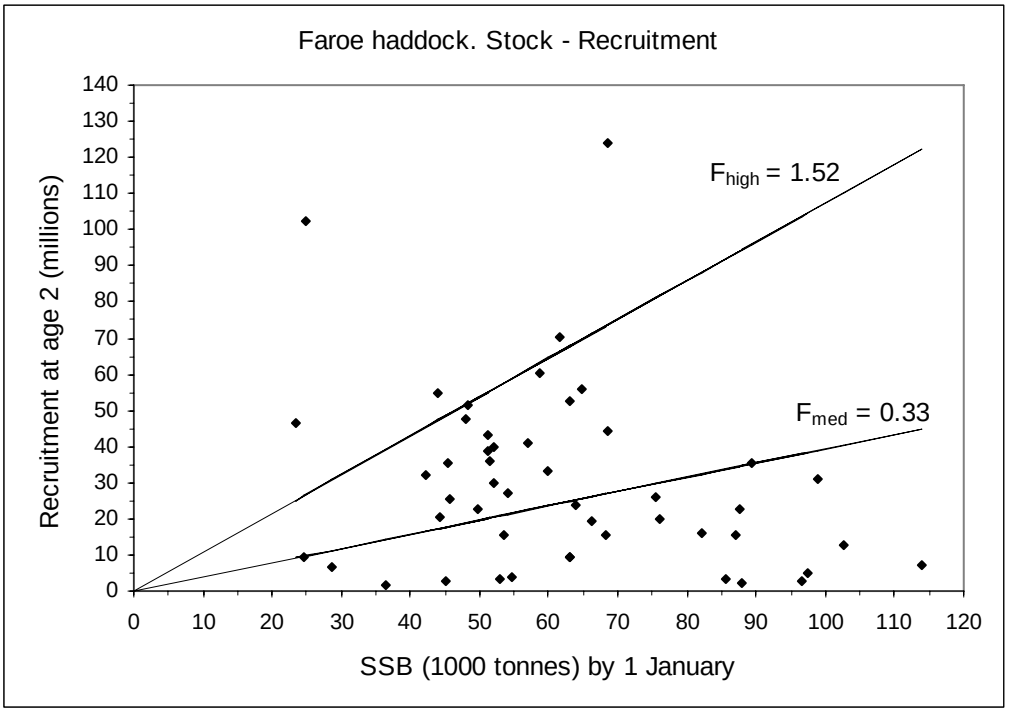
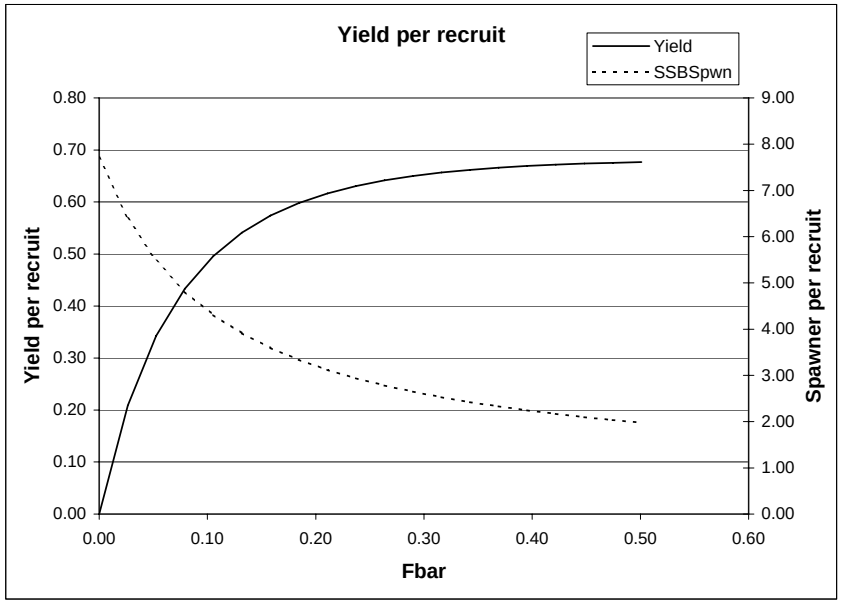
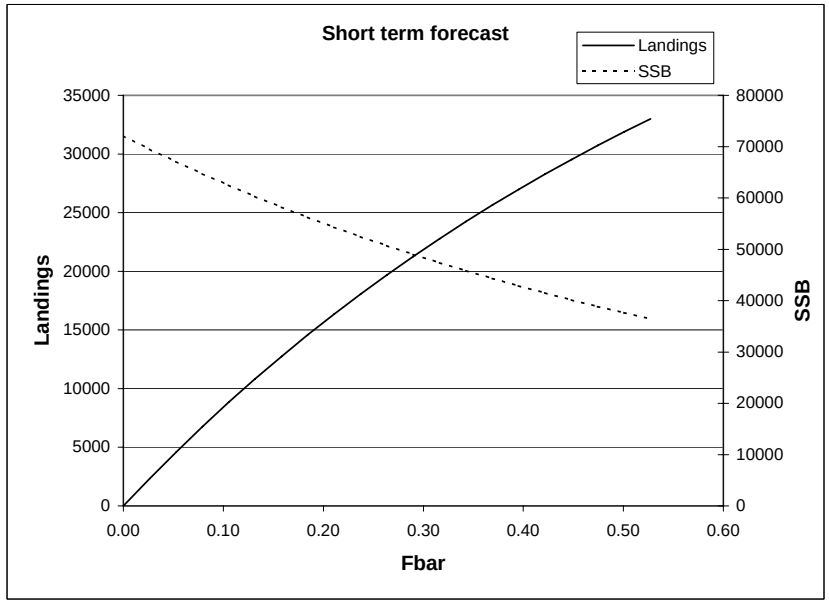


Figure 2.4.17. Faroe haddock. SSB-R plot.





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Run: YPR2006
Time and date: 21:42 5/1/2006

Reference point	F multiplier	Absolute F
Fbar(3-7)	1.0000	0.2636
FMax	2.4588	0.6482
F0.1	0.6233	0.1643
F35%SPR	1.0579	0.2789
Flow	5.7608	1.5187
Fmed	1.2567	0.3313
Fhigh	5.7608	1.5187

Weights in kilograms

MFDP version 1
Run: STP2006
Index file 01/05/2006
Time and date: 22:05 5/1/2006
Fbar age range: 3-7

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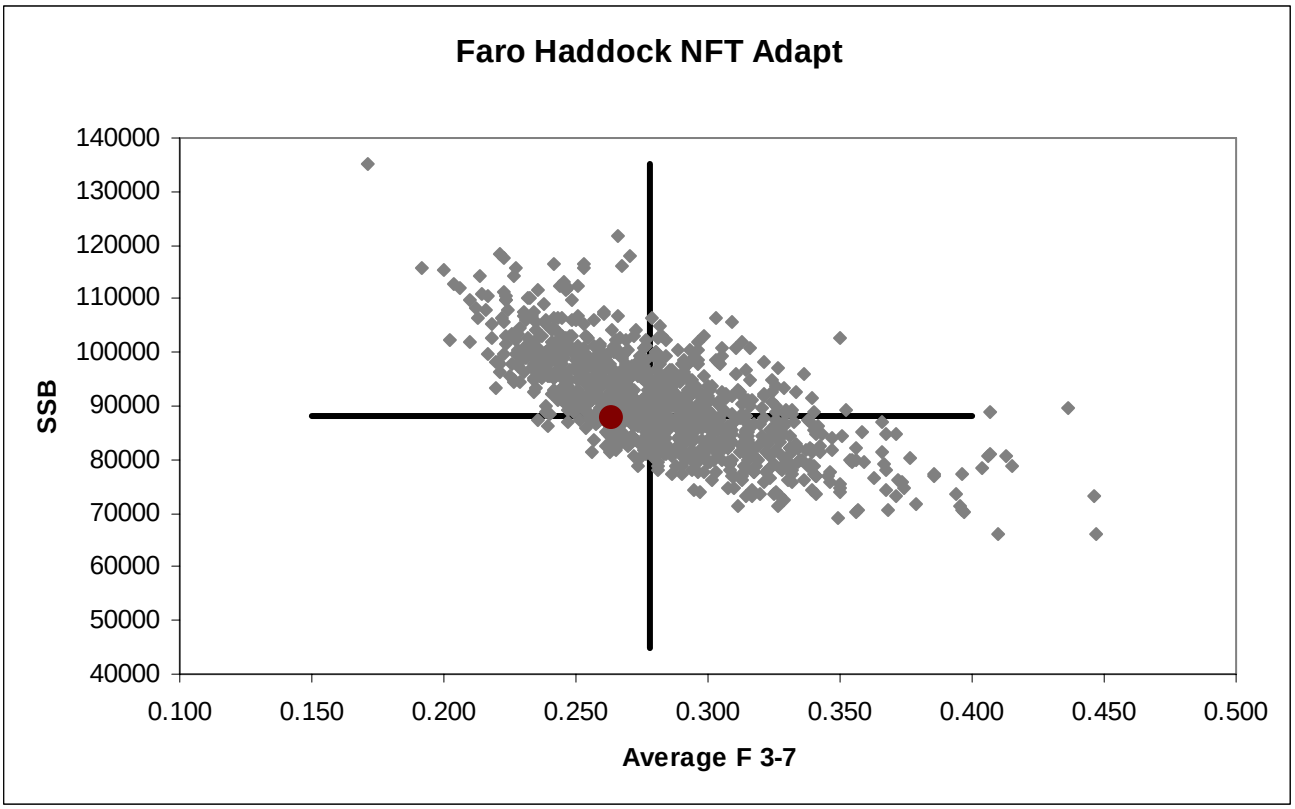


Figure 2.4.19. The F's and SSB's from a 1000 bootstraps of the ADAPT. Inserted are the point values of F and SSB from the accepted XSA.

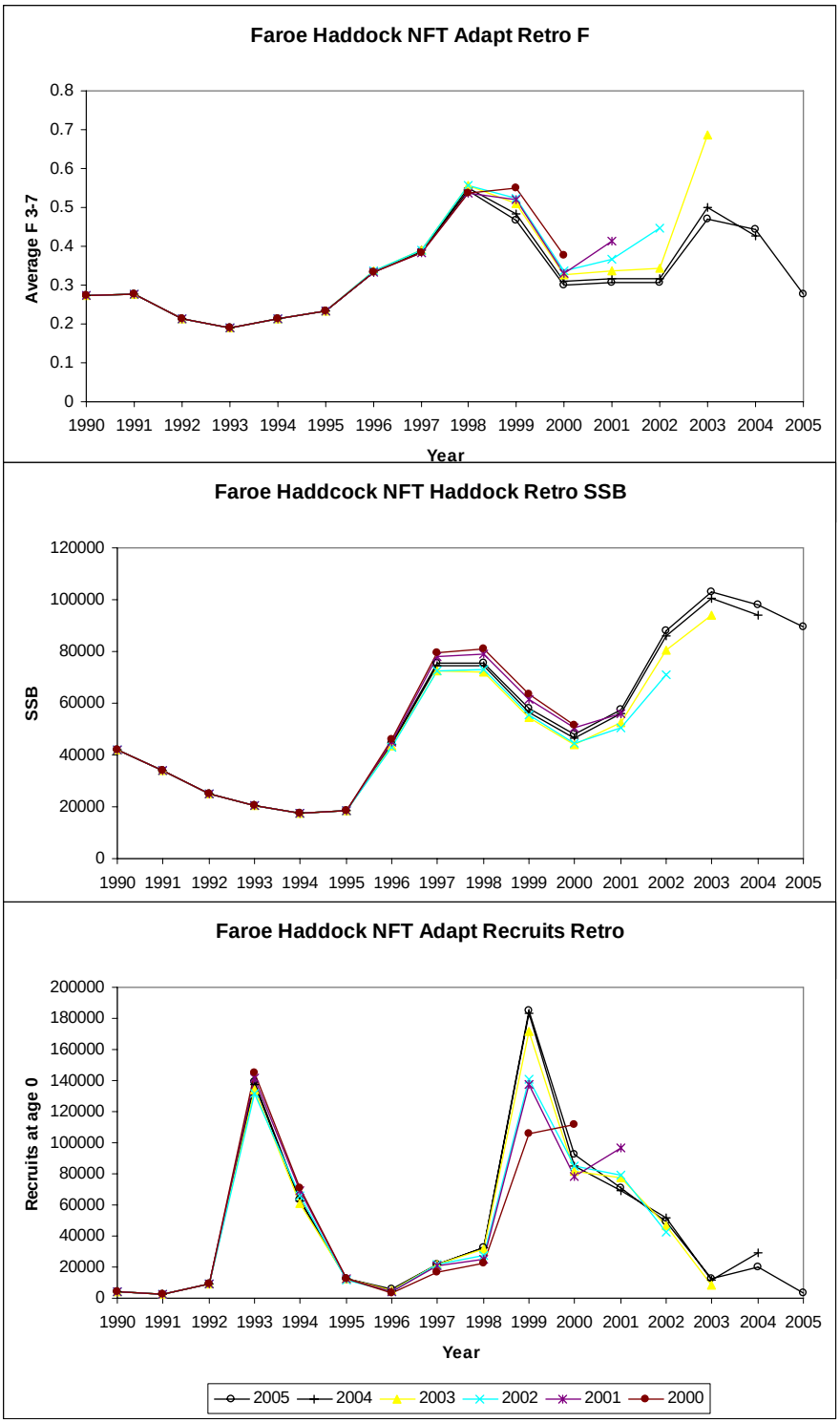
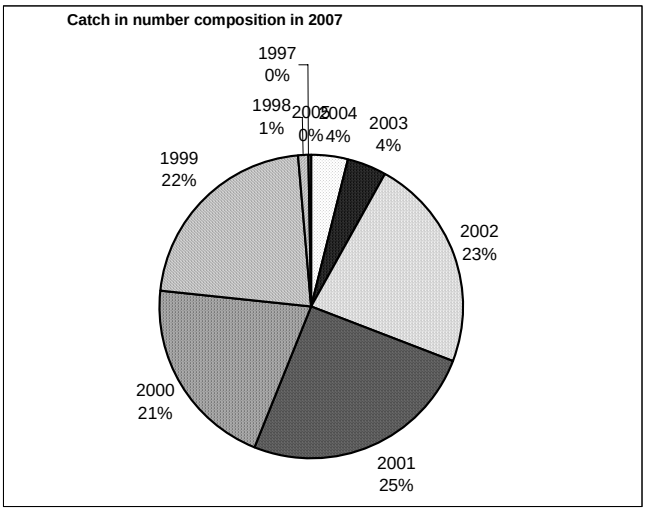


Figure 2.4.20. Faroe haddock. The ADAPT retrospective patterns.



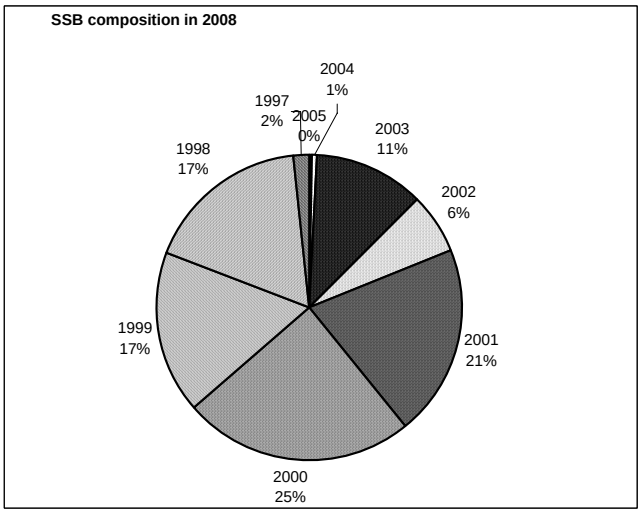


Figure 2.4.21. Faroe haddock. Projected composition of the number by year classes in the catch in 2007 (left figure) and the composition of SSB in 2008 by year classes (right figure).

2.5 Faroe saithe

Summary

The working group estimates of landings in 2005 were 61 000 t compared to 46 000 t in 2004.

Mean weight at age in the catch for all ages displays a downward trend since 1996.

A three year running average smoother has been used to predict maturity at age for 1983-2005 instead of the GLM model in previous assessments.

The XSA model has been tuned with commercial CPUE series derived from a GLM model (WD 37, 2005).

In the present assessment the estimated spawning stock biomassin 2004 is 81 000 tonnes compared to 86 000 tonnes in last year's assessment.

The year classes 2000-2001 were estimated at 46 000 and 28 000 t respectively in the last year assessment compared to 41 000 and 30 000 t in the current assessment.

2.5.1 Landings and trends in the fishery

Nominal landings of saithe from the Faroese grounds (Division Vb) have varied cyclically between 10 000 t and 60 000 t since 1960. After a third high of about 60 000 t in 1990, landings declined steadily to 20 000 t in 1996. Since then landings have increased steadily to 53 500 tonnes in 2002 (Table 2.5.1.1, Figure 2.5.1.1) but declined to 46 100 t in 2004. In 2005 landings were 61 400 tonnes, the second highest catch recorded since 1961.

With the introduction of the 200 miles EEZ in 1977, mostly Faroese vessels have prosecuted the saithe fishery. The principal fleet consists of large pair trawlers (>1000 HP), which have a directed fishery for saithe, accounting for about 60% of the reported landings in 1993-2005 (Table 2.5.1.2). The smaller pair trawlers (<1000 HP) have a more mixed fishery and they account for about 10-20% of the total landings of saithe in 1993-2005. During the last decade the proportion of saithe in the catches has generally increased for larger pair trawlers and larger single trawlers (>1000 HP) but decreased for the smaller trawlers and jiggers. In 2003 – 2005 the saithe catches decreased for larger single trawlers and increased for smaller pair trawlers. Other vessel categories report only small catches of saithe as by-catch.

Catches used in the assessment are presented in Table 2.5.1.1. These include foreign catches that have been reported to the Faroese Authorities but not officially reported to ICES. Catches in that part of Sub-division IIa, which lies immediately north of the Faroes, have also been included. Little discarding is thought to occur in this fishery.

2.5.2 Catch at age

Catch at age is based on length and otoliths samples from Faroese landings of small and large single and pair trawlers, and landing statistic by fleet provided by the Faroese Authorities. Catch at age was calculated for each fleet by four-month periods and the total was raised by the foreign catches. The catch-at-age data for previous years were also revised according to the final catch statistics (Tables 2.5.2.1 and 2.5.2.3). The sampling intensity in 2005 was similar to that in 2004 (Table 2.5.2.2).

2.5.3 Weight at age

Mean weights at age have varied by a factor of about 2 during 1961-2005. Mean weights at age were generally high during the early 1980s and they subsequently decreased from the mid

1980s to the early 1990s (Table 2.5.3.1 and Figure 2.5.3.1). The mean weights increased again in the period 1992-96 but have shown a general decrease since. Weights at age for 2005 are athe lowest since 1991.

The catchability (q) is calculated as the catch number at age in the tuning series divided with the stock number at age. Catchability (q) may change as a result of changes of weight at age given the high variability in the weight at age for saithe. There appears to be a relationship between weight at age and catchability at age 3 ($P<0.05$) (Figure 2.5.3.2). This may have an effect on the assessment that saithe at age 3 is underestimated in the tuning when weight at age are low. The SOP for weight at age in 2005 was 100%.

2.5.4 Maturity at age

Maturity at age data from the spring survey is available from 1983 onward (Steingrund, 2003). Due to poor sampling in 1988 the proportion mature for that year was calculated as the average of the two adjacent years. A model was used since 1993 (ICES C.M.1993/Assess:18), to predict maturity at age in order to reduce the year to year variability associated with small samples. The initial model used was a GLM with a Logit link function describing maturity at age as a function of age, year class strength, mean weight at age and a year effect (WD 12, 2005). Year class strength was not significant and was excluded from the model in the 2005 assessment.The decreasing trend in weights at age caused the predicted maturities to decline when the observed maturities did not. The working group examined various smoothers and decided to use a three years running average to predict the maturity at age for 1983-2005.. (Table 2.5.4.1 and Figure 2.5.4.1). For 1961 to 1982, the average maturity at age for 1983 to 1996 was used. The proportion mature for most ages has been slightly increasing in resent years. A comparison of XSA SSB output with different maturity input show little variation of SSB (Figure 2.5.4.2).

2.5.5 Stock assessment

2.5.5.1 Tuning and estimation of fishing mortality

The 2005 Faroe saithe assessment was a benchmark assessment, where several different settings and combinations of tuning series were run in the XSA (WD 16, 2005). This year's assessment is an update assessment. The CPUE series that has been used in the assessment since 2000 was introduced in 1998 (ICES C.M. 1998/ACFM:19), and consists of saithe catch at age and effort in hours, referred to as the pair trawler series. The series extends back to 1985 and consists of data from 8-10 pair trawlers greater than 1000 HP which have specialized in fishing on saithe and account for 5 000-10 000 t of saithe each year (described in annex). In 2002/2003, 4 of these trawlers left the fleet. The 4 remaining trawlers have larger CPUE, but they show the same trends. In 2004 a new pair of trawlers (>1000 HP) was introduced and they showed the same trends, but lower value in CPUE. In 2005 a new pair of trawlers (>1000 HP) was introduced to this common fleet showing the same trend as the Cuba-trawlers during 1999-2003. In the pair trawler series (1995-2005) information for each haul was supplied and only those hauls where saithe contributed to more than 50% of the total catches of cod, haddock and saithe were used. Figure 2.5.5.1 shows a map of the distribution of saithe hauls from the pair trawlers tuning fleet in 2005.

A systematic check of the age based indices from the different pairs of the commercial series showed that there were differences between the pairs (ICES C.M. 2005/ACFM:21), especially in 2004. A GLM model was run using data from each haul to standardize the CPUE-data (WD 37, 2005). The fitted CPUE values have been estimated for the period 1995-2005 including year, month, pair, and statistical square as explanatory variables (Figure 2.5.5.2) . The different pairs of trawlers are described in the appendix.

The survey series were updated with the traditional stratification but were not used in 2006 assessment.

Pending the resolution of the best stratification to use, the NWWG decided to use the XSA with the GLM Pair Trawlers as a final assessment with catchability independent of stock size for all ages, catchability independent of age for ages ≥ 8, the shrinkage of the SE of the mean = 2.0, and no time tapered weighting. These settings are also used for the 2006 update assessment. The tunings series used are shown in table 2.5.5.1. The XSA diagnostics are in Table 2.5.5.2 and the output from the XSA is presented in Tables 2.5.5.3-5. Log catchability residuals are relatively random in recent years (Figure 2.5.5.3).

The ADAPT assessments gave results very similar to those of the XSA with a slight tendency to overestimate F and consequently underestimate SSB in the terminal year (Figure 2.5.5.5). The point estimator of the SSB historical time trajectory from the ADAPT and the XSA are almost the same in the final year (Adapt SSB 73495, XSA SSB 77730). The bootstrap probability profile (Figure 2.5.5.4) for the SSB and the reference F in 2005 show the point estimator from the final XSA runand the ADAPT results.

The catchability coefficient for the cuba trawlers shows an increasing trend from 1991 to 1996, but the estimates have been reasonably stable for the period 1997-2002 (ICES C:M: 2003/ACFM:24). The estimates, however, are calculated from an assessment calibrated with a GLM model run on all available data from the pair-trawlers during 1995-2005. The working group accepted the XSA calibrated with the CPUE from the GLM-model

Retrospective analysis of the average fishing mortality from the XSA for age groups 4-8 (Figure 2.5.5.6) shows a tendency to underestimate F in the last three years. This implies that biomass was correspondingly overestimated (Figure 2.5.5.7). With respect to recruitment, the analysis indicated an underestimate (Figure 2.5.5.8). The new stock size index and XSA settings appear to result in an improved retrospective. The fishing mortalities for 1961-2005 are presented in Table 2.5.5.3 and in Figure 2.5.5.9. The average fishing mortality for age groups 4-8 was 0.58 in 2005.

2.5.5.2 Stock estimates and recruitment

Recruitment in the 1980s was above or close to average (28 millions). The strongest year class since 1986 was produced in the 1990s and the average for that decade is about 29 millions (Figure 2.5.5.10). The 1998 year class is the largest ever (> 83 mill.) and can be seen in the modal length progression in the summer survey from 1999 (Figure 2.5.5.11). Even though recruitment had been above average in the 1960s and 1970s, SSB declined from nearly 115 000 t in 1985 to 64 000 t in 1991 as a result of high fishing mortality yielding the highest (1990) and third highest (1991) landings of the whole 1961-2001 period. The historically low SSB persisted in 1992-1995 (Table 2.5.5.5 and Figure 2.5.5.12). The SSB has increased since 1996 to 2001 (91 000 tonnes) with the maturation of the 1992, 1994, 1996 and 1998 year-classes but in 2005 the SSB decreased to 78 000 t. The relation between stock and recruitment is given in Figure 2.5.5.13. While the spawning stock biomass graph shows three cycles of decreasing magnitude, that of total biomass (Figure 2.5.5.14) shows three cycles of increasing magnitude. This could be due to higher exploitation rates since the early 1990s.

2.5.6 Prediction of catch and biomass

2.5.6.1 Input data

Input data for prediction with management options are presented in Table 2.5.6.1 and input data for the yield per recruit calculations are given in Table 2.5.6.2.

Population numbers for the short term prediction up to the 2002 year class are from the final VPA run whereas values for the 2003-2005 year classes are the geometric mean of the 1977 to 2002 year classes. A correlation between mean weight at age from the landings and mean weight at age from the spring survey and an arithmetic mean for 2003-2005 was tried to get a prediction of 2006 mean weight at age. Because the results from this showed an increase in weight in 2006, the 2005 values were used for 2006-2008 weights (Table 2.5.6.1). In the long term prediction (yield per recruit) mean weights for 1961-2005 were used. The value of natural mortality is 0.2.

In the short term prediction the average of 2005-2006 proportion mature values from the spring survey were used for 2006. For 2007 and 2008 the average for 2004-2006 was used. In the long term prediction the average of smoothed values for 1983-2006 was used.

For all three years in the short term prediction the average exploitation pattern in the final VPA for 2003-2005, unscaled to Fbar (ages 4-8) in 2004 in view of a retrospective problem (as suggested by ACFM, 2004), was used. In the long term prediction the exploitation pattern was set equal to the average of exploitation patterns for 2001-2005 (as suggested from ACFM, 2004).

2.5.6.2 Biological reference points

Yield per recruit and spawning stock biomass per recruit curves are presented in Figure 2.5.6.1. Compared to the 2005 average fishing mortality of 0.58 in age groups 4-8, $\mathbf{F}_{max}$ is 0.43, $\mathbf{F}_{0.1}$ is 0.12, $\mathbf{F}_{med}$ is 0.35 and $\mathbf{F}_{high}$ is 1.10 (Table 2.5.6.3, Figure 2.5.6.1 and Figure 2.5.6.2).

	Fish Mort Ages 4-8	Yield/R	SSB/R
Average last 3 years	0.512	1.517	2.763
Fmax	0.432	1.519	3.145
F0.1	0.125	1.319	7.494
Fmed	0.352	1.516	3.672

Yield and spawning biomass per Recruit F-reference points:

Medium term projections and reference points for Faroese stocks are discussed in the introductory section for the Faroese waters.

The history of the stock/fishery in relation to the existing four reference points can be seen in Figure 2.5.6.3.

2.5.6.3 Projection of catch and biomass

Results from predictions with management option are presented in Table 2.5.6.3. Catches at status quo F would be 41 300 t in 2006 and 36 700 t in 2007. The spawning stock biomass would be about 70 000 tonnes in 2006 and about $\mathbf{B}_{lim}$ in 2007.

Results from the yield per recruit estimates are shown in Table 2.5.6.4 and Figure 2.5.6.1.

A projection of catch in number by year classes in 2006 and weight composition in SSB by year classes in 2007 is presented in Figure 2.5.6.4. The catch in 2006 is predicted to rely on the four most recent year classes (84%). In 2007 the 1998 year class (age 9) is expected to contribute about 28% of the SSB, and the 1999-2002 year classes with about 15% each.

2.5.7 Management considerations

Management consideration for saithe is under the general section for Faroese stocks.

The spawning stock biomass has decreased below $\mathbf{B}_{pa}$ and is expected to reduce to 70 000 t at status quo fishing mortality, due to poor recruitment in the short term.

2.5.8 Comments on the assessment

The XSA settings have not been changed in the 2006 assessment. The tuning fleets had to be changed due to replacement of vessels in the commercial index tuning fleet. The cpue standardisation with GLM is considered an improvement.

The geometric mean is used at age 3 in the short term prediction. There are indications that the spring survey could be helpful as an index of age 2 or 3 in the terminal year. This question will be further investigated once an appropriate stratification scheme has been identified.

The question of migration has been brought up previously. Although tagging data indicate that saithe migrates between management areas, and some indications are seen in the assessment as well, no attempts have been made to quantify the migration rate of saithe.

The 2005 assessment indicates that the point estimator of biomass is lower than in the 2004 assessment (2004 SSB = 81 500t compared to 77 700t) and the fishing mortality has increased to 0.58.

The assessment is calibrated exclusively with commercial CPUE data. The WG recognises that these are high quality data, but the problems associated with the use of commercial CPUE data (e.g. increased efficiency due to technological creep etc.) may affect the assessment. The introduction of GLM standardisation could mitigate the problems of vessel replacement if sufficient overlap occurs with other vessels. Nevertheless, the introduction of the spring survey as an index of stock size in the assessment would be an improvement (Table 2.5.8.1-5, Figure 2.5.8.1-3).

The ADAPT calibrations conducted appear to offer promises, but the results were not examined closely because ADAPT was intended mostly as a validation of the XSA results. The NMFS NFT ADAPT software does offer some advantages over the XSA however, particularly with regards to medium term predictions. Time permitting, the possibility of migrating the assessment to the NFT environment will be evaluated intersessionally.

The assessment of Faroe saithe is uncertain because:

1) 1. the assessment uses only one index of stock size, a commercial cpue from a subset of the pair trawlers. The effort information is good, but the age composition is the same as is used to derive the pair trawler catch at age, which means that the cpue is not independent of the catch at age.

2) 2. The weights at age have declined substantially over the calibration period (for example the weight of an age 6 fish declined from 3 kg in 1995 to 1.75 kg in 2005, the weight of an age 2 fish in 1995). There are indications that this may affect catchability at age which could currently be lower than those estimated in the XSA assessment. This could be particularly important for the very strong 1999 year class, for which F is estimated to have been high in 2005 (F=1.0 compared with F=0.46 for age 5 and F=0.7 for age 7) with the consequence that the year class appears seriously depleted. The WG believes 1999 year class at age 7 at the beginning of 2006 could in fact be as much as twice the size estimated in the current assessment. This view is supported by the very good saithe catches so far in 2006 (figure 2.5.51b).

Bycatch

In the last years concerns have been raised about the bycatch of saithe in the blue whiting fishery around the Faroes and Iceland (Pálsson 2005). The catch of blue whiting in ICES sub-area Vb was 468 thousand tonnes in 2003 (ICES, 2004) and only small percentages of by-catch may thus become important in absolute terms. There are indications that the bycatch of saithe is most important in Faroese waters whereas the bycatch of cod is restricted to Icelandic waters (Pálsson 2005). There are also indications that the by-catch may vary by year (was higher in 2004 than in 2003) (Pálsson *et al.* 2005).

Sampling the by-catch of saithe in Faroese and Icelandic waters in the blue whiting fisheries indicate a high variability between hauls, but the overall percentage in 2003 was 0.32% and in 2004 0.69% (Pálsson et al. 2005). Sampling on a Faroese vessel in November 2004 indicated an average by-catch of saithe of 3.2% (Lamhauge, 2004).

The length distribution of saithe in the blue whiting fishery is variable. Icelandic samples indicate and average length of about 64 cm (Pálsson, 2005) whereas Faroese samples indicate about 75 cm (Lamhauge, 2004). There are also indications that the by-catch varies by season (Pálsson 2005, Pálsson *et al.* 2005).

An attempt was made in 2004 to estimate the by-catch of saithe in Faroese waters (see table below). It was assumed that the catch in 2004 was on the same level as in 2003. In Scenario 1, the mean overall percentage in Pálsson *et al.* 2005 is used (0.69%). The length measurements in Lamhauge (2005) were used as basis and the age-length key for the Faroese pair trawlers. In Scenario 2, the mean overall percentage in Lamhauge (2004) is used (3.2%). In Scenario 1, the by-catch is estimated to 3231 tonnes and in Scenario 2 to 10770 tonnes. In order to account for the by-catch of saithe in the blue whiting fishery, the catch-at-age should be scaled up by a factor of 1.0-1.7 in Scenario 1 and 1.0-3.2 in Scenario 2.

The exercise shows that it is important to get more information about the by-catch of saithe in the blue whiting fishery and that the by-catch may affect the stock assessment of saithe in Vb. The exercise is on a very broad scale and the result should be taken as illustrative rather than quantitative. In order to get more precise estimates of the by-catch of saithe in Faroese waters it is necessary to sample the blue whiting fishery representatively by area, season and by year.

Estimating by-catch of saithe in Vb in the blue whiting fishery.

	SCENARIO 1	SCENARIO 2
Total blue whiting catch in Vb (tonnes)	468269	468269
By-catch of saithe (%)	0.69	3.2
By-catch of saithe (tonnes)	3231	14985
Relative change in catch at age in 2004		
Age		
3	1.0	1.0
4	1.0	1.0
5	1.0	1.0
6	1.0	1.1
7	1.1	1.5
8	1.1	1.6
9	1.1	1.4
10	1.1	1.4
11	1.5	3.5
12+	1.7	4.1

2.5.9 Annex

Stock definition

Saithe are widely distributed around the Faroes, from the shallow inshore waters to depths of 500 m. The main spawning areas are found at 150-250 meters depth east and north of the Faroes. Spawning takes place from January to April, with the main spawning in the second-half of February. The pelagic eggs and larvae drift with the anti-clockwise current around the islands until May/June, when the juveniles, at lengths of 2.5-3.5 cm, migrate inshore. The nursery areas during the first two years of life are in very shallow waters in the littoral zone. Young saithe are also distributed in shallow depths, but at increasing depths with increasing age. Saithe enter the adult stock at the age of 3 or 4 years (Jákupsstovu 1999). Tagging experiments of saithe has demonstrated migrations between the Faroes, Iceland, Norway, west of Scotland and the North Sea (Jákupsstovu 1999).

Description of the pair trawlers

The tuning fleet consists of several pair of trawlers (>1000 HP). For all of the vessels the mesh size of the trawl is 135 mm. The catch is stored on ice on board the trawlers and landed as fresh fish.

Four of the pairs were built in East Germany in 1970 as part of a help-programme for Cuba (called Cuba trawlers). In 1973 “Faroe Ship” bought 8 of these trawlers and brought them to Faroe Islands. Today, the Runavik Trawl Company “Beta” keeps them, which is the company that has operated the trawlers during all these years and has registered the catches. During 1977-1978 the trawlers were altered and adjusted for fishing saithe, cod and haddock in Faroese waters. The vessels were equipped with new gear and other equipment. Engine, Winch and equipment for the navigating bridge were replaced principally by Norwegian equipment. Except for the fact that 4 of the trawlers are equipped with bigger winches (to be able to fish at deep waters) the 8 trawlers are identical. The gears used are mainly from the same producers and the vessels are similar with respect to construction. However, improvements have been carried out when needed (*e.g.* winch and engines). Engine power is more than 1 000 HP. Total length is about 37-38m. Loading capacity is approximately. 100 tons catch per vessel. The Cuba-trawlers started as single trawlers. However, since 1983 the trawlers have operated as pair-trawlers to reduce costs (meaning a reduction of *ca.* 45% with respect to fuel and *ca*. 15% with respect to fishing gear).

The new tuning fleet called J&A consists of two identical trawlers, “Jaspis” and “Ametyst”, built at the same shipyard in the Faroe Islands in 1986. They have been operating as pair-trawlers in Faroe waters since the 1986 fishing cod, haddock and saithe, but have in later years been mainly targeting for saithe. The vessels have been stationed at the village of “Saltangará”, the same place as the Cuba trawlers, since origin, but have been in the property and administrated by various companies, the present being “Snaraløkur” Ltd. The engine power is 1350 HP. The engines of both boats were overhauled in 2000. Improvements have been carried out when needed (*e.g.* winch and engines). Both vessels were equipped with new gear and other equipment in 2002 replaced principally by Norwegian equipment. Total length is about 30 m. Loading capacity is approximately 2 500 boxes of fish corresponding to *ca*. 125 tons catch per vessel.

The new tuning fleet introduced in the assessment in 2005, called SV&PV, consists of two trawlers > 1000 HK, operating as a pair. The pair ”Vestursøki” and ”Vesturleiki” consists of identical vessels (renamed from ”Stjørnan” and ”Polarhav” when they switched owner in 2003) built in Poland in 1990 and presently owned by P/F Rávan in Sandavágur. The vessels are 36 m long and cargo 265 BRT.

The data on which the tuning series are based origin from all available log-books from the above mentioned trawlers since 1995. The data are stored in the database on the Faroese Fisheries Laboratory in Torshavn, and they are corrected and quality controlled.

The effort obtained from the logbooks is estimated as number of fishing (trawling) hours, which is the time from when the trawl meets the bottom until hauling starts. It is not possible to get effort as fishing days because the logbooks do not tell when the trip ends (day and time).

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Table 2.5.1.1. Saithe in the Faroes (Division Vb). Nominal catches (tonnes) by countries, 1989-2005, as officially reported to ICES, and the Working Group estimate.

Country	1989	1990	1991	1992	1993	1994	1995	1996
Denmark	-	2	-	-	-	-	-	-
Faroe Islands	43,624	59,821	53,321	35,979	32,719	32,406	26,918	19,267
France [3]	-	-	-	120	75	19	10	12
Germany	-	-	32	5	2	1	41	3
German Dem.Rep.	9	-	-	-	-	-	-	-
German Fed. Rep.	20	15	-	-	-	-	-	-
Netherlands	22	67	65	-	-	-	-	-
Norway	51	46	103	85	32	156	10	16
UK (Eng. & W.)	-	-	5	74	279	151	21	53
UK (Scotland)	9	33	79	98	425	438	200	580
USSR/Russia [2]	-	30	-	12	-	-	-	18
Total	43,735	60,014	53,605	36,373	33,532	33,171	27,200	19,949
Working Group estimate [4,5]	44,477	61,628	54,858	36,487	33,543	33,182	27,209	20,029

Country	1997	1998	1999	2000	2001	2002	2003	2004	2005 [1]
Estonia	16	-	-	-	-	-	-	-	-
Faroe Islands	21,721	25,995	32,439		49,676	55,165	47,933	48,222	
France	9	17	-	273	934	607	370	147	100
Germany	5	-	100	230	667	422	281	186	1
Greenland	-	-	-	-		442			
Irland	-	-	-	-	5	-	-	-	-
Norway	67	53	160	72	60	77	94	82	82
Portugal	-	-	-	-	-	-	-	5	-
Russia	28	-	-	20	1	10	32	71	210
UK (E/W/NI)	-	19	67	32	80	58	89	85	
UK (Scotland)	460	337	441	534	708	540	610	748	
United Kingdom									940
Total	22,306	26,421	33,207	1,161	52,131	57,321	49,409	49,546	1,333
Working Group estimate [4,5,6,7]	22,306	26,421	33,207	39,020	51,786	53,546	46,555	46,355	61,372

[1] Preliminary.

[2] As from 1991.

[3] Quantity unknown 1989-91.

[4] Includes catches from Sub-division Vb2 and Division IIa in Faroese waters.

[5] Includes French, Greenlandic, Russian catches from Division Vb, as reported to the Faroese coastal guard service.

[6] Includes Faroese, French, Greenlandic catches from Division Vb, as reported to the Faroese coastal guard service.

[7] The 2001-2005 catches from Faroe Islands, as stated from Faroese coastal guard service, are corrected in order to be consistent with procedures used previous years.

Table 2.5.1.2. Saithe in the Faroes (Division Vb). Total Faroese landings (rightmost column) and the contribution (%) by each fleet category. Averages for 1985-2005 are given at the bottom.

Year	Open boats	Long-liners <100 GRT	Single trawl <400 HP	Gill-nets	Jiggers	Single trawl 400-1000 HP	Single trawl >1000 HP	Pair trawl <1000 HP	Pair trawl >1000 HP	Long-liners >100 GRT	Indust-rial trawlers	Others	Total round weight (tonnes)
1985	0.2	0.1	0.1	0.0	2.6	6.6	33.7	28.2	28.2	0.1	0.2	0.2	42598
1986	0.3	0.2	0.1	0.1	3.6	2.8	27.3	27.5	36.5	0.1	0.7	0.9	40107
1987	0.7	0.1	0.3	0.4	5.6	4.1	20.4	22.8	44.2	0.1	1.1	0.0	39627
1988	0.4	0.3	0.1	0.3	6.5	6.8	20.8	19.6	43.6	0.1	1.3	0.1	43940
1989	0.9	0.1	0.3	0.2	9.3	5.4	17.7	23.5	41.1	0.1	1.3	0.0	44547
1990	0.6	0.2	0.2	0.2	7.4	3.9	19.6	24.0	42.8	0.2	0.9	0.0	60740
1991	0.6	0.1	0.1	0.6	9.8	1.3	13.9	26.5	46.2	0.1	0.8	0.0	54290
1992	0.4	0.4	0.0	0.0	10.5	0.5	7.1	24.4	55.6	0.1	1.0	0.0	34934
1993	0.6	0.2	0.1	0.0	9.3	0.6	6.5	21.4	60.6	0.1	0.7	0.0	32313
1994	0.4	0.4	0.1	0.0	12.6	1.1	6.8	18.5	59.1	0.2	0.7	0.0	32405
1995	0.2	0.1	0.4	0.0	9.6	0.9	9.9	17.7	60.9	0.3	0.0	0.0	26915
1996	0.0	0.0	0.1	0.0	9.2	1.2	6.8	23.7	58.6	0.2	0.0	0.0	19262
1997	0.0	0.1	0.1	0.0	8.9	2.5	10.7	17.8	58.9	0.4	0.4	0.0	21713
1998	0.1	0.4	0.1	0.0	8.1	2.8	13.8	16.5	57.6	0.3	0.4	0.0	25993
1999	0.0	0.1	0.1	0.0	5.7	1.2	12.6	18.5	60.0	0.2	1.6	0.0	33057
2000	0.1	0.1	0.2	0.0	3.7	0.3	15.0	17.5	62.3	0.1	0.7	0.0	37450
2001	0.1	0.1	0.1	0.0	2.8	0.3	20.2	16.5	58.8	0.2	0.8	0.1	49395
2002	0.1	0.2	0.1	0.0	1.6	0.1	26.5	10.5	60.8	0.1	0.0	0.0	53698
2003	0.0	0.0	1.9	0.0	0.9	0.4	17.4	14.7	64.7	0.1	0.0	0.0	46555
2004	0.1	0.2	3.7	0.0	1.9	0.4	15.1	14.4	63.8	0.2	0.0	0.0	46355
2005	0.2	0.1	4.4	0.0	2.4	0.2	12.7	20.6	59.2	0.2	0.0	0.0	61372
Average	0.3	0.2	0.6	0.1	6.3	2.1	15.9	20.2	53.5	0.2	0.6	0.1	40346

Table 2.5.2.1. Saithe in the Faroes (Division Vb). Catch in number at age by fleet categories (calculated from gutted weights).

Age	Jiggers	Single trawlers >1000 HP	Pair trawlers <1000 HP	Pair trawlers >1000HP	Others	Total Faroese fleet	Foreign fleet	Total Division Vb
0	0	0	0	0	0	0	0	0
1	0	0	0	0	0	0	0	0
2	0	20	2	5	0	33	5	38
3	7	40	76	188	14	400	10	409
4	50	211	555	1189	121	2611	52	2663
5	171	631	1617	4039	396	8418	155	8573
6	298	1238	2569	7266	595	14697	304	15001
7	120	723	874	3130	222	6226	177	6404
8	16	130	104	320	20	726	32	758
9	13	149	87	291	22	691	37	727
10	1	10	3	7	1	27	2	29
11	3	16	7	43	3	88	4	92
12	1	2	8	8	1	24	0	25
13	0	1	0	1	0	2	0	3
14	0	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0	0
Total No.	681	3171	5901	16488	1395	33943	778	34721
Catch, t.	1249	6491	10120	28533	2408	59938	1434	61372

Notes: Numbers in 1000'
Catch, round weight in tonnes
Others includes longliners, small single trawlers, industrial trawlers and catches not otherwise accounted for

Table 2.5.2.2. Saithe in the Faroes (Division Vb). Sampling intensity in 2000-2005.

Year		Jiggers	Single trawlers >1000 HP	Pair trawlers <1000 HP	Pair trawlers >1000 HP	Others	Total	Amount sampled pr tonnes landed (%)
2000	**Lengths**	2443	2429	9910	28724		43506	10.7
	Otoliths	300	301	1019	2816		4436	
	Weights	300	241	959	2816		4316	
2001	**Lengths**	1788	4388	5613	30341		42130	7.7
	Otoliths	180	450	480	3237		4347	
	Weights	180	420	420	3177		4197	
2002	**Lengths**	1197	9235	5049	30761		46242	5.8
	Otoliths	120	1291	422	3001		4834	
	Weights	120	420	240	2760		3540	
2003	**Lengths**		4959	6393	34812	1388	47552	7.0
	Otoliths		719	960	3719	180	5578	
	Weights		420	239	2999		3658	
2004	**Lengths**	916	2665	3455	35609	1781	44426	6.0
	Otoliths	180	180	240	3537	240	4377	
	Weights	180	120	120	3357	1364	5141	
2005	**Lengths**	1048	4266	6183	32046	1564	45107	4.0
	Otoliths	120	413	690	2760	240	4223	
	Weights	340	385	791	3533	1564	6613	

Table 2.5.2.3. Saithe in the Faroes (Division Vb). Catch numbers at age (Thousands).

Table 1 Catch numbers at age Numbers*10**-3

YEAR	1961	1962	1963	1964	1965
AGE					
3	183	562	614	684	996
4	379	542	340	1908	850
5	483	617	340	1506	1708
6	403	495	415	617	965
7	**216**	**286**	**406**	**572**	**510**
8	129	131	202	424	407
9	116	129	174	179	306
10	82	113	158	150	201
11	45	71	94	100	156
+gp	82	105	274	174	285
TOTALNUM	2118	3051	3017	6314	6384
TONSLAND	9592	10454	12693	21893	22181
SOPCOF %	108	93	96	99	92

YEAR	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975
AGE										
3	488	595	614	1191	1445	2857	2714	2515	3504	2062
4	1540	796	1689	2086	6577	3316	1774	6253	4126	3361
5	1201	1364	1116	2294	1558	5585	2588	7075	4011	3801
6	1686	792	1095	1414	1478	1005	2742	3478	2784	1939
7	806	1192	548	1118	899	828	1529	1634	1401	1045
8	377	473	655	589	730	469	1305	693	640	714
9	294	217	254	580	316	326	1017	550	368	302
10	205	190	128	239	241	164	743	403	340	192
11	156	97	89	115	86	100	330	215	197	193
+gp	225	140	187	190	132	100	210	186	265	298
TOTALNUM	6978	5856	6375	9816	13462	14750	14952	23002	17636	13907
TONSLAND	25563	21319	20387	27437	29110	32706	42663	57431	47188	41576
SOPCOF %	98	104	102	97	96	109	100	120	113	116

YEAR	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985
AGE										
3	3178	1609	611	287	996	411	387	2483	368	1224
4	3217	2937	1743	933	877	1804	4076	1103	11067	3990
5	1720	2034	1736	1341	720	769	994	5052	2359	5583
6	1250	1288	548	1033	673	932	1114	1343	4093	1182
7	877	767	373	584	726	908	380	575	875	1898
8	641	708	479	414	284	734	417	339	273	273
9	468	498	466	247	212	343	296	273	161	103
10	223	338	473	473	171	192	105	98	52	38
11	141	272	407	368	196	92	88	98	65	26
+gp	287	330	535	691	786	1021	902	540	253	275
TOTALNUM	12002	10781	7371	6371	5641	7206	8759	11904	19566	14592
TONSLAND	33065	34835	28138	27246	25230	30103	30964	39176	54665	44605
SOPCOF %	107	104	100	102	99	96	96	100	100	94

YEAR	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
AGE										
3	1167	1581	866	451	294	1030	521	1316	690	398
4	1997	5793	2950	5981	3833	5125	4067	2611	3961	1019
5	4473	3827	9555	5300	10120	7452	3667	4689	2663	3468
6	3730	2785	2784	7136	9219	5544	2679	1665	2368	1836
7	953	990	1300	793	5070	3487	1373	858	746	1177
8	1077	532	621	546	477	1630	894	492	500	345
9	245	333	363	185	123	405	613	448	307	241
10	104	81	159	83	61	238	123	245	303	192
11	67	43	27	55	60	128	63	54	150	104
+gp	158	97	60	39	79	118	108	52	49	117
TOTALNUM	13971	16062	18685	20569	29336	25157	14108	12430	11737	8897
TONSLAND	41716	40020	45285	44477	61628	54858	36487	33543	33182	27209
SOPCOF %	94	96	99	97	98	99	105	102	102	102

YEAR	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
AGE										
3	297	344	163	322	811	1125	302	330	76	409
4	1087	832	1689	655	2830	2452	8399	2432	2011	2663
5	1146	2440	1934	3096	1484	8437	5962	11152	8544	8573
6	1449	1767	3475	2551	4369	2155	9786	3994	8762	15001
7	1156	1335	1379	4113	2226	3680	862	4287	2125	6404
8	521	624	683	915	2725	1539	1280	417	1807	758
9	132	165	368	380	348	1334	465	419	265	727
10	77	71	77	147	186	293	362	304	293	29
11	64	29	32	24	56	90	33	91	146	92
+gp	82	100	73	69	25	56	45	43	112	28
TOTALNUM	6011	7707	9873	12272	15060	21161	27496	23469	24141	34684
TONSLAND	20029	22306	26421	33207	39020	51786	53546	46555	46355	61372
SOPCOF %	103	100	102	102	102	100	100	100	100	100

Table 2.5.3.1. Saithe in the Faroes (Division Vb). Catch weights at age (kg).

Table 2 Catch weights at age (kg)

YEAR	1961	1962	1963	1964	1965
AGE					
3	1.4300	1.2730	1.2800	1.1750	1.1810
4	2.3020	2.0450	2.1970	2.0550	2.1250
5	3.3480	3.2930	3.2120	3.2660	2.9410
6	4.2870	4.1910	4.5680	4.2550	4.0960
7	5.1280	5.1460	5.0560	5.0380	4.8780
8	6.1550	5.6550	5.9320	5.6940	5.9320
9	7.0600	6.4690	6.2590	6.6620	6.3210
10	7.2650	6.7060	8.0000	6.8370	7.2880
11	7.4970	7.1500	7.2650	7.6860	8.0740
+gp	9.3399	9.0237	8.8589	8.5591	8.9035
SOPCOFAC	1.0779	.9342	.9590	.9933	.9220

YEAR	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975
AGE										
3	1.3610	1.2730	1.3020	1.1880	1.2440	1.1010	1.0430	1.0880	1.4300	1.1140
4	2.0260	1.7800	1.7370	1.6670	1.4450	1.3160	1.4850	1.4610	1.5250	1.6580
5	3.0550	2.5340	2.0360	2.3020	2.2490	1.8180	2.0550	1.5820	2.2070	2.2600
6	3.6580	3.5720	3.1200	2.8530	2.8530	2.9780	2.8290	2.2490	2.5000	3.1200
7	4.5850	4.3680	4.0490	3.6730	3.5150	3.7020	3.7910	3.6870	3.1200	3.5570
8	5.5200	5.3130	5.1830	5.0020	4.4180	4.2710	4.1750	4.3850	4.6010	4.0960
9	6.8370	5.8120	6.2380	5.7140	5.4440	5.3880	4.8080	5.1280	5.5590	5.1280
10	7.2650	6.5540	7.5200	6.4050	5.7330	5.9720	5.2940	5.2760	5.7140	6.0940
11	7.6620	7.8060	8.0490	6.5540	6.6620	6.4900	6.9480	6.7270	6.2590	7.1960
+gp	9.2233	8.1494	9.0925	8.0870	8.5844	8.0047	7.5146	8.0307	8.0104	8.5982
SOPCOFAC	.9769	1.0357	1.0194	.9663	.9634	1.0935	1.0043	1.2006	1.1296	1.1607

YEAR	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985
AGE										
3	1.0880	1.2230	1.4930	1.2200	1.2300	1.3100	1.3370	1.2080	1.4310	1.4010
4	1.6760	1.6410	2.3240	1.8800	2.1200	2.1300	1.8510	2.0290	1.9530	2.0320
5	2.8780	2.6600	3.0680	2.6200	3.3200	3.0000	2.9510	2.9650	2.4700	2.9650
6	3.0810	3.7900	3.7460	3.4000	4.2800	3.8100	3.5770	4.1430	3.8500	3.5960
7	4.2870	4.2390	4.9130	4.1800	5.1600	4.7500	4.9270	4.7240	5.1770	5.3360
8	4.3520	5.5970	4.3680	4.9500	6.4200	5.2500	6.2430	5.9010	6.3470	7.2020
9	4.7900	5.3500	5.2760	5.6900	6.8700	5.9500	7.2320	6.8110	7.8250	6.9660
10	5.9120	5.9120	5.8320	6.3800	7.0900	6.4300	7.2390	7.0510	6.7460	9.8620
11	6.6190	6.8370	6.0530	7.0200	7.9300	7.0000	8.3460	7.2480	8.6360	10.6700
+gp	7.8941	7.7085	7.5756	8.6262	9.2153	8.9618	10.0411	10.0547	10.0976	11.9501
SOPCOFAC	1.0680	1.0442	1.0049	1.0248	.9937	.9564	.9632	.9997	.9991	.9415

YEAR	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
AGE										
3	1.7180	1.6090	1.5000	1.3090	1.2230	1.2400	1.2640	1.4080	1.5030	1.4560
4	1.9860	1.8350	1.9750	1.7350	1.6330	1.5680	1.6020	1.8600	1.9510	2.1770
5	2.6180	2.3950	1.9780	1.9070	1.8300	1.8640	2.0690	2.3230	2.2670	2.4200
6	3.2770	3.1820	2.9370	2.3730	2.0520	2.2110	2.5540	3.1310	2.9360	2.8950
7	4.1860	4.0670	3.7980	3.8100	2.8660	2.6480	3.0570	3.7300	4.2140	3.6510
8	5.5890	5.1490	4.4190	4.6670	4.4740	3.3800	4.0780	4.3940	4.9710	5.0640
9	6.0500	5.5010	5.1150	5.5090	5.4240	4.8160	5.0120	5.2090	5.6570	5.4400
10	6.1500	6.6260	6.7120	5.9720	6.4690	5.5160	6.7680	6.5400	5.9500	6.1670
11	9.5360	6.3430	9.0400	6.9390	6.3430	6.4070	7.7540	8.4030	6.8910	7.0800
+gp	10.2181	10.2439	9.3369	9.9364	8.2869	7.7285	8.2297	8.0501	9.1086	7.5392
SOPCOFAC	.9419	.9620	.9928	.9698	.9811	.9938	1.0506	1.0169	1.0240	1.0205

YEAR	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
AGE										
3	**1.4320**	**1.4760**	**1.3880**	**1.3740**	**1.4770**	**1.3300**	**1.1420**	**1.1230**	**1.1430**	**1.1480**
4	1.8750	1.7830	1.7110	1.7120	1.6060	1.5900	1.4600	1.3040	1.3330	1.3250
5	2.4960	2.0320	1.9540	1.9050	2.0770	1.7850	1.6520	1.6140	1.4500	1.5160
6	3.2290	2.7780	2.4050	2.3960	2.3600	2.5860	1.9690	1.9770	1.7890	1.6720
7	3.7440	3.5980	3.3000	2.8450	2.9770	3.0590	3.1300	2.5320	2.5600	2.0870
8	4.9640	4.7660	4.2200	4.1240	3.4800	3.8710	3.5890	3.9700	3.1590	2.9750
9	6.3750	5.9820	4.9990	5.2560	4.8510	4.3740	4.5130	4.8340	4.1540	3.7900
10	6.7450	7.6580	6.3910	5.5260	5.2680	5.5650	5.1380	5.4990	5.1670	6.0870
11	7.4660	7.8820	6.6650	6.9560	6.5230	6.7030	6.4220	6.0990	6.0150	6.1340
+gp	7.9806	9.2453	8.4847	8.5237	5.9024	6.9076	7.5192	6.9154	6.3209	6.7338
SOPCOFAC	1.0319	.9994	1.0221	1.0182	1.0154	1.0017	1.0004	1.0012	1.0038	.9998

Table 2.5.4.1. Saithe in the Faroes (Division Vb). Proportion mature at age.

Table 5 Proportion mature at age

YEAR	1961	1962	1963	1964	1965
AGE					
3	.0400	.0400	.0400	.0400	.0400
4	.2600	.2600	.2600	.2600	.2600
5	.5700	.5700	.5700	.5700	.5700
6	.8200	.8200	.8200	.8200	.8200
7	.9100	.9100	.9100	.9100	.9100
8	.9800	.9800	.9800	.9800	.9800
9	1.0000	1.0000	1.0000	1.0000	1.0000
10	1.0000	1.0000	1.0000	1.0000	1.0000
11	1.0000	1.0000	1.0000	1.0000	1.0000
+gp	1.0000	1.0000	1.0000	1.0000	1.0000

YEAR	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975
AGE										
3	.0400	.0400	.0400	.0400	.0400	.0400	.0400	.0400	.0400	.0400
4	.2600	.2600	.2600	.2600	.2600	.2600	.2600	.2600	.2600	.2600
5	.5700	.5700	.5700	.5700	.5700	.5700	.5700	.5700	.5700	.5700
6	.8200	.8200	.8200	.8200	.8200	.8200	.8200	.8200	.8200	.8200
7	.9100	.9100	.9100	.9100	.9100	.9100	.9100	.9100	.9100	.9100
8	.9800	.9800	.9800	.9800	.9800	.9800	.9800	.9800	.9800	.9800
9	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
10	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
11	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
+gp	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000

YEAR	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985
AGE										
3	.0400	.0400	.0400	.0400	.0400	.0400	.0400	.0000	.0300	.0400
4	.2600	.2600	.2600	.2600	.2600	.2600	.2600	.2800	.2500	.3700
5	.5700	.5700	.5700	.5700	.5700	.5700	.5700	.6300	.5600	.7100
6	.8200	.8200	.8200	.8200	.8200	.8200	.8200	.9900	.9400	.9200
7	.9100	.9100	.9100	.9100	.9100	.9100	.9100	1.0000	.9800	.9800
8	.9800	.9800	.9800	.9800	.9800	.9800	.9800	1.0000	1.0000	1.0000
9	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
10	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
11	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
+gp	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000

YEAR	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
AGE										
3	.1100	.1100	.1000	.0300	.0000	.0000	.0000	.0100	.0400	.0400
4	.3100	.3200	.2200	.2000	.2000	.1600	.1700	.1500	.1800	.1400
5	.5500	.5900	.5200	.5700	.5500	.4400	.4700	.5100	.6600	.6500
6	.8600	.8300	.7500	.6700	.6800	.7000	.7800	.8300	.8600	.8600
7	.9800	.9700	.9100	.8300	.8000	.8300	.8900	.9400	.9600	.9500
8	1.0000	.9700	.9200	.9200	.9400	1.0000	1.0000	1.0000	1.0000	1.0000
9	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
10	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
11	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
+gp	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000

YEAR	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
AGE										
3	.0200	.0000	.0100	.0300	.0300	.0200	.0000	.0000	.0000	.0000
4	.1300	.1300	.1600	.2000	.2100	.2000	.1800	.1500	.1300	.1700
5	.5900	.4300	.3700	.3500	.3600	.3600	.4100	.3700	.3800	.3500
6	.8000	.6400	.5400	.5200	.6200	.6000	.6000	.5100	.5500	.5600
7	.9400	.8700	.7900	.7400	.7600	.7500	.7300	.6700	.7100	.7100
8	1.0000	.9900	.9700	.9200	.9300	.9100	.9400	.8700	.8700	.8500
9	1.0000	1.0000	.9700	.9700	.9600	.9700	.9700	.9900	.9900	.9700
10	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
11	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
+gp	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000

Table 2.5.5.1. Saithe in the Faroes (Division Vb). Effort (hours) and catch in number at age for commercial pair trawlers.

```
Faroe Saithe (ICES Div. Vb)    AllpairGLM3-11.dat
101
All pair (GLM) >1000 HP
1995 2005
1 1 0 1
3 11
10498 91    349   1118  457   283   95    46    37    27
6125  99    306   262   358   161   90    43    41    22
7441  76    205   571   389   295   128   28    13    4
8346  46    281   492   637   313   139   73    17    5
12257 89    249   794   1031  1035  418   97    42    6
11234 205   741   432   1278  631   759   91    50    15
13298 315   742   2554  602   958   386   319   66    15
11282 58    1741  1736  3016  228   299   108   77    11
8072  50    528   2321  839   800   70    75    44    13
8616  15    428   1818  1828  370   272   40    42    19
9266  73    463   1573  2829  1219  125   113   3     17
```

Table 2.5.5.2. Saithe in the Faroes (Division Vb). Diagnostics from XSA with commercial pair trawler tuning series.

```
Lowestoft VPA Version 3.1

  28/04/2006   9:54

 Extended Survivors Analysis

 FAROE SAITHE (ICES Division Vb)                 SAI_IND

 CPUE data from file D:\Stovnsmeting\Ices2006\XSA\allpairGLM3-11.DAT

 Catch data for  45 years. 1961 to 2005. Ages  3 to  12.

      Fleet             First  Last  First  Last  Alpha   Beta
                         year  year   age    age
 All pair (GLM) >1000    1995  2005    3     11    .000   1.000

 Time series weights :

      Tapered time weighting not applied

 Catchability analysis :

      Catchability independent of stock size for all ages

      Catchability independent of age for ages >=    8

 Terminal population estimation :

      Survivor estimates shrunk towards the mean F
      of the final   5 years or the   3 oldest ages.

      S.E. of the mean to which the estimates  are shrunk =   2.000

      Minimum standard error for population
      estimates derived from each fleet =    .300

      Prior weighting not applied

 Tuning converged after   26 iterations

 Regression weights
         1.000  1.000  1.000  1.000  1.000  1.000  1.000  1.000  1.000  1.000

 Fishing mortalities

    Age   1996   1997   1998   1999   2000   2001   2002   2003   2004   2005
      3   .014   .012   .015   .006   .029   .015   .005   .009   .003   .013
      4   .039   .048   .072   .075   .068   .114   .148   .051   .069   .125
      5   .138   .116   .152   .183   .243   .299   .443   .299   .257   .465
      6   .303   .328   .241   .307   .425   .671   .679   .609   .408   .990
      7   .490   .508   .462   .501   .483   .788   .629   .734   .788   .597
      8   .833   .539   .534   .647   .747   .743   .712   .729   .816   .740
      9   .557   .698   .723   .653   .549  1.093   .522   .536  1.791   .967
     10   .745   .674   .858   .730   .800  1.394  1.070   .793   .929  1.102
     11   .327   .711   .754   .728   .693  1.291   .539   .887  1.239   .886

 XSA population numbers (Thousands)

                                   AGE
 YEAR          3          4          5          6          7          8          9         10         11

 1996      2.41E+04  3.12E+04  9.79E+03  6.13E+03  3.30E+03  1.02E+03  3.41E+02  1.62E+02  2.54E+02
 1997      3.32E+04  1.94E+04  2.46E+04  6.98E+03  3.70E+03  1.65E+03  3.63E+02  1.60E+02  6.30E+01
 1998      1.24E+04  2.68E+04  1.52E+04  1.79E+04  4.12E+03  1.82E+03  7.90E+02  1.48E+02  6.68E+01
 1999      5.81E+04  1.00E+04  2.04E+04  1.07E+04  1.15E+04  2.12E+03  8.76E+02  3.14E+02  5.13E+01
 2000      3.17E+04  4.73E+04  7.59E+03  1.39E+04  6.42E+03  5.72E+03  9.11E+02  3.73E+02  1.24E+02
 2001      8.37E+04  2.52E+04  3.61E+04  4.87E+03  7.46E+03  3.24E+03  2.22E+03  4.31E+02  1.37E+02
 2002      6.58E+04  6.75E+04  1.84E+04  2.19E+04  2.04E+03  2.78E+03  1.26E+03  6.09E+02  8.75E+01
 2003      4.11E+04  5.36E+04  4.77E+04  9.67E+03  9.11E+03  8.90E+02  1.12E+03  6.13E+02  1.71E+02
 2004      3.07E+04  3.33E+04  4.17E+04  2.89E+04  4.31E+03  3.58E+03  3.51E+02  5.35E+02  2.27E+02
 2005      3.59E+04  2.51E+04  2.55E+04  2.64E+04  1.58E+04  1.60E+03  1.30E+03  4.80E+01  1.73E+02
```

Table 2.5.5.2. (Continued)

Estimated population abundance at 1st Jan 2006

0.00E+00 2.90E+04 1.81E+04 1.31E+04 8.03E+03 7.10E+03 6.26E+02 4.03E+02 1.31E+01

Taper weighted geometric mean of the VPA populations:

2.52E+04 1.91E+04 1.28E+04 7.55E+03 4.03E+03 2.10E+03 1.13E+03 5.97E+02 3.31E+02

Standard error of the weighted Log(VPA populations) :

.5357 .5689 .5998 .5904 .5584 .5520 .6563 .8779 .9811

Log catchability residuals.

Fleet : All pair (GLM) >1000

Age	1995
3	.02
4	.40
5	.66
6	-.19
7	.18
8	.05
9	-.05
10	-.52
11	.00

Age	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
3	1.11	.33	.70	-.57	.97	.25	-1.04	-.38	-1.37	-.01
4	-.09	-.21	-.32	.17	-.21	.27	.32	-.35	-.15	.17
5	-.23	-.58	-.34	-.53	-.04	.04	.56	.16	-.03	.34
6	.05	-.18	-.79	-.14	-.05	.18	.46	.30	-.17	.54
7	-.21	.10	-.09	-.29	-.12	.11	.07	.21	.15	-.11
8	.37	-.08	-.22	.40	.13	-.15	-.10	-.07	-.13	-.21
9	.61	-.02	.06	-.17	-.24	.19	-.41	-.31	.64	.00
10	1.38	.02	.33	.05	.17	.36	.21	-.13	-.05	-.28
11	.13	-.21	-.14	-.09	.02	-.01	-.02	-.03	.14	.08

Mean log catchability and standard error of ages with catchability independent of year class strength and constant w.r.t. time

Age	3	4	5	6	7	8	9	10	11
Mean Log q	-15.2205	-13.1389	-11.9433	-11.3658	-11.2075	-11.0430	-11.0430	-11.0430	-11.0430
S.E(Log q)	.7912	.2708	.4106	.3696	.1680	.2153	.3420	.5109	.1068

Regression statistics :

Ages with q independent of year class strength and constant w.r.t. time.

Age	Slope	t-value	Intercept	RSquare	No Pts	Reg s.e	Mean Q
3	3.36	-1.546	26.30	.05	11	2.49	-15.22
4	1.19	-1.080	13.69	.78	11	.32	-13.14
5	1.01	-.040	11.96	.68	11	.44	-11.94
6	.95	.269	11.27	.77	11	.37	-11.37
7	1.09	-1.053	11.46	.93	11	.18	-11.21
8	1.05	-.393	11.21	.88	11	.24	-11.04
9	1.41	-1.897	12.81	.70	11	.43	-11.02
10	1.10	-.460	11.44	.69	11	.56	-10.90
11	.87	4.452	10.23	.99	11	.05	-11.05

Table 2.5.5.2. (Continued)

```
Terminal year survivor and F summaries :

Age  3   Catchability constant w.r.t. time and dependent on age
Year class = 2002

Fleet                  Estimated     Int        Ext     Var     N  Scaled   Estimated
                       Survivors     s.e        s.e    Ratio       Weights     F
All pair (GLM) >1000      28816.    .826        .000     .00    1   .853      .013

  F shrinkage mean        30378.    2.00                            .147      .012

Weighted prediction :

Survivors         Int       Ext     N     Var      F
at end of year    s.e       s.e          Ratio
    29041.        .76       .02     2     .027    .013

Age  4   Catchability constant w.r.t. time and dependent on age
Year class = 2001

Fleet                  Estimated     Int        Ext     Var     N  Scaled   Estimated
                       Survivors     s.e        s.e    Ratio       Weights     F
All pair (GLM) >1000      17984.    .282        .492    1.75    2   .978      .126

  F shrinkage mean        25461.    2.00                            .022      .090

Weighted prediction :

Survivors         Int       Ext     N     Var      F
at end of year    s.e       s.e          Ratio
    18122.        .28       .35     3    1.239    .125

Age  5   Catchability constant w.r.t. time and dependent on age
Year class = 2000

Fleet                  Estimated     Int        Ext     Var     N  Scaled   Estimated
                       Survivors     s.e        s.e    Ratio       Weights     F
All pair (GLM) >1000      12950.    .236        .174     .74    3   .977      .469

  F shrinkage mean        21338.    2.00                            .023      .310

Weighted prediction :

Survivors         Int       Ext     N     Var      F
at end of year    s.e       s.e          Ratio
    13097.        .23       .15     4     .627    .465

Age  6   Catchability constant w.r.t. time and dependent on age
Year class = 1999

Fleet                  Estimated     Int        Ext     Var     N  Scaled   Estimated
                       Survivors     s.e        s.e    Ratio       Weights     F
All pair (GLM) >1000       7816.    .203        .260    1.28    4   .968     1.007

  F shrinkage mean        17952.    2.00                            .032      .563

Weighted prediction :

Survivors         Int       Ext     N     Var      F
at end of year    s.e       s.e          Ratio
     8029.        .21       .23     5    1.132    .990

Age  7   Catchability constant w.r.t. time and dependent on age
Year class = 1998

Fleet                  Estimated     Int        Ext     Var     N  Scaled   Estimated
                       Survivors     s.e        s.e    Ratio       Weights     F
All pair (GLM) >1000       7129.    .178        .096     .54    5   .981      .595

  F shrinkage mean         5821.    2.00                            .019      .691

Weighted prediction :

Survivors         Int       Ext     N     Var      F
at end of year    s.e       s.e          Ratio
     7102.        .18       .09     6     .479    .597
```

Table 2.5.5.2. (Continued)

```
Age  8   Catchability constant w.r.t. time and dependent on age
 Year class = 1997

 Fleet                      Estimated      Int          Ext      Var      N   Scaled
Estimated
                        Survivors     s.e        s.e    Ratio       Weights     F
 All pair (GLM) >1000        627.    .184        .113     .62    6   .975      .739

   F shrinkage mean          606.    2.00                            .025      .757

 Weighted prediction :

 Survivors         Int       Ext     N     Var      F
 at end of year    s.e       s.e          Ratio
       626.        .19       .10     7     .548    .740

 Age  9   Catchability constant w.r.t. time and age (fixed at the value for age)  8
 Year class = 1996

 Fleet                      Estimated      Int          Ext      Var      N   Scaled
Estimated
                        Survivors     s.e        s.e    Ratio       Weights     F
 All pair (GLM) >1000        402.    .190        .063     .33    7   .963      .970

   F shrinkage mean          445.    2.00                            .037      .908

 Weighted prediction :

 Survivors         Int       Ext     N     Var      F
 at end of year    s.e       s.e          Ratio
       403.        .20       .06     8     .293    .967

 Age 10   Catchability constant w.r.t. time and age (fixed at the value for age)  8
 Year class = 1995

 Fleet                      Estimated      Int          Ext      Var      N   Scaled
Estimated
                        Survivors     s.e        s.e    Ratio       Weights     F
 All pair (GLM) >1000         13.    .295        .135     .46    8   .898     1.113

   F shrinkage mean           15.    2.00                            .102     1.009

 Weighted prediction :

 Survivors         Int       Ext     N     Var      F
 at end of year    s.e       s.e          Ratio
        13.        .33       .12     9     .362   1.102

 Age 11   Catchability constant w.r.t. time and age (fixed at the value for age)  8
 Year class = 1994

 Fleet                      Estimated      Int          Ext      Var      N   Scaled
Estimated
                        Survivors     s.e        s.e    Ratio       Weights     F
 All pair (GLM) >1000         59.    .208        .051     .24    9   .965      .884

   F shrinkage mean           53.    2.00                            .035      .947

 Weighted prediction :

 Survivors         Int       Ext     N     Var      F
 at end of year    s.e       s.e          Ratio
        58.        .21       .05    10     .224    .886
```

Table 2.5.5.3. Saithe in the Faroes (Division Vb). Fishing mortality (F) at age.

Table 8 Fishing mortality (F) at age

YEAR	1961	1962	1963	1964	1965
AGE					
3	.0226	.0465	.0307	.0478	.0495
4	.0556	.0863	.0358	.1260	.0772
5	.0994	.1208	.0716	.2198	.1588
6	.1219	.1401	.1115	.1797	.2137
7	.0933	.1192	.1634	.2213	.2216
8	.0852	.0752	.1157	.2566	.2424
9	.0972	.1150	.1355	.1424	.2983
10	.0915	.1295	.2012	.1658	.2355
11	.0916	.1069	.1514	.1891	.2601
+gp	.0916	.1069	.1514	.1891	.2601
FBAR 4- 8	.0911	.1083	.0996	.2007	.1827

YEAR	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975
AGE										
3	.0250	.0248	.0320	.0328	.0479	.0885	.0935	.1271	.2293	.1505
4	.1007	.0518	.0910	.1452	.2547	.1480	.0728	.3227	.3170	.3595
5	.1492	.1217	.0954	.1719	.1538	.3579	.1649	.4582	.3543	.5442
6	.2326	.1388	.1357	.1684	.1597	.1404	.2985	.3486	.3276	.2891
7	.2784	.2564	.1345	.2000	.1536	.1262	.3286	.2919	.2297	.1957
8	.2536	.2615	.2183	.2094	.1943	.1118	.2995	.2425	.1770	.1752
9	.2770	.2269	.2182	.3063	.1656	.1244	.3759	.1982	.1960	.1183
10	.3346	.2903	.2027	.3289	.2008	.1213	.4600	.2496	.1809	.1485
11	.2900	.2609	.2141	.2831	.1877	.1196	.3810	.2312	.1854	.1479
+gp	.2900	.2609	.2141	.2831	.1877	.1196	.3810	.2312	.1854	.1479
FBAR 4- 8	.2029	.1660	.1350	.1790	.1832	.1769	.2329	.3328	.2811	.3127

YEAR	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985
AGE										
3	.2055	.1478	.0837	.0374	.0926	.0137	.0285	.0693	.0158	.0629
4	.3705	.2977	.2367	.1776	.1536	.2415	.1832	.1061	.4955	.2367
5	.3153	.4251	.2881	.2890	.2024	.1958	.2031	.3629	.3460	.5028
6	.3432	.4140	.1915	.2780	.2299	.4379	.4823	.4648	.5672	.2917
7	.2048	.3665	.2001	.3213	.3217	.5551	.3197	.4954	.6364	.5662
8	.1767	.2537	.4119	.3572	.2550	.6322	.5384	.5284	.4650	.4141
9	.1664	.2026	.2642	.3872	.3127	.5593	.5698	.8446	.5173	.3185
10	.1202	.1740	.3018	.4698	.5105	.5211	.3288	.3718	.3693	.2173
11	.1550	.2111	.3279	.4075	.3617	.5757	.4826	.5866	.4538	.3185
+gp	.1550	.2111	.3279	.4075	.3617	.5757	.4826	.5866	.4538	.3185
FBAR 4- 8	.2821	.3514	.2657	.2846	.2325	.4125	.3453	.3915	.5020	.4023

YEAR	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
AGE										
3	.0211	.0367	.0215	.0176	.0159	.0470	.0299	.0634	.0466	.0115
4	.1385	.1386	.0891	.2026	.2042	.4162	.2641	.2058	.2752	.0900
5	.4552	.4274	.3560	.2287	.6239	.7723	.5998	.5545	.3349	.4136
6	.7618	.5769	.6420	.4944	.7893	.8665	.7163	.6083	.6108	.4079
7	.4057	.4624	.5887	.3757	.8095	.8102	.5395	.5267	.6128	.7155
8	.7505	.4173	.5986	.5298	.4081	.6725	.4958	.3755	.6803	.6494
9	.8262	.5485	.5648	.3542	.2135	.7394	.5809	.4990	.4266	.8526
10	.6211	.7314	.5554	.2383	.1877	.8263	.5209	.4853	.7646	.5216
11	.7397	.5705	.5778	.3765	.2712	.7534	.5369	.4566	.6294	.6565
+gp	.7397	.5705	.5778	.3765	.2712	.7534	.5369	.4566	.6294	.6565
FBAR 4- 8	.5023	.4045	.4549	.3662	.5670	.7075	.5231	.4541	.5028	.4553

YEAR	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	FBAR **-**
AGE											
3	.0137	.0115	.0146	.0061	.0287	.0150	.0051	.0089	.0027	.0127	.0081
4	.0392	.0485	.0721	.0752	.0685	.1138	.1480	.0515	.0690	.1248	.0818
5	.1385	.1161	.1520	.1831	.2434	.2986	.4432	.2993	.2570	.4652	.3405
6	.3031	.3281	.2411	.3071	.4252	.6708	.6790	.6094	.4077	.9897	.6689
7	.4900	.5081	.4622	.5011	.4830	.7877	.6292	.7340	.7883	.5966	.7063
8	.8327	.5393	.5340	.6467	.7475	.7431	.7116	.7292	.8160	.7396	.7616
9	.5574	.6984	.7235	.6531	.5487	1.0927	.5223	.5356	1.7910	.9672	1.0979
10	.7448	.6737	.8581	.7297	.8005	1.3936	1.0702	.7934	.9291	1.1017	.9414
11	.3268	.7109	.7535	.7282	.6931	1.2908	.5391	.8875	1.2390	.8858	1.0041
+gp	.3268	.7109	.7535	.7282	.6931	1.2908	.5391	.8875	1.2390	.8858	
FBAR 4- 8	.3607	.3080	.2923	.3426	.3935	.5228	.5222	.4847	.4676	.5832	

Table 2.5.5.4. Saithe in the Faroes (Division Vb). Stock number at age (start of year) (Thousands).

Table 10 Stock number at age (start of year) Numbers*10**-3

YEAR	1961	1962	1963	1964	1965
AGE					
3	9047	13663	22431	16192	22803
4	7739	7241	10678	17809	12638
5	5643	5993	5438	8435	12854
6	3881	4183	4349	4145	5543
7	2680	2813	2977	3185	2835
8	1746	1999	2044	2070	2090
9	1384	1313	1518	1491	1311
10	1036	1028	958	1085	1059
11	568	774	740	641	753
+gp	1032	1141	2147	1111	1367
TOTAL	34757	40149	53279	56164	63253

YEAR	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975
AGE										
3	21830	26879	21514	40798	34135	37285	33607	23282	18897	16306
4	17769	17432	21468	17059	32325	26640	27941	25059	16786	12301
5	9578	13154	13551	16048	12079	20514	18811	21271	14859	10010
6	8979	6755	9536	10085	11064	8480	11742	13059	11013	8536
7	3665	5826	4814	6816	6978	7721	6033	7132	7545	6498
8	1860	2272	3691	3445	4569	4899	5572	3556	4361	4910
9	1343	1182	1432	2429	2288	3080	3587	3381	2285	2991
10	797	833	771	942	1464	1587	2227	2016	2271	1537
11	685	467	510	515	555	981	1151	1151	1286	1551
+gp	981	670	1067	846	848	977	727	990	1722	2385
TOTAL	67486	75468	78354	98985	106305	112164	111397	100898	81024	67026

YEAR	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985
AGE										
3	18910	12940	8414	8632	12450	33326	15215	40976	25962	22192
4	11484	12607	9138	6336	6808	9292	26913	12107	31301	20923
5	7030	6492	7664	5905	4343	4780	5975	18346	8914	15614
6	4756	4199	3475	4704	3621	2905	3218	3993	10449	5164
7	5234	2763	2273	2349	2917	2356	1535	1627	2054	4852
8	4375	3492	1568	1523	1395	1731	1107	913	811	890
9	3374	3002	2218	850	872	885	753	529	441	417
10	2176	2339	2007	1394	473	522	414	349	186	215
11	1085	1580	1609	1215	714	232	254	244	197	105
+gp	2199	1907	2100	2262	2840	2549	2579	1330	759	1106
TOTAL	60623	51319	40466	35171	36433	58578	57963	80413	81075	71477

YEAR	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
AGE										
3	61705	48479	44979	28507	20647	24792	19528	23680	16750	38594
4	17061	49464	38261	36042	22932	16638	19366	15517	18197	13089
5	13520	12162	35256	28656	24097	15307	8985	12176	10342	11314
6	7732	7022	6494	20219	18666	10572	5789	4038	5726	6057
7	3158	2955	3229	2798	10097	6941	3639	2316	1799	2545
8	2255	1723	1524	1467	1573	3680	2527	1737	1120	798
9	482	872	930	686	707	857	1538	1260	977	464
10	248	173	412	433	394	468	335	704	627	522
11	142	109	68	194	279	267	168	163	355	239
+gp	329	244	149	136	365	243	284	155	115	265
TOTAL	106632	123203	131302	119138	99757	79763	62159	61746	56006	73889

YEAR	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	GMST 61-**	AMST 61-**
AGE													
3	24069	33167	12391	58069	31662	83667	65781	41079	30713	35923	0	24871	28726
4	31238	19438	26843	9997	47252	25189	67483	53583	33334	25077	29041	18692	21986
5	9795	24592	15161	20449	7592	36126	18404	47651	41670	25472	18122	12303	14532
6	6125	6982	17927	10663	13941	4873	21943	9673	28922	26385	13097	7103	8192
7	3298	3704	4118	11533	6422	7461	2040	9111	4306	15751	8029	3897	4480
8	1019	1654	1824	2124	5721	3244	2779	890	3580	1603	7102	2091	2431
9	341	363	790	876	911	2218	1263	1117	351	1296	626	1163	1419
10	162	160	148	314	373	431	609	613	535	48	403	635	856
11	254	63	67	51	124	137	88	171	227	173	13	339	523
+gp	323	214	150	145	55	83	118	79	171	52	76		
TOTAL	76624	90337	79419	114221	114052	163429	180507	163968	143810	131781	76509		

Table 2.5.5.5. Saithe in the Faroes (Division Vb). Summary table.

Run title : FAROE SAITHE (ICES Division Vb) SAI_IND

At 28/04/2006 9:56

Table 16 Summary (without SOP correction)

Terminal Fs derived using XSA (With F shrinkage)

	RECRUITS Age 3	TOTALBIO	TOTSPBIO	LANDINGS	YIELD/SSB	FBAR 4- 8
1961	9047	121972	83798	9592	.1145	.0911
1962	13663	126462	85635	10454	.1221	.1083
1963	22431	158238	100631	12693	.1261	.0996
1964	16192	160429	98383	21893	.2225	.2007
1965	22803	174777	107215	22181	.2069	.1827
1966	21830	184152	108779	25563	.2350	.2029
1967	26879	181651	104635	21319	.2037	.1660
1968	21514	189804	115962	20387	.1758	.1350
1969	40798	215030	123795	27437	.2216	.1790
1970	34135	224447	129143	29110	.2254	.1832
1971	37285	228425	139500	32706	.2345	.1769
1972	33607	237048	147569	42663	.2891	.2329
1973	23282	210526	136682	57431	.4202	.3328
1974	18897	204072	137611	47188	.3429	.2811
1975	16306	187420	137886	41576	.3015	.3127
1976	18910	169750	122017	33065	.2710	.2821
1977	12940	156334	114098	34835	.3053	.3514
1978	8414	137397	96026	28138	.2930	.2657
1979	8632	113047	83557	27246	.3261	.2846
1980	12450	124847	88942	25230	.2837	.2325
1981	33326	142231	76327	30103	.3944	.4125
1982	15215	150234	83368	30964	.3714	.3453
1983	40976	179273	91795	39176	.4268	.3915
1984	25962	190386	96186	54665	.5683	.5020
1985	22192	190139	118080	44605	.3778	.4023
1986	61705	235606	98138	41716	.4251	.5023
1987	48479	250262	102751	40020	.3895	.4045
1988	44979	260372	100826	45285	.4491	.4549
1989	28507	229044	101129	44477	.4398	.3662
1990	20647	192258	98738	61628	.6242	.5670
1991	24792	149848	71077	54858	.7718	.7075
1992	19528	124126	59363	36487	.6146	.5231
1993	23680	133190	59123	33543	.5673	.4541
1994	16750	126825	62917	33182	.5274	.5028
1995	38594	152377	61422	27209	.4430	.4553
1996	24069	162411	62955	20029	.3181	.3607
1997	33167	180064	63680	22306	.3503	.3080
1998	12391	163767	66461	26421	.3975	.2923
1999	58069	210907	72868	33207	.4557	.3426
2000	31662	217860	83795	39020	.4657	.3935
2001	83667	277388	82858	51786	.6250	.5228
2002	65781	273893	80266	53546	.6671	.5222
2003	41079	249003	77530	46555	.6005	.4847
2004	30713	220706	81516	46355	.5687	.4676
2005	35923	201455	77730	61372	.7896	.5832
Arith. Mean	28930	185988	95395	35316	.3900	.3460
0 Units	(Thousands)	(Tonnes)	(Tonnes)	(Tonnes)		

Table 2.5.6.1. Saithe in the Faroes (Division Vb). Input data for prediction with management options.

MFDP version 1a
Run: FinalFaroeSaitheMFDP
Time and date: 18:10 29/04/2006
Fbar age range: 4-8

2006

Age	N	M	Mat	PF	PM	SWt	Sel	CWt	
	3	30518	0.2	0.00	0	0	1.148	0.01	1.148
	4	29041	0.2	0.21	0	0	1.325	0.08	1.325
	5	18122	0.2	0.45	0	0	1.516	0.34	1.516
	6	13097	0.2	0.62	0	0	1.672	0.67	1.672
	7	8029	0.2	0.74	0	0	2.087	0.71	2.087
	8	7102	0.2	0.89	0	0	2.975	0.76	2.975
	9	626	0.2	0.95	0	0	3.790	1.10	3.790
	10	403	0.2	1.00	0	0	6.087	0.94	6.087
	11	13	0.2	1.00	0	0	6.134	1.00	6.134
	12	76	0.2	1.00	0	0	6.734	1.00	6.734

2007

Age	N	M	Mat	PF	PM	SWt	Sel	CWt	
	3	30518	0.2	0.00	0	0	1.148	0.01	1.148
	4.		0.2	0.17	0	0	1.325	0.08	1.325
	5.		0.2	0.40	0	0	1.516	0.34	1.516
	6.		0.2	0.58	0	0	1.672	0.67	1.672
	7.		0.2	0.72	0	0	2.087	0.71	2.087
	8.		0.2	0.87	0	0	2.975	0.76	2.975
	9.		0.2	0.97	0	0	3.790	1.10	3.790
	10.		0.2	1.00	0	0	6.087	0.94	6.087
	11.		0.2	1.00	0	0	6.134	1.00	6.134
	12.		0.2	1.00	0	0	6.734	1.00	6.734

2008

Age	N	M	Mat	PF	PM	SWt	Sel	CWt	
	3	30518	0.2	0.00	0	0	1.148	0.01	1.148
	4.		0.2	0.17	0	0	1.325	0.08	1.325
	5.		0.2	0.40	0	0	1.516	0.34	1.516
	6.		0.2	0.58	0	0	1.672	0.67	1.672
	7.		0.2	0.72	0	0	2.087	0.71	2.087
	8.		0.2	0.87	0	0	2.975	0.76	2.975
	9.		0.2	0.97	0	0	3.790	1.10	3.790
	10.		0.2	1.00	0	0	6.087	0.94	6.087
	11.		0.2	1.00	0	0	6.134	1.00	6.134
	12.		0.2	1.00	0	0	6.734	1.00	6.734

Input units are thousands and kg - output in tonnes

Table 2.5.6.2. Saithe in the Faroes (Division Vb). Yield per recruit input data.

MFYPR version 2a
Run: FinalFaroeSaitheMFYPR
Index file 28/4/2006
Time and date: 19:47 29/04/2006
Fbar age range: 4-8

Age	M	Mat	PF	PM	SWt	Sel	CWt	
3	0.2	0.027	0	0	1.304	0.01	1.304
4	0.2	0.201	0	0	1.788	0.10	1.788
5	0.2	0.494	0	0	2.382	0.35	2.382
6	0.2	0.718	0	0	3.091	0.67	3.091
7	0.2	0.851	0	0	3.930	0.71	3.930
8	0.2	0.954	0	0	4.850	0.75	4.850
9	0.2	0.989	0	0	5.654	0.98	5.654
10	0.2	1.000	0	0	6.406	1.06	6.406
11	0.2	1.000	0	0	7.244	0.97	7.244
12	0.2	1.000	0	0	8.518	0.97	8.518

Weights in kilograms

Table 2.5.6.3. Saithe in the Faroes (Division Vb). Prediction with management option

MFDP version 1a
Run: FinalFaroeSaitheMFDP
Index file 28/4/2006
Time and date: 18:10 29/04/2006
Fbar age range: 4-8

2006				
Biomass	**SSB**	**FMult**	**FBar**	**Landings**
166187	70604	1.0000	0.5118	41313

2007					2008	
Biomass	**SSB**	**FMult**	**FBar**	**Landings**	**Biomass**	**SSB**
152152	57547	0.0000	0.0000	0	185623	84738
.	57547	0.1000	0.0512	4805	179958	80139
.	57547	0.2000	0.1024	9305	174682	75882
.	57547	0.3000	0.1535	13524	169763	71940
.	57547	0.4000	0.2047	17482	165174	68285
.	57547	0.5000	0.2559	21199	160889	64895
.	57547	0.6000	0.3071	24693	156884	61749
.	57547	0.7000	0.3583	27981	153138	58825
.	57547	0.8000	0.4095	31076	149631	56108
.	57547	0.9000	0.4606	33993	146344	53579
.	57547	1.0000	0.5118	36744	143261	51225
.	57547	1.1000	0.5630	39342	140368	49031
.	57547	1.2000	0.6142	41797	137649	46986
.	57547	1.3000	0.6654	44119	135092	45076
.	57547	1.4000	0.7165	46317	132685	43293
.	57547	1.5000	0.7677	48399	130417	41626
.	57547	1.6000	0.8189	50374	128279	40067
.	57547	1.7000	0.8701	52248	126261	38607
.	57547	1.8000	0.9213	54028	124355	37239
.	57547	1.9000	0.9725	55721	122552	35956
.	57547	2.0000	1.0236	57331	120846	34752

Input units are thousands and kg - output in tonnes

Table 2.5.6.4. Saithe in the Faroes (Division Vb). Yield per recruit, summary table.

MFYPR version 2a
Run: FinalFaroeSaitheMFYPR
Time and date: 19:47 29/04/2006
Yield per results

FMult	Fbar	CatchNos	Yield	StockNos	Biomass	SpwnNosJan	SSBJan	SpwnNosSpwn	SSBSpwn
0.0000	0.0000	0.0000	0.0000	5.5167	22.1252	3.3084	18.0359	3.3084	18.0359
0.1000	0.0516	0.1818	0.9062	4.6120	15.5000	2.4257	11.4886	2.4257	11.4886
0.2000	0.1032	0.2785	1.2438	4.1319	12.2966	1.9660	8.3556	1.9660	8.3556
0.3000	0.1548	0.3402	1.3902	3.8270	10.4362	1.6799	6.5592	1.6799	6.5592
0.4000	0.2064	0.3838	1.4591	3.6122	9.2277	1.4824	5.4091	1.4824	5.4091
0.5000	0.2580	0.4167	1.4928	3.4503	8.3804	1.3367	4.6154	1.3367	4.6154
0.6000	0.3097	0.4428	1.5093	3.3227	7.7525	1.2241	4.0367	1.2241	4.0367
0.7000	0.3613	0.4641	1.5167	3.2185	7.2674	1.1340	3.5971	1.1340	3.5971
0.8000	0.4129	0.4821	1.5192	3.1313	6.8803	1.0601	3.2521	1.0601	3.2521
0.9000	0.4645	0.4974	1.5190	3.0570	6.5634	0.9982	2.9744	0.9982	2.9744
1.0000	0.5161	0.5107	1.5172	2.9925	6.2986	0.9455	2.7462	0.9455	2.7462
1.1000	0.5677	0.5225	1.5145	2.9359	6.0736	0.9000	2.5554	0.9000	2.5554
1.2000	0.6193	0.5329	1.5113	2.8856	5.8797	0.8603	2.3935	0.8603	2.3935
1.3000	0.6709	0.5423	1.5079	2.8406	5.7105	0.8253	2.2545	0.8253	2.2545
1.4000	0.7225	0.5508	1.5044	2.7999	5.5614	0.7942	2.1338	0.7942	2.1338
1.5000	0.7741	0.5586	1.5009	2.7629	5.4288	0.7663	2.0281	0.7663	2.0281
1.6000	0.8257	0.5657	1.4974	2.7290	5.3099	0.7411	1.9346	0.7411	1.9346
1.7000	0.8774	0.5723	1.4940	2.6977	5.2026	0.7182	1.8515	0.7182	1.8515
1.8000	0.9290	0.5783	1.4908	2.6689	5.1051	0.6974	1.7769	0.6974	1.7769
1.9000	0.9806	0.5840	1.4876	2.6420	5.0160	0.6783	1.7098	0.6783	1.7098
2.0000	1.0322	0.5893	1.4846	2.6170	4.9342	0.6606	1.6488	0.6606	1.6488

Reference point	F multiplier	Absolute F
Fbar(4-8)	1.0000	0.5161
FMax	0.8362	0.4316
F0.1	0.2419	0.1248
F35%SPR	0.3183	0.1643
Flow	0.1783	0.092
Fmed	0.6811	0.3515
Fhigh	2.137	1.1029

Weights in kilograms

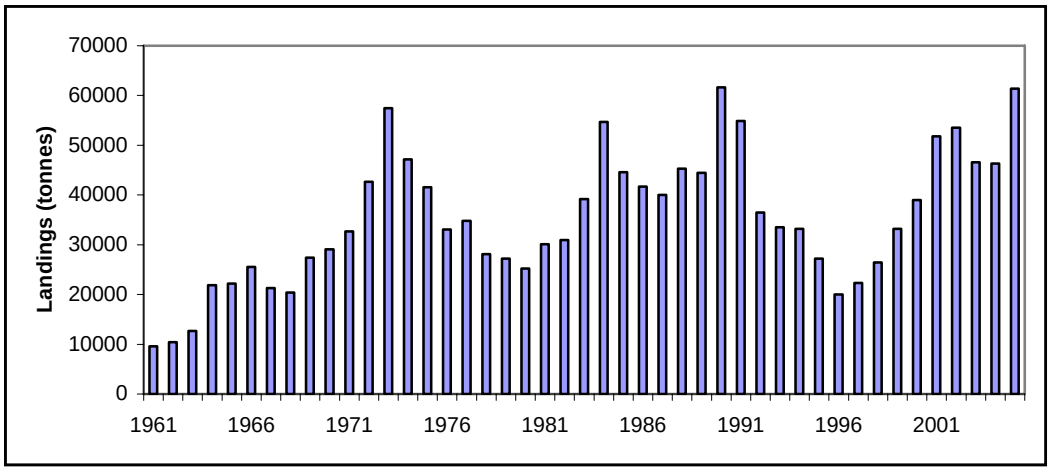


Figure 2.5.1.1. Saithe in the Faroes (Division Vb). Landings in 1000 tonnes.

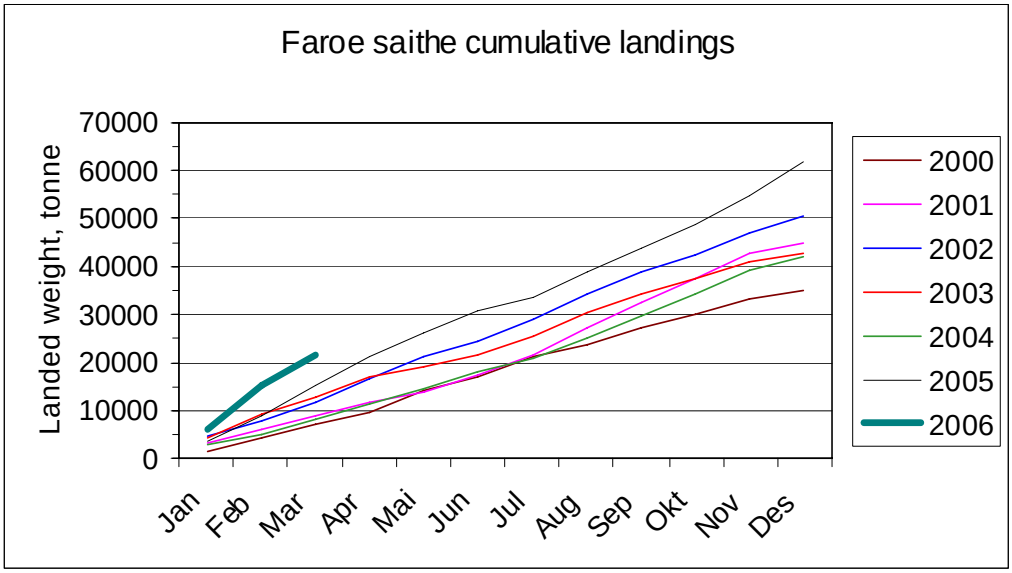


Figure 2.5.1.1b. Saithe in the Faroes (Division Vb). Cumulative landings (tonnes).

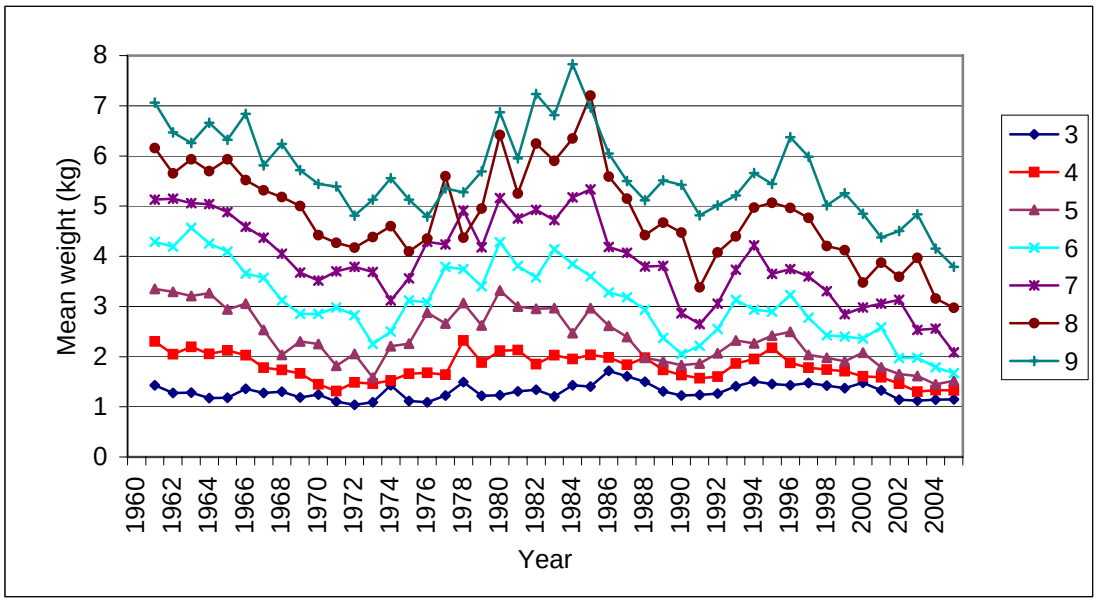


Figure 2.5.3.1. Saithe in the Faroes (Division Vb). Mean weight (kg) at age in the catches in 1961-2005.

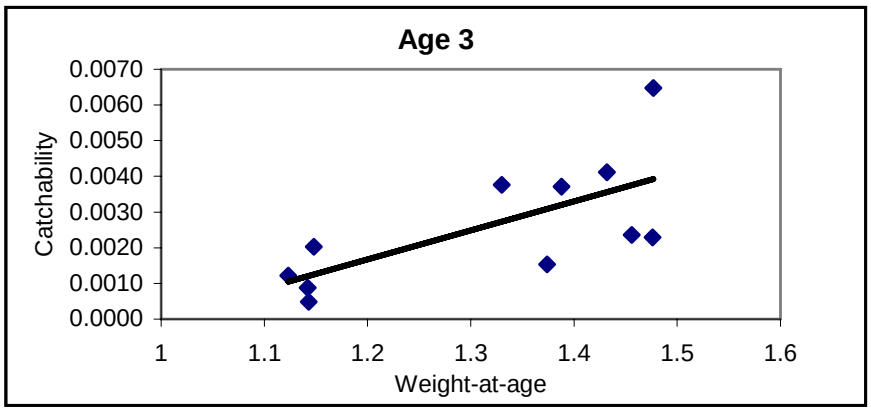


Figure 2.5.3.2. Saithe in the Faroes (Division Vb). Relation between weight at age and catchability for age 3.

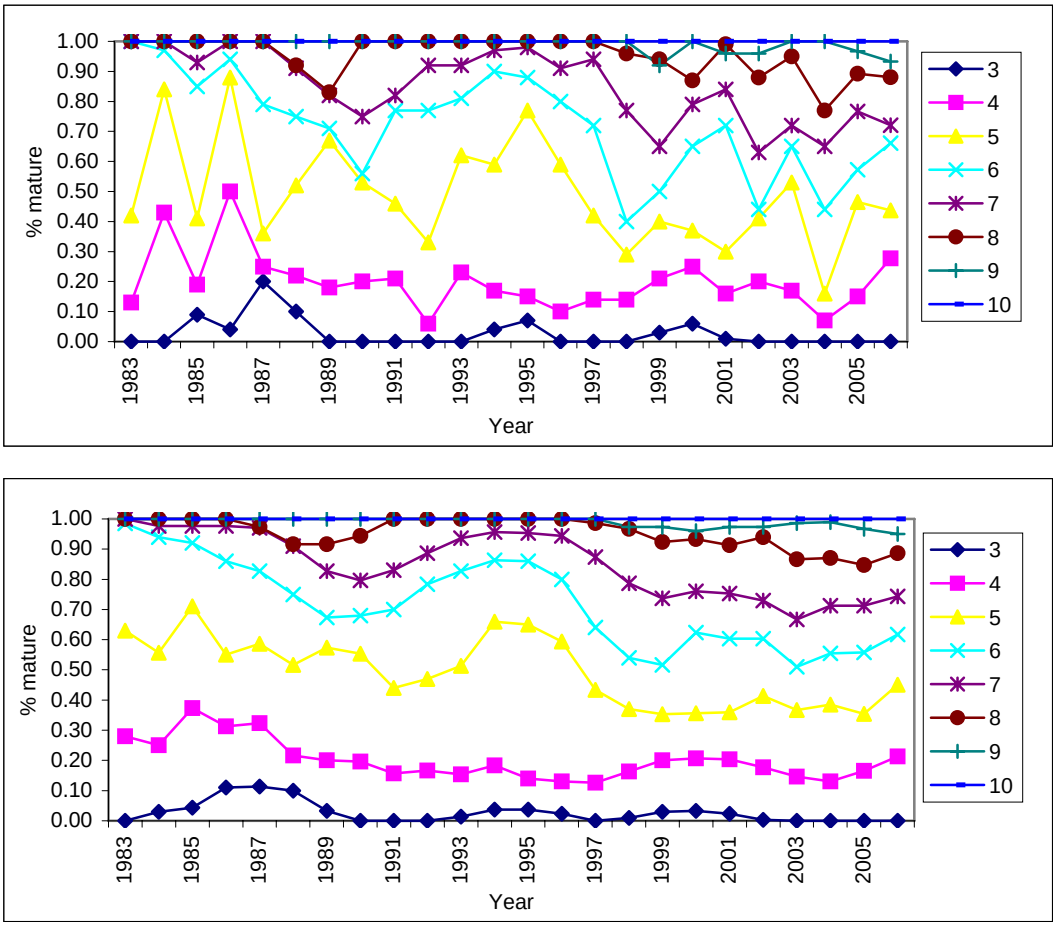


Figure 2.5.4.1. Saithe in the Faroes (Division Vb). Observed (upper figure) and three years running average (lower figure) proportion mature at age for the period 1983-2005. 2006 is the predicted value.

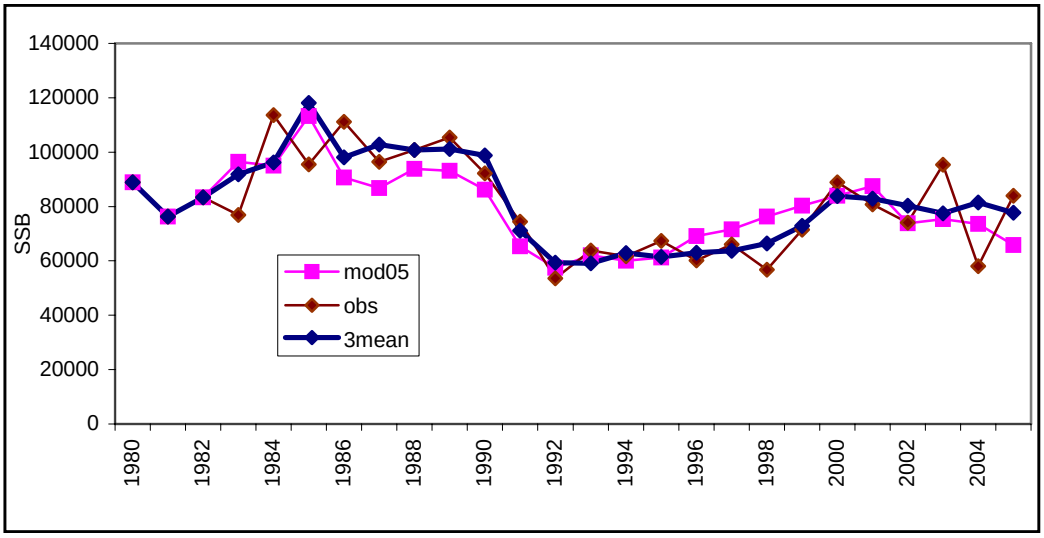


Figure 2.5.4.2. Saithe in the Faroes (Division Vb). Comparison of SSB with different maturity input in XSA. Mod05 is calculated using a GLM model as in the 2005 assessment, obs are the observed values and 3mean are three years running average.

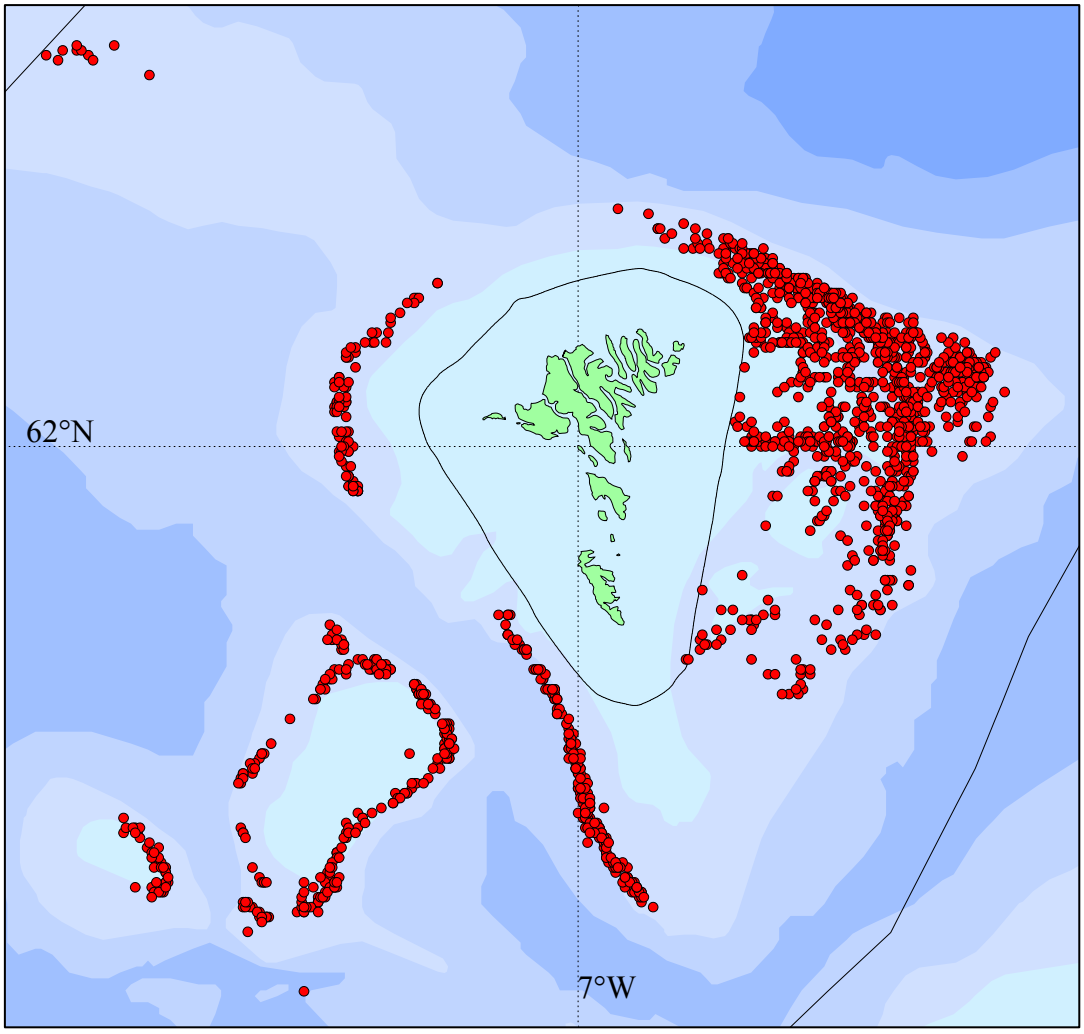


Figure 2.5.5.1. Saithe in the Faroes (Division Vb). Distribution of all saithe hauls from the pair trawlers, which are used in the tuning series.

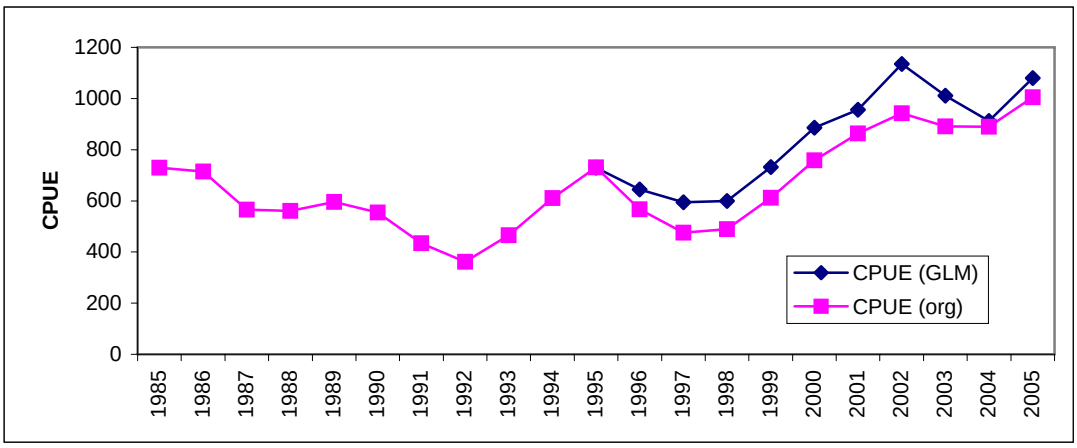


Figure 2.5.5.2. Saithe in the Faroes (Division Vb). Catch per unit effort from pair trawlers (tuning series). CPUE (GLM)- modelled catch per unit effort and CPUE (org)- original cpue for pair trawlers.

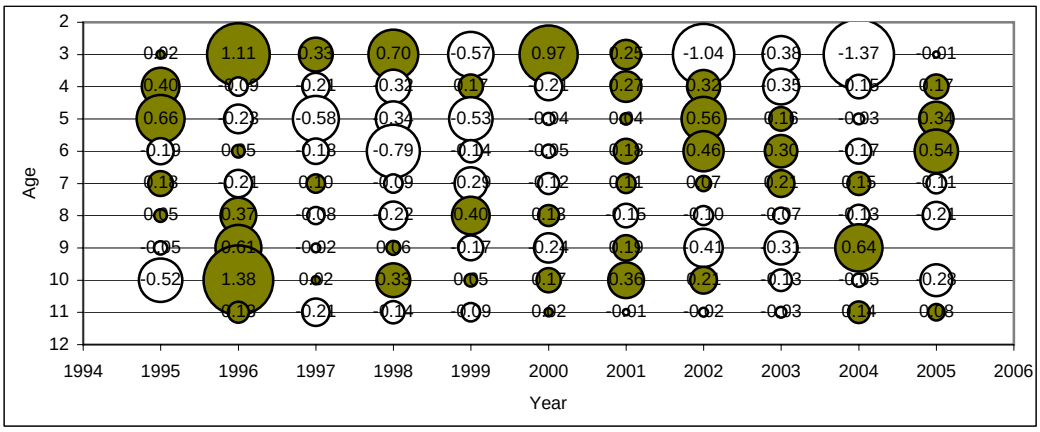


Figure 2.5.5.3. Saithe in the Faroes (Division Vb). Log catchability residuals for age groups 3 -11 from XSA.

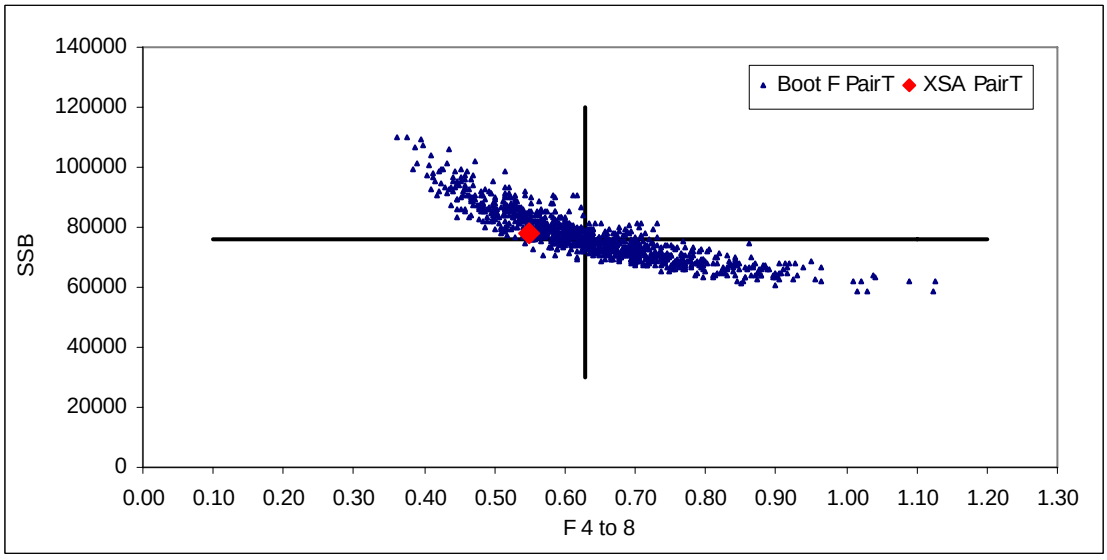
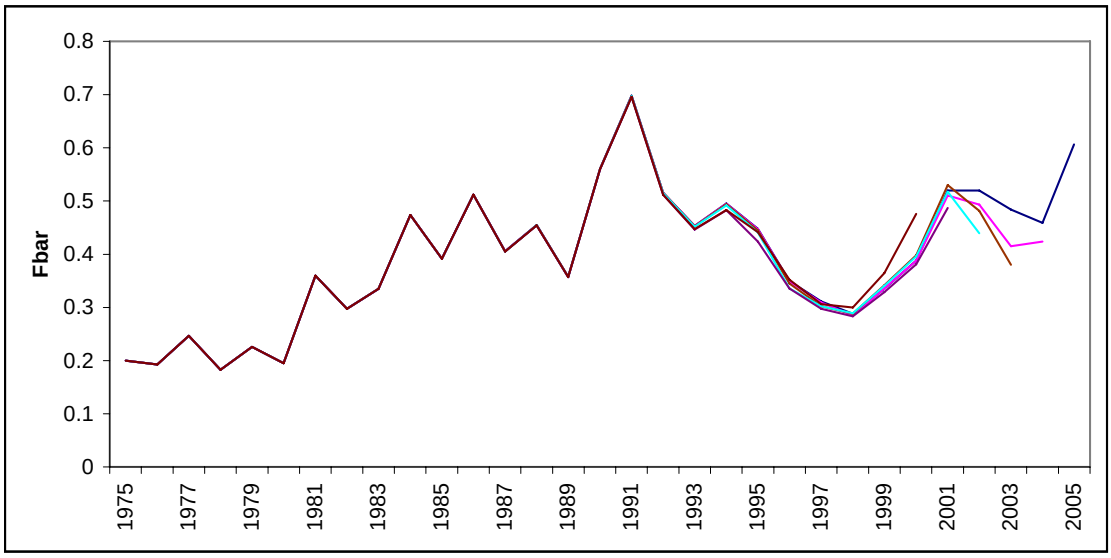


Figure 2.5.5.4. Saithe in the Faroes (Division Vb). Bootstrapped SSB and F on the pair trawler fleet ages 3-11 and the output from XSA on the pair trawlers. Vertical and horizontal lines show the median F and SSB respectively.



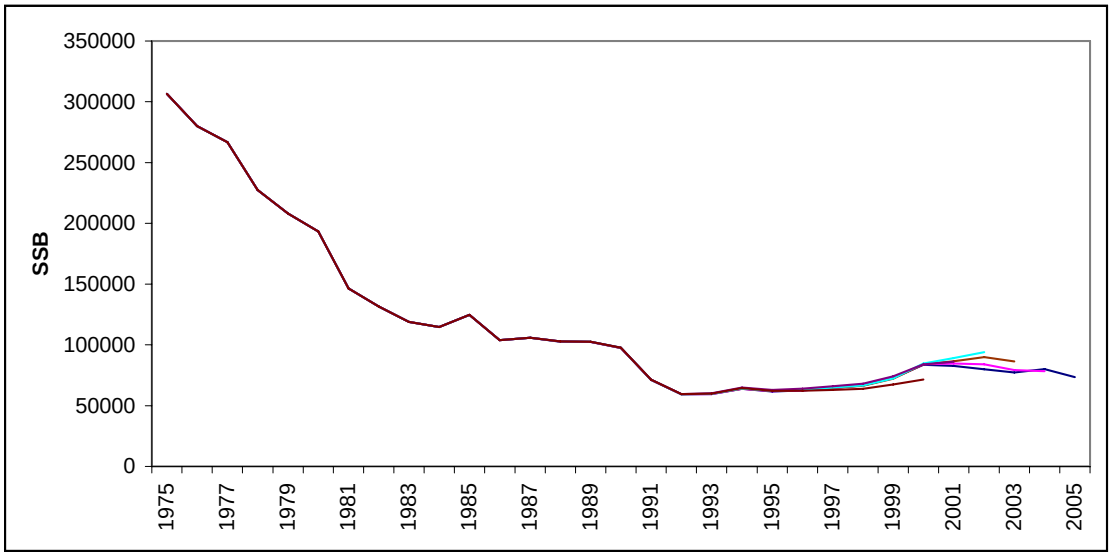


Figure 2.5.5.5. Saithe in the Faroes (Division Vb). Retrospective analysis of spawning stock biomass of age groups 4-8 (lower figure) and retrospective analysis of average fishing mortality of age groups 4-8 from Adapt (upper figure).

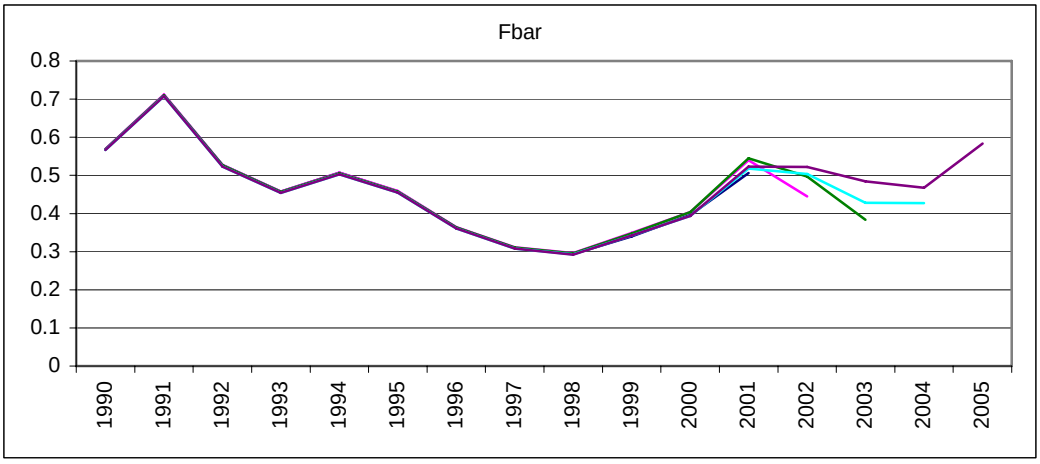


Figure 2.5.5.6. Saithe in the Faroes (Division Vb). Retrospective analysis of average fishingmortality of age groups 4-8 from XSA for the years 2001-2005.

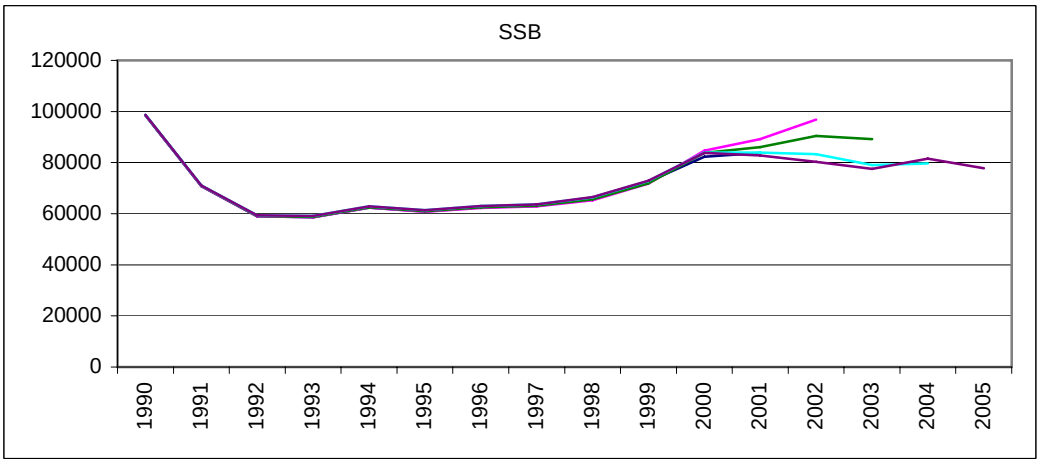


Figure 2.5.5.7. Saithe in the Faroes (Division Vb). Retrospective analysis of spawning stock biomass of age groups 4-8 from XSA for the years 2001-2005.

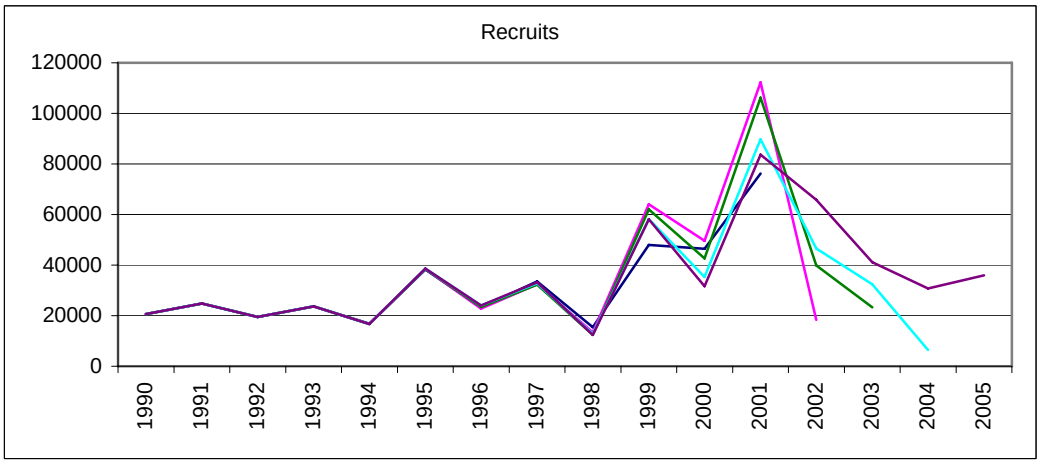


Figure 2.5.5.8. Saithe in the Faroes (Division Vb). Retrospective analysis of average recruitment for age 3 from XSA for the years 2001-2005.

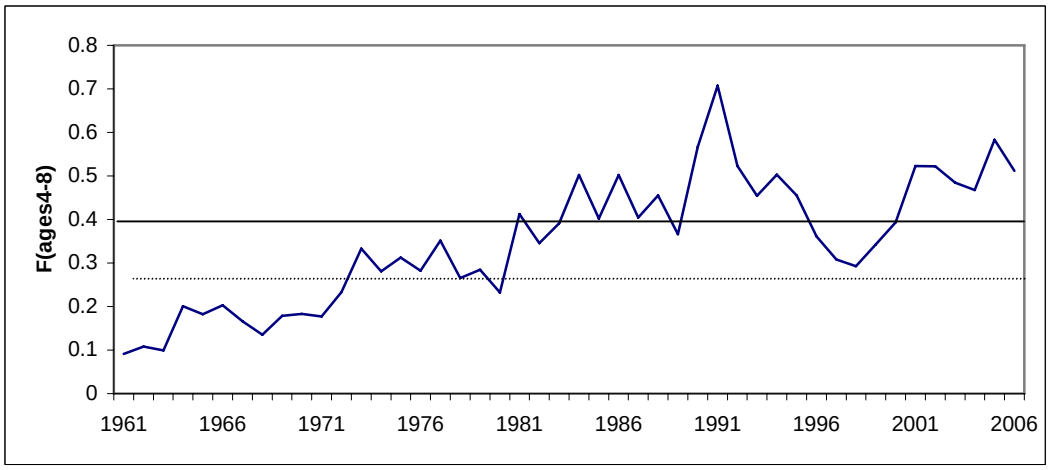


Figure 2.5.5.9. Saithe in the Faroes (Division Vb). Fishing mortality (average F ages 4-8). 2006 is predicted value.

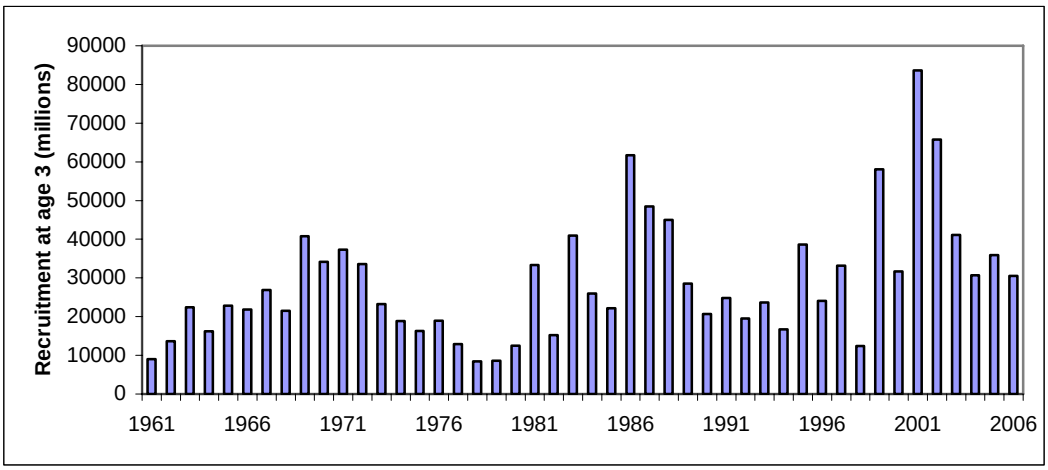


Figure 2.5.5.10. Saithe in the Faroes (Division Vb). Recruitment at age 3 (millions). 2006 is predicted value.

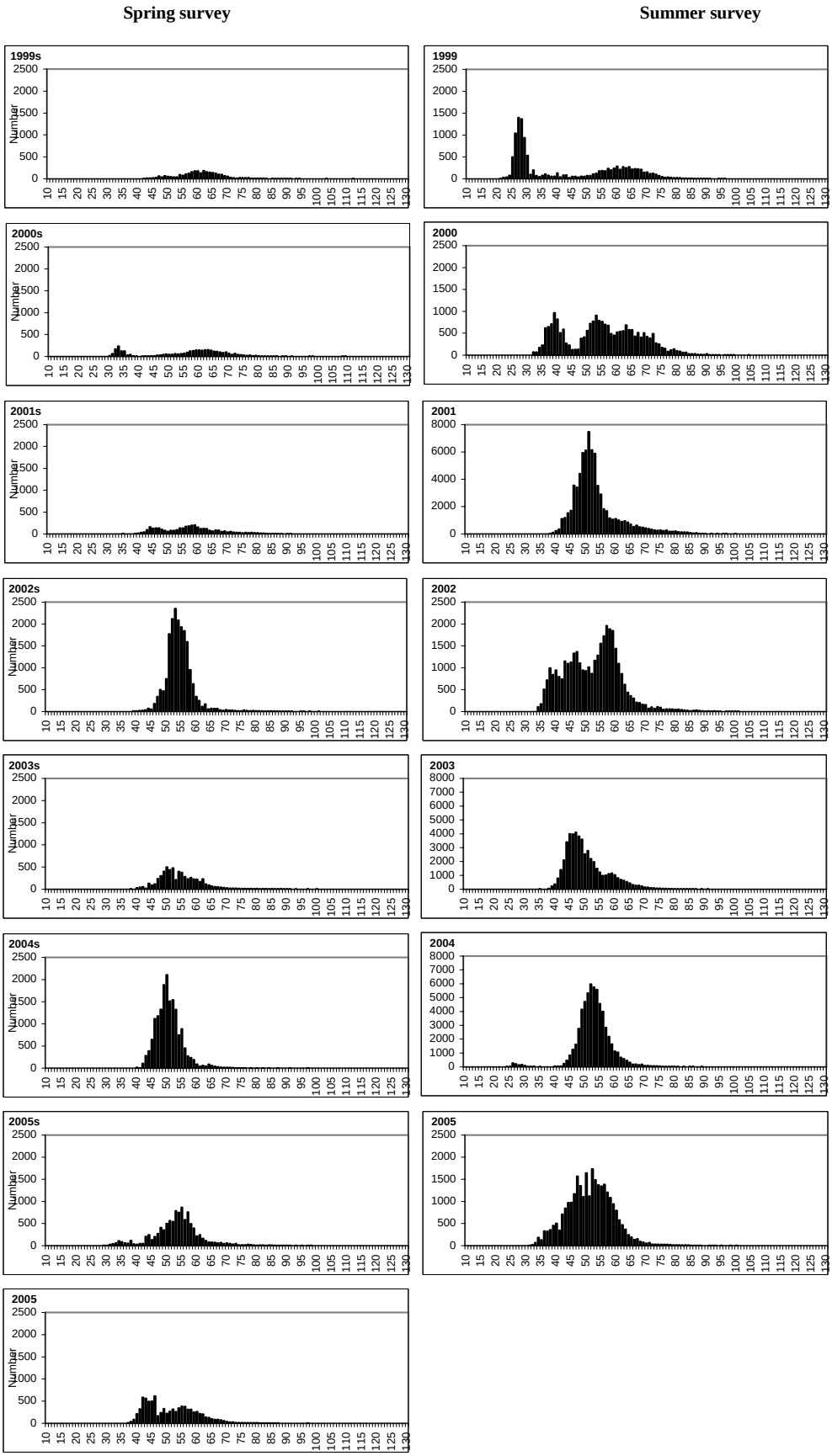


Figure 2.5.5.11. Saithe in the Faroes (Division Vb). Length distribution from spring (s) and summer survey 1999-2006. NB! Different scale for year 2001, 2003 and 2004 summer survey.

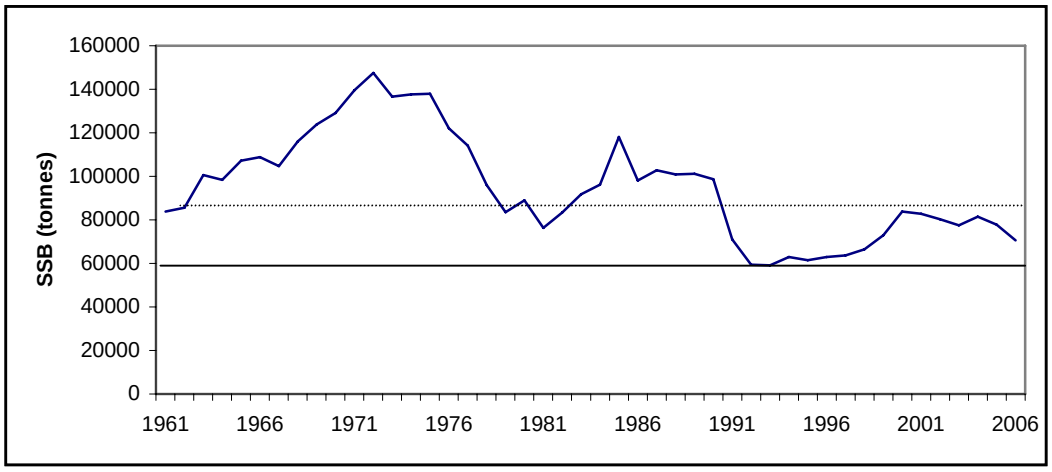


Figure 2.5.5.12 Saithe in the Faroes (Division Vb). Spawning stock biomass (1000 tonnes). 2006 is predicted value.

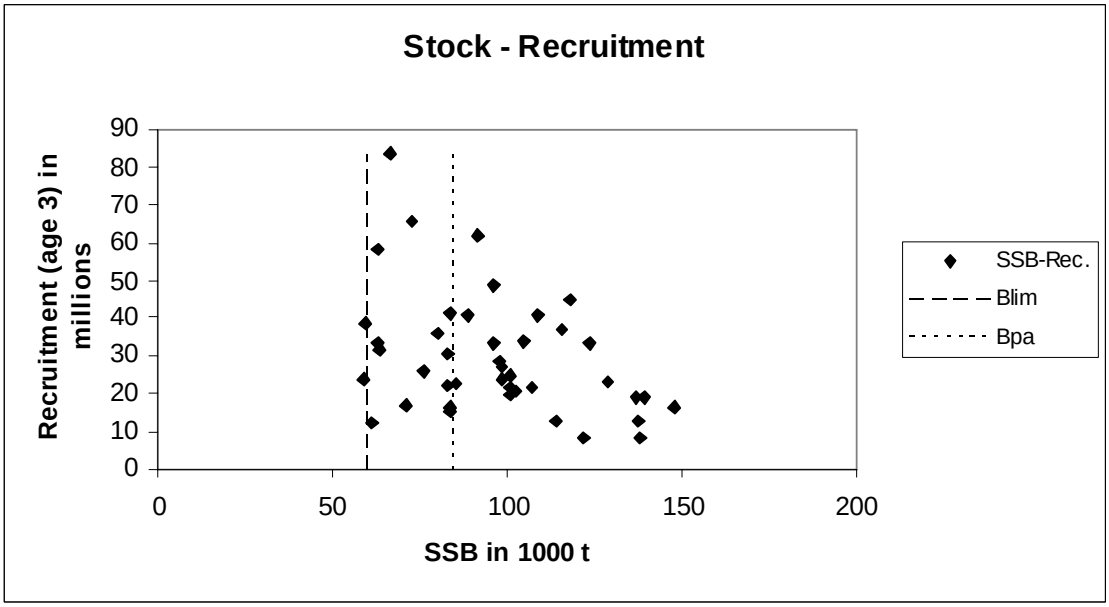


Figure 2.5.5.13 Saithe in the Faroes (Division Vb). Stock-Recruitment plot.

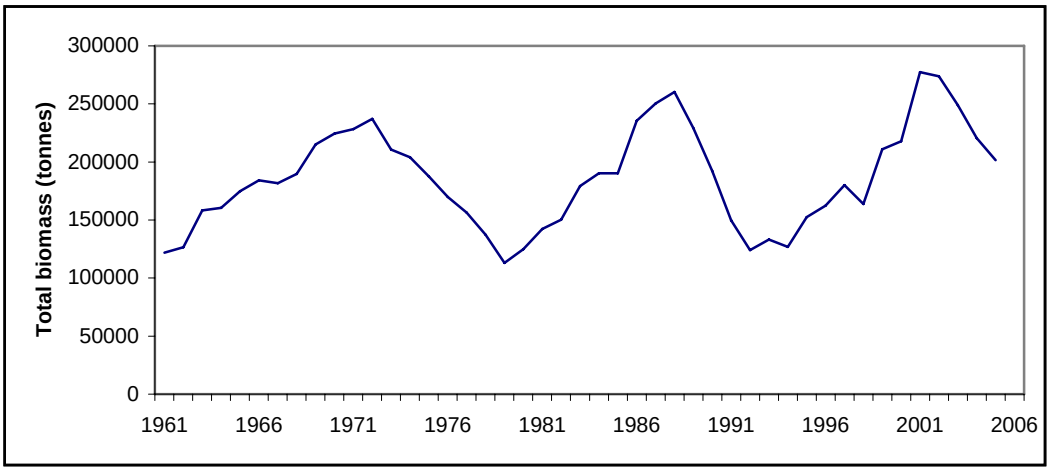


Figure 2.5.5.14. Saithe in the Faroes (Division Vb). Total biomass (1000 tonnes).

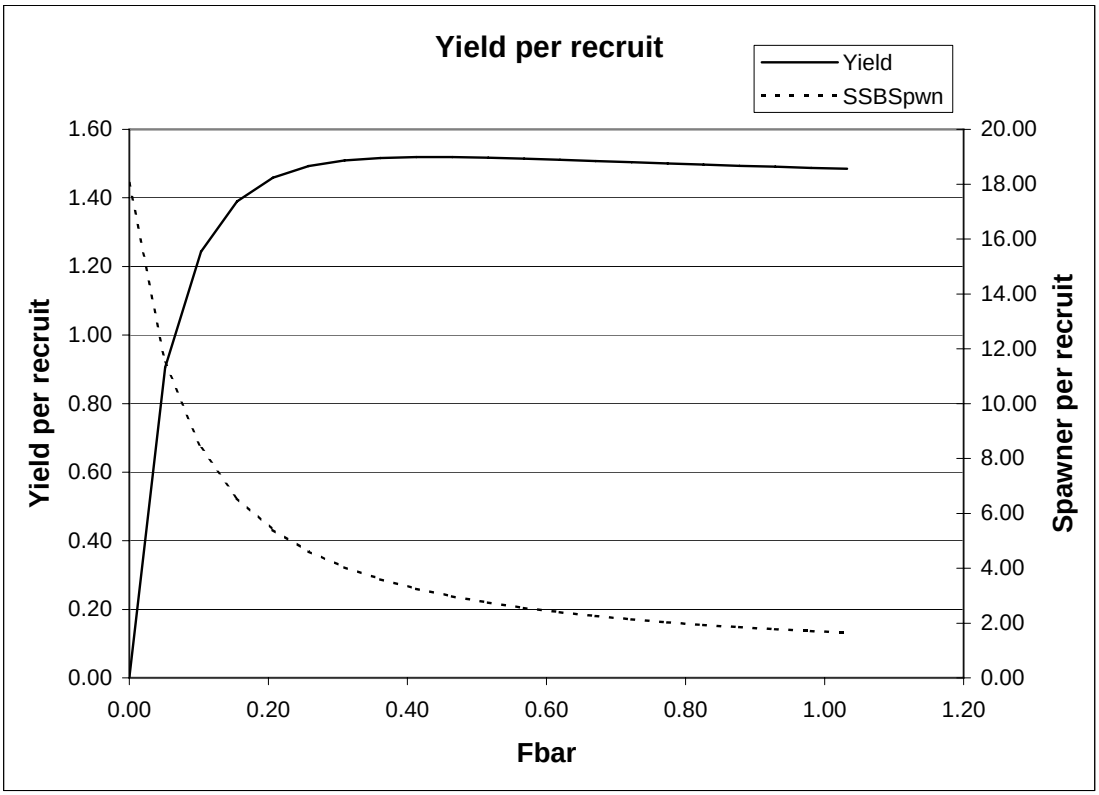


Figure 2.5.6.1 Saithe in the Faroes (Division Vb). Fish stock summary.

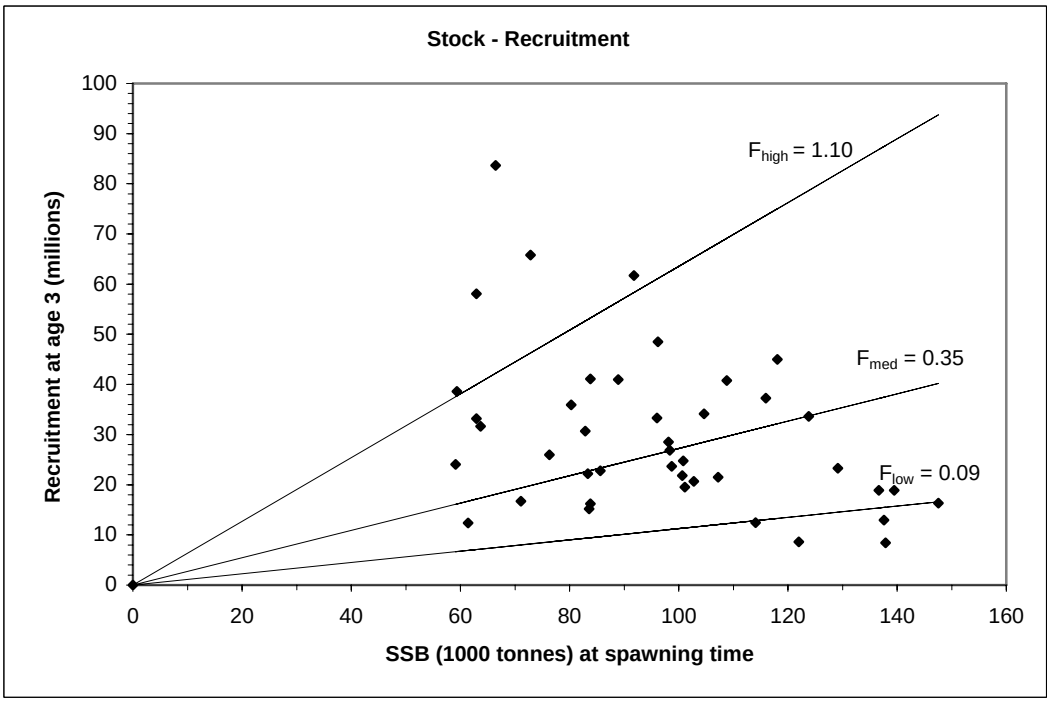


Figure 2.5.6.2 Saithe in the Faroes (Division Vb). Stock- recruitment.

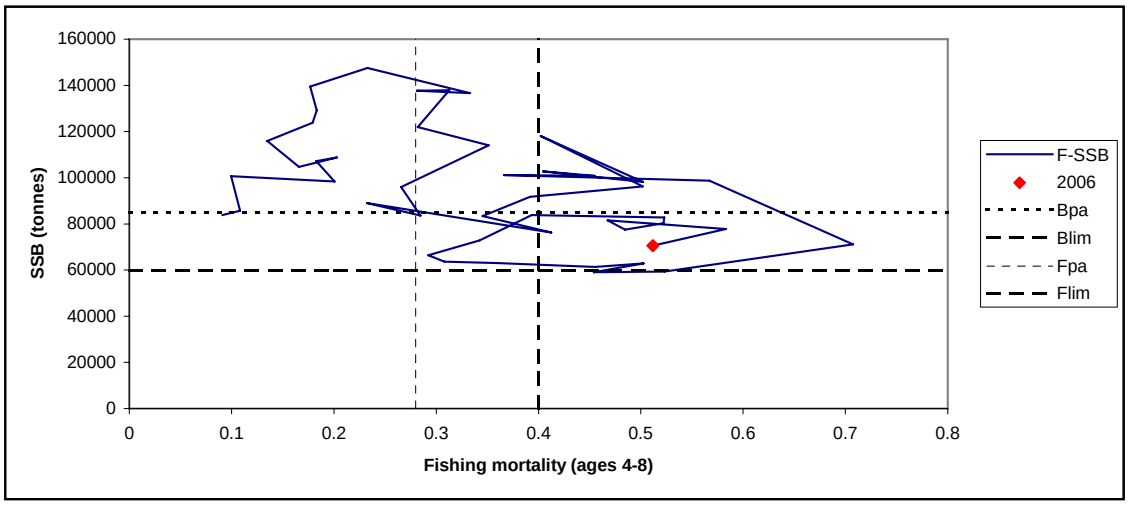


Figure 2.5.6.3. Saithe in the Faroes (Division Vb). Precautionary approach plot, period 1961-2006. The history of the stock/fishery in relation to the four reference points.

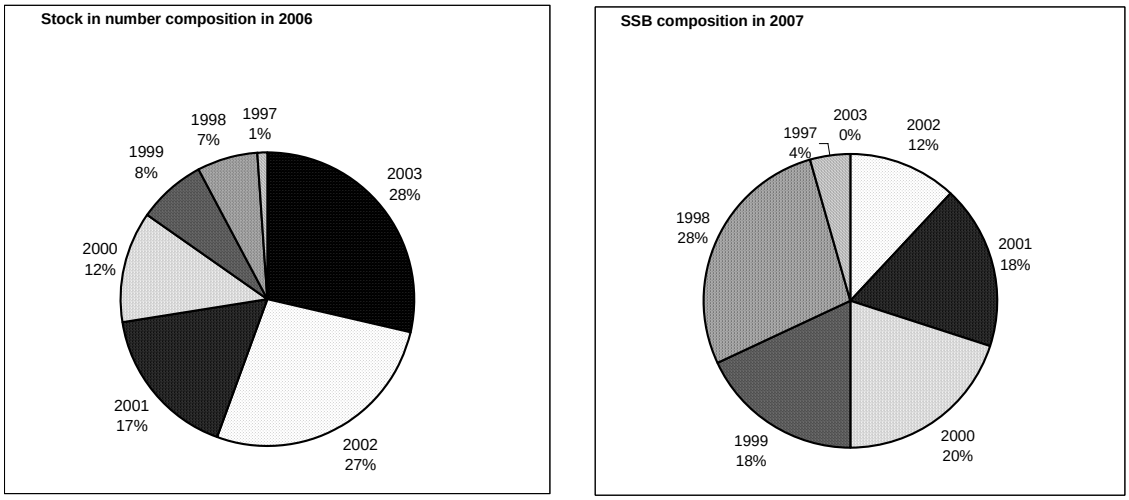


Figure 2.5.6.4. Saithe in the Faroes (Division Vb). Projected composition in number by year classes in the catch in 2006 (left figure) and the composition in SSB in 2007 by year classes (right figure).