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Volume 4

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Conseil International pour l'Exploration de la Mer

H.C. Andersens Boulevard 44-46
DK-1553 Copenhagen V
Denmark
Telephone (+45) 33 38 67 00
Telefax (+45) 33 93 42 15
www.ices.dk
info@ices.dk

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VOLUME 4

Section **Page**

1 THE FAROE PLATEAU ECOSYSTEM

1.1 Ecosystem overview

1.1.1 Ecosystem components

Topography, water masses, and circulation patterns

The Faroes are situated on a submarine ridge, which extends from Greenland, over Iceland, to Scotland (Figure 1.1.1.1, left panels). This ridge separates the Atlantic Ocean southwest of the ridge from the Norwegian Sea to the northeast. The sill of the ridge reaches different depths in different areas. Most of it is shallower than 500 m, but a small part is deeper with the Faroe Bank Channel being the deepest passage across the ridge.

The upper layers of the waters surrounding the Faroes are dominated by 'Modified North Atlantic Water' which derives from the North Atlantic Current flowing towards the east and north-east (Hansen and Østerhus, 2000) (Figure 1.1.1.1, upper left panel). This water is typically around 8°C and salinities around 35.25.

Deeper than 500–600 m (Figure 1.1.1.1, lower left panel) the water in most areas is dominated by cold (T<0°C) with salinities close to 34.9.

In shallow regions, there are strong tidal currents which mix the shelf water very efficiently. This results in homogeneous water masses in the shallow shelf areas. The well-mixed shelf water is separated relatively well from the offshore water by a persistent tidal front, which surrounds the shelf at about the 100- to 130-m bottom depth. In addition, residual currents have a persistent clockwise circulation around the islands.

The Shelf-front provides a fair, although variable, degree of isolation between the on-shelf and the off-shelf areas. This allows the on-shelf areas to support a relatively uniform shelf ecosystem, which in many ways is distinct from off-shelf waters. The ecosystem has distinct planktonic communities, benthic fauna, and several fish stocks. Furthermore, about 1.7 million pairs of seabirds breed on the Faroe Islands and take most of their food from the shelf water.

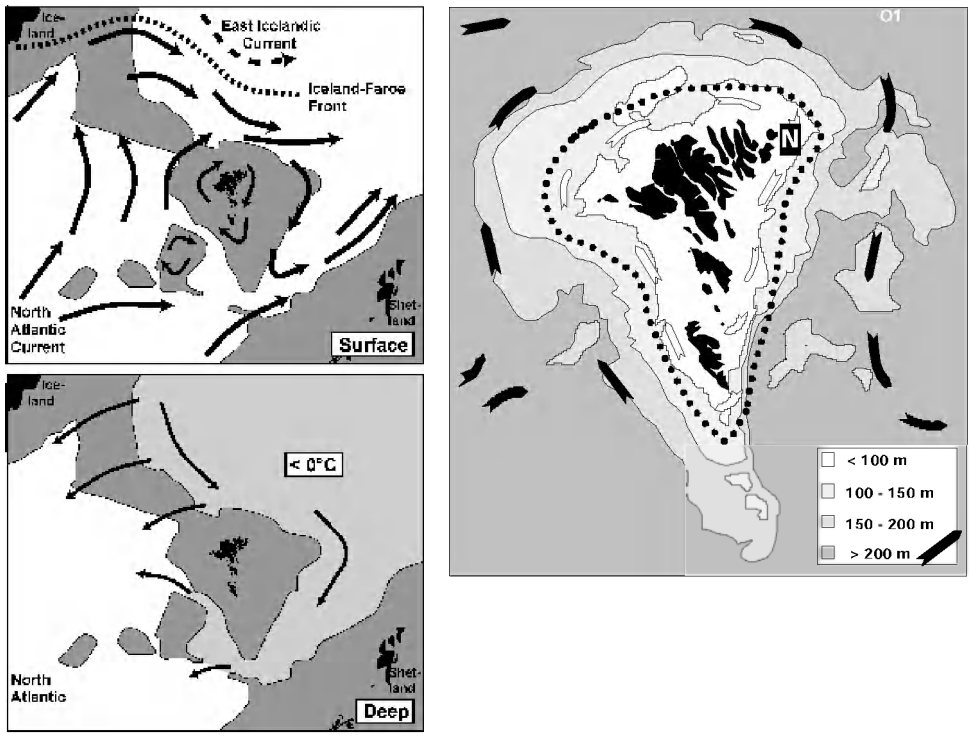

Figure 1.1.1.1 Bottom topography, circulation and water masses at the surface (top left panel), at depths greater than about 500 m (bottom left panel) in the area around the Faroes and on the Faroe shelf (right panel). Dashed lines indicate fronts.

Phytoplankton

These three regimes (well-mixed, frontal, and stratified) give different conditions for primary production. While the shallow well-mixed part is relatively well studied, little is known about production cycles in Faroese waters, and their dependence on the variable weather conditions in the two other regimes in the region.

One distinguishing feature is a typical earlier establishment of the spring bloom on the shelf than off-shelf, but observations (Gaard, 2003; Hansen *et al.*, 2005) have shown that the timing and intensity of this bloom can vary very much from one year to another.

In most years the phytoplankton community on the shelf is dominated by diatoms. However, in summers with low nutrient concentrations, smaller flagellates may take over (Gaard *et al.*, 1998).

Most of the new primary production on the shelf is between May and July. There has been observed high interannual variability in potential new primary production (Gaard, 2003). From 1990 to 2004 this new primary production (from spring to mid-summer) has fluctuated by a factor ~5 (Figure 1.1.1.2).

A characteristic feature of this variability is a high correlation between the onset and intensity of new primary production. In years with an early spring bloom, the total new primary production from April to late June may be several times greater than in years with a late spring bloom development (Gaard, 2003; Hansen *et al.*, 2005). It has furthermore been observed that this high variability is transmitted quickly upwards through the food chain (See later sections in this document).

The mechanisms controlling the primary production on the shelf are not well understood. However, recent modelling studies indicate that the variable exchange rate between on-shelf and off-shelf waters may be a main controlling factor for the timing and intensity of the spring bloom (Hansen *et al.*, 2005).

The index for 2004 is close to the 1990–2004 average (Figure1.1.1.2).

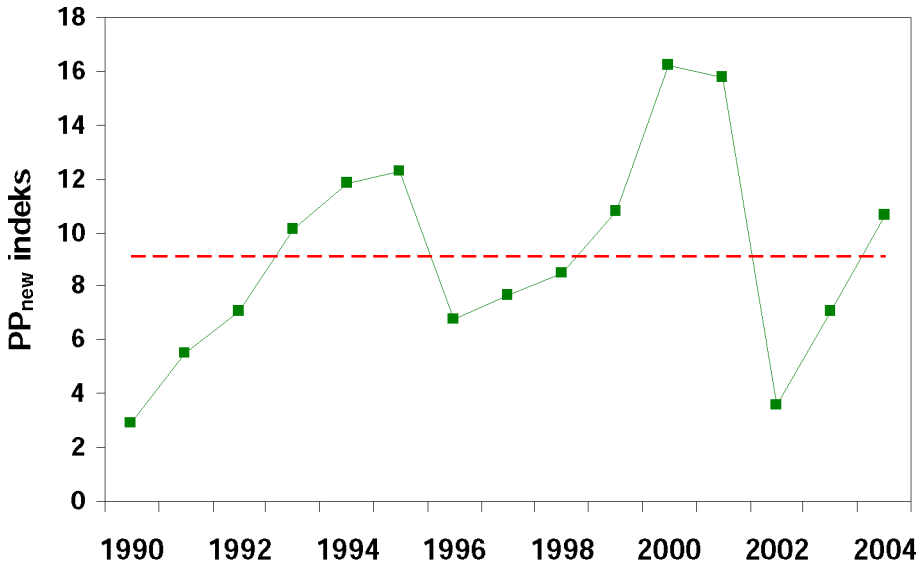

Figure 1.1.1.2 Index of new primary production from spring to mid-summer on the Faroe shelf since 1990. The horizontal line represents the average primary production index during the 1990–2004 period.

Zooplankton

While the zooplankton community outside the shelf front is largely dominated by the copepod *Calanus finmarchicus*, the shelf zooplankton community is basically neritic (shelf related species). During spring and summer the zooplankton in the shelf water is largely dominated by the copepods *Acartia longiremis* and *Temora longicornis*. *C. finmarchicus* is advected from off-shelf and occurs in interannually, highly variable abundance in the shelf water. Usually the abundance of *C. finmarchicus* is highest in spring and early summer. Meroplanktonic larvae, mainly barnacle larvae, may also be abundant, and decapod larvae and fish larvae and juveniles are common on the shelf during spring and summer (Gaard, 1999).

Reproduction rates of copepods depends largely on their feeding conditions and co-occurring fluctuations have been observed between phytoplankton abundance and copepod egg production rates, abundance, and composition.

Fish community

A total of 170 fish species are found in Faroese waters. Many of these species occur, however, in low abundance and are not exploited. Of the demersal species, saithe, cod, and haddock are the most abundant. Other common species are monkfish, Norway pout, ling, tusk, redfish, Greenland halibut, blue ling, and other. Most of these species spawn locally; however, some species (e.g. redfish and Greenland halibut) have their spawning grounds outside the Faroese area and apparently are common stocks over large parts of the Northeast Atlantic. An overview of typical depth distribution of the main species in offshore and shelf areas (deeper than 65-m bottom depth) is shown in Figure 1.1.1.3.

Of pelagic fish blue whiting is the most abundant. After spawning to the west of the British Isles in early spring, they start their feeding migration further north into the Norwegian Sea. They usually enter the ecoregion in May. They feed mainly on krill and other large zooplankton at depths between 300 and 500 meters, and partly also on the smaller *Calanus finmarchicus* closer to the surface. In late summer and autumn mature individuals migrate southwards again towards the spawning area while juveniles stay in Faroese water and the Norwegian Sea. Mackerel make a similar migration, although is has a more eastern and shallower distribution. Their main food items are *C. finmarchicus* and krill.

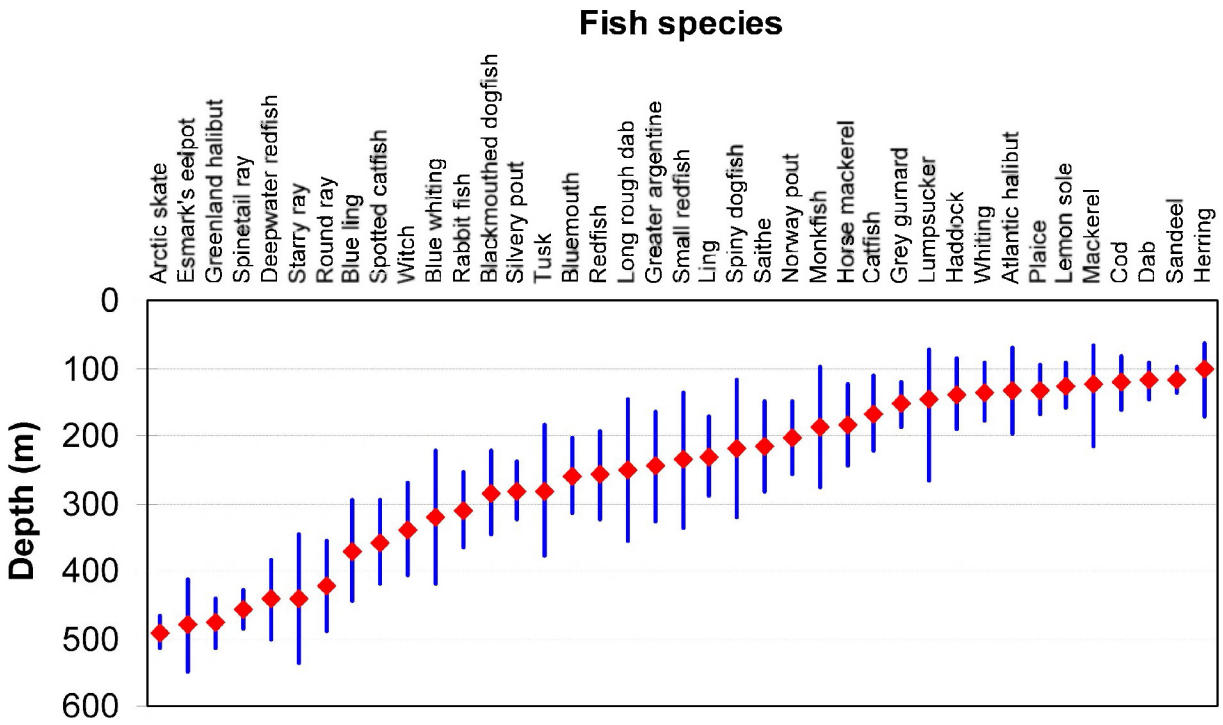

Figure 1.1.1.3 Typical depth distribution of fish in areas deeper than ~65 m on the Faroe shelf and in the ocean around the Faroes.

Cod and haddock and saithe are the most commercially important demersal stocks in Faroese waters.

Their spawning takes place on the shelf in spring. The spawning grounds of the haddock are more disperse than those of cod and saithe. Their offspring is dispersed by the strong currents throughout the shelf area. As they grow they predate on progressively larger zooplankton prey items on the shelf (Gaard and Steingrund, 2001; Gaard and Reinert, 2002). In July, at lengths of about 4 cm, the cod juveniles migrate into the littoral zone of the fjords and sounds, while the haddock make the transition to a predominant demersal habit on the plateau and the banks at depths of 90–200 m. The offspring is found close to the shores already in May. At an age of about 3 years they migrate into deep habitats, mainly on the upper slope.

Detailed knowledge about variability in food consumption of cod and haddock in Faroese waters is not conclusive. Both cod and haddock show diversity in prey items, and predate on benthic fauna as well as fish, with fish being a somewhat

more prevalent prey item for cod than for. Of the fish prey, sandeel seems to be a key species in the shallow areas and is a main link between zooplankton and higher trophic levels. When sandeels are abundant they are a preferred food item for cod on the shelf and hence affecting the feeding conditions for demersal cod on the shelf already during the first year after recruitment of the sandeel. At bottom depths less than 200 m sandeels and benthic crustaceans may also be important cod diet, but when sandeels are abundant, they form the principal food item for cod. Years with high cod production seem to be associated with a high abundance of sandeels.

In deeper areas other species (mainly Norway pout) have been observed to be more important as prey items for cod and haddock. On the slope other species, e.g. blue whiting may be important.

Despite a marked increase in fishing effort on cod and haddock, the landings have not increased correspondingly. The long-term landings of the cod usually have fluctuated between 20 000 and 40 000 tonnes during the 20th century and of haddock between 15 000 and 25 000 tonnes since the 1950s. The catches of these two main fish stocks have therefore for a long time reached the limit for long-term production within the ecosystem. Consequently, it is likely that the catches reflect interannual variability in production of these fish stocks.

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 (Figure 1.1.1.4). The temperature on the shelf has increased about 1°C during the last ten years. However, interannual temperature variability does not correlate with variability in primary production or cod and haddock growth or recruitment.

In 2002 the primary production was on a very low level, and this affected cod and haddock recruitment and weight-at-age shortly after. In 2004 the production again reached average levels.

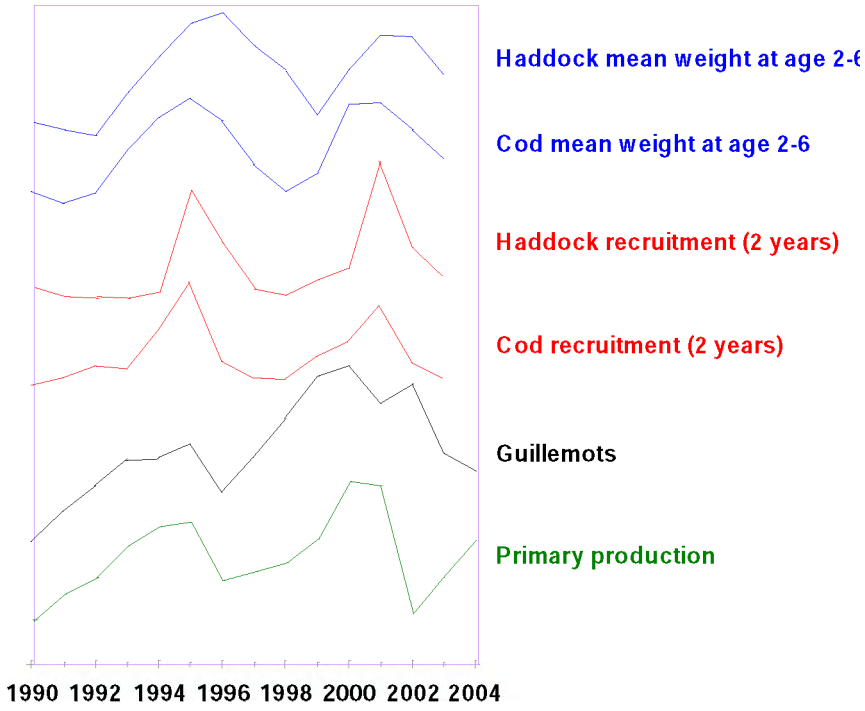

Figure 1.1.1.4 Relative variability in calculated new primary production, number of attending guillemots, recruitment of 2-year-old cod and haddock, and mean weight of 2- to 6-year-old cod and haddock since 1990 (Updated from Gaard *et al.*, 2002).

Benthos

Due to strong tidal currents on the shelf, the seabed consists mainly of sand on stones. In deeper areas is mort silt and organic material. The benthic fauna on the shelf is diverse with e.g. decapods and echinoderms and bivalves as important groups. On the slope coral and sponge areas occur. The coral areas have been reduced due to trawling and therefore the authorities recently have closed three areas for trawling. On the shelf there is local fishery (dredging) for scallops and in inshore areas there is lobster (*Nephrops*) fishery for pots.

1.1.2 Environmental impacts on the ecosystem dynamics

Cod and haddock recruitment

There is no clear relationship between fluctuations in cod and haddock spawning stock biomasses and recruitment on the Faroe plateau, but long-term relations between cod and haddock recruitment and weight-at-age have demonstrated that periods with high weight-at-age occur simultaneously with good recruitment of 2-year-old fish (Gaard *et al.*, 2002; 2005). Since 1990, when monitoring of environmental parameters in the Faroe shelf ecosystem started, clear co-occurring fluctuations can be observed in primary production and recruitment of cod and haddock (Figure 1.1.1.4).

The cod and haddock stocks have proven several times that when environmental conditions are favourable, they are, even with very small SSB, able to recover quickly. But it is when the environmental conditions are poor that the importance of spawning stock size and age composition most likely is significant. Therefore, the lack of direct relationship between SSB and recruitment is no argument for decreasing the significance of SSB.

The year class strength of cod seems to be determined rather late in life, i.e. during the second winter, which coincides with the migration towards deeper waters (Steingrund and Gaard, 2005). The bottleneck seems to be food availability in the area, which is determined by phytoplankton production (about 6 months before) and competition from older cod (Figure 1.1.2.1).

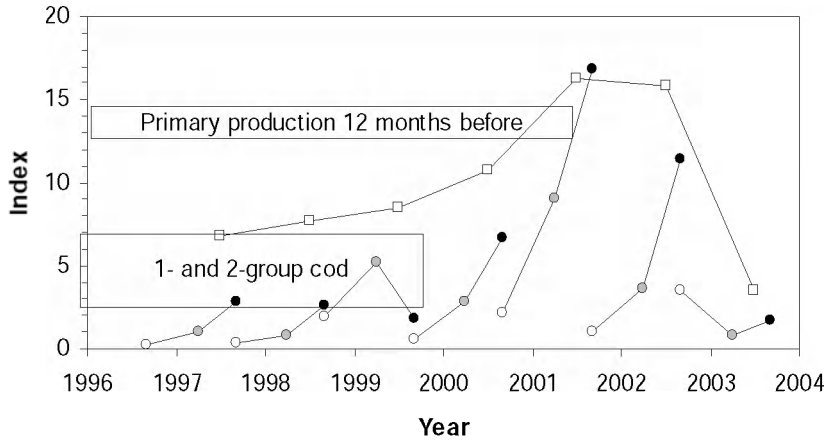

Figure 1.1.2.1 Relationship between primary production (12 months before) and catch per unit effort (number per trawl hour) of 1-group cod in August and 2-group cod of the same year class in March and August the following year (Steingrund and Gaard, 2005).

Cod and haddock growth

Growth rates on cod and haddock on the Faroe plateau are highly variable. Since 1990 the mean growth rates of 2- to 7-year-old cod have fluctuated between 0.24 and 1.36 kg individual^{-1} year^{-1} and the mean growth rates of 2- to 7-year-old haddock between 0.13 and 0.46 kg individual^{-1} year^{-1}. There is no correlation between the growth rates and the *in situ* temperature, but good relationship is found between primary production and growth variability of both species (Figure 1.1.2.2). The growth rates are mainly affected by the highly variable food production. The causal mechanism seems to be a positive relationship between phytoplankton production, zooplankton production, and the production of food organisms for cod (e.g. benthic crustaceans and especially sandeels).

Since primary production is rapidly transferred to cod and haddock, they obviously eat young prey items. Detailed analysis of interannual variability in food items for cod and haddock are not available at the present, but the available information indicates that sandeel is the main food item during productive years. In low-productive years they seem to predate more on benthic fauna. Fish furthermore seems to be a somewhat more prevalent prey item for cod than for haddock. This may be the reason why haddock growth variability is often lagging one year behind cod growth variability, especially during low productive periods (Figure 1.1.2.2). Possibly, the benthic fauna have higher ages than the fish prey (which mostly are 0-group sandeels in the shallow areas). Detailed analysis of this is needed before final conclusions can be drawn.

The increased primary production during the last two years, just above average level, indicates that a minor increase of growth rates (mainly of cod) can be expected (Figure 1.1.2.1).

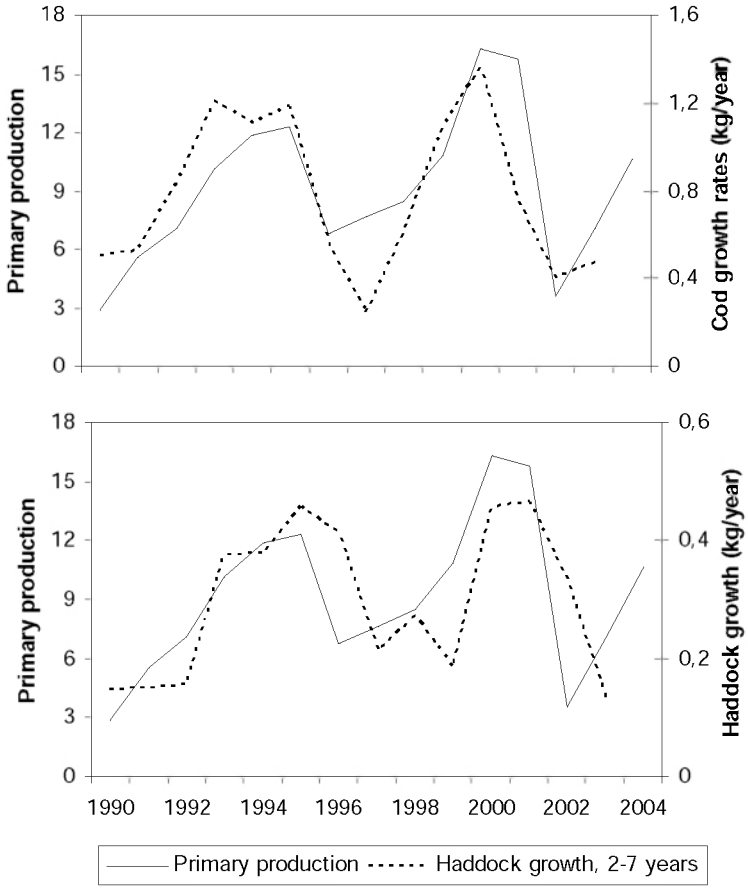

Figure 1.1.2.2 Primary production and cod growth rates (upper panel) and haddock growth rates (lower panel) during the 1990–2004 period.

Fish production

Fish production in the ecosystem is clearly food limited. Mainly cod production (numbers x individual growth summed up for all age groups) fluctuates well with primary production (Figure 1.1.2.3). When comparing primary production with production of cod haddock and saithe combined, the correlation is even better.

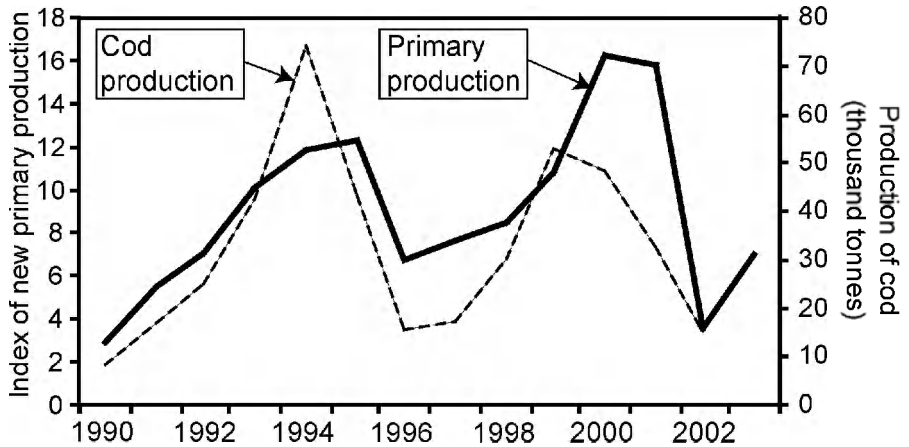

Figure 1.1.2.3 Index of new primary production on the Faroe shelf and corresponding production of Faroe Plateau cod older than 1.5 years. Updated from Steingrund *et al.*, 2003.

Since young age classes are the most numerous (mainly in the productive years) the observed variability in cod production in Figure 1.1.2.3 largely is due to variable abundances of recruits (Figure 1.1.2.4). The figure furthermore illustrates that in the 1960s and 1970s the proportion of production of older age classes was clearly higher than in recent times. The reason most likely is higher fishing mortalities in the later years.

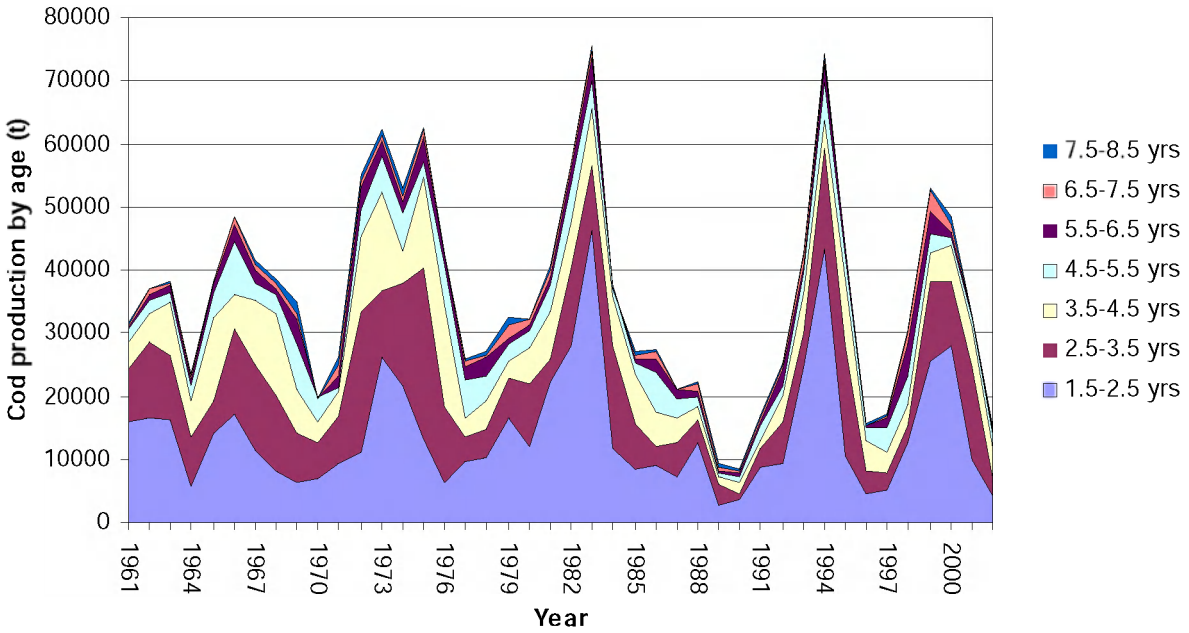

Figure 1.1.2.4 Production of Faroe Plateau cod split into age groups.

As cod grow older, they tend to move into deeper areas, feeding on the slope outside the shelf front (Steingrund and Gaard, 2005). Since fish production in the system is food limited (even year by year), a higher proportion of individuals feeding in deeper areas seems to be the only possibility for increased fish production. It is likely that a reduced fishing mortality, allowing a higher fraction of older individuals in the stock, would allow a higher total cod production, and would possible also have a smoothing affect on the stock production variability. There is, however, not sufficient available information at the moment to quantify this potential effect.

1.1.3 Fisheries effect on the ecosystem

Trawling activity has caused a significant reduced the distribution areas of corals (*Lophelia pertusa*) on the shelf and bank slopes. Therefore the Faroese authorities have recently closed three coral areas for trawling.

Since fishery on the Faroe Plateau is effort regulated, discard of commercially fish most likely is small. Bycatch of non-commercial species and of non-commercial size in unknown and may be higher, especially during periods of high recruitment.

1.1.4 Concluding remarks

Since studies on environmental conditions on the Faroe shelf started in 1990, a clear relationship has been observed between primary production and cod and haddock, recruitment, and growth rates. Food production seems to be transferred quickly into higher trophic levels in the ecosystem.

The food production (based on primary production, as shown in Figure 1.1.1.2) reached average values in 2004, after having being well below average in recent years. An increase in growth rates of cod toward average value can therefore be expected. Haddock growth rates may be somewhat smaller, since their fluctuations often lag somewhat behind the cod growth rates, especially during recovering periods. Feeding conditions for the coming year will, however, largely depend on food production in spring-summer 2005. These data will be available in July 2005.

There is no clear relationship between fluctuations in cod and haddock spawning stock biomasses and recruitment on the Faroe plateau, but their recruitment success correlates well with variability in primary production, while the correlation to SSB is weak.

The cod and haddock stocks have proven several times that when environmental conditions are favourable, they are, even with a very small SSB, able to recover quickly. But it is when the environmental conditions are poor that the importance of spawning stock size and age composition is most likely significant. Therefore, the lack of direct relationship between SSB and recruitment is no argument for decreasing the significance of SSB.

Fish production in the ecosystem clearly is food-limited. Since cod tend to migrate into deeper feeding habitats as they grow older, this may be a way to increase the total cod production. There is, however, not sufficient available information at the moment to quantify this potential effect.

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 (Figure 1.1.4.2). The growth of cod seems to be negatively correlated with the catchability of longlines (Figure 1.1.4.3), suggesting that cod prefer longline baits 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 longline catchability and there is thus a negative relationship between cod growth and fishing mortality (Figure 1.1.4.4).

For haddock there seems to be a similar mechanism as for cod. Although the catchability for longliners (which take the majority of the catch) as estimated from the longliner logbooks does not follow the expected pattern for the first part of the series (1986–1995), it may be a result of very small catches in this period when stock biomass was low. The fact that we observe a negative relationship between growth and fishing mortality (Figure 1.1.4.5) 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. The relationship is most clear for fish age 5; for cod age 3 and 4 the relationship is less clear, and 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 haddock on changes of 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 2004 and 2005 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.

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1.2 The human use of the ecosystem

1.2.1 Overall impacts

1.2.2 Fisheries

The total demersal catches decreased from 120 000 t in 1985 to 65 000 t in 1993, but have since increased again to above 120 000 t in 2002; the demersal catches in 2004 were about 105 000 t. The decrease up to 1993 was mainly due to lower catches of cod, haddock, and saithe, and the most recent decrease due to lower catches of cod.

Part of the catches of mackerel, Norwegian spring-spawning herring and blue whiting are taken around the Faroe Islands. The catches of these species are reported together with the catches from other areas in the section on widely migrating stocks, see Volume 9.

The main fisheries in Faroese waters are mixed-species, demersal fisheries, and single-species, pelagic fisheries. The demersal fisheries are mainly conducted by Faroese fishers, whereas the major part of the pelagic fisheries is conducted by foreign fishers licensed through bilateral and multilateral fisheries agreements.

The longliners fish mainly cod and haddock; in addition, some longliners fish in deep water for ling and tusk. Most of the trawlers fish cod, haddock, and saithe, while some large trawlers fish in deeper waters for redfish, blue ling, Greenland halibut, and occasionally grenadier and black scabbardfish. The jiggers fish mainly saithe and cod. Recently, gillnet fisheries for Greenland halibut and anglerfish and a directed pair trawler fishery for argentines have been introduced.

Pelagic fisheries. Three main species of pelagic fish are fished in Faroese waters: blue whiting, Norwegian spring-spawning herring, and mackerel; several nations participate. The assessment and status of these stocks are discussed as "widely migrating stocks", see Volume 9, as these fish occur in major parts of the Northeast Atlantic. 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 fishing for these fish in the Faroese ecosystem use purse seiners and factory trawlers. These fleets fish the pelagic stocks in other areas as well.

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 can therefore appear in different fleets.

The small boats fishing in these waters are Faroese. The fleets of other countries are longliners > 110 GRT and otter board trawlers with more than 1000 HP.
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 (above 1400 licenses) are often operated by non-professional 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. The number of licenses is about 90.

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. During summer they also make a few trips to Icelandic waters. There are 19 Faroese vessels in this fleet. Vessels of the same type as the Faroese longliners larger than 110 GRT from other countries (mainly Norway) also fish in these waters. They target mainly ling and tusk with bycatches of cod, haddock and blue ling. Norway has in the bilateral fishery agreement with the Faroe Islands obtained a total quota of these species; numbers of vessels can vary from year to year.

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. These vessels, also called the deepwater trawlers, consist of 13 vessels. They target several deepwater 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. Vessels flying the flags of France, Germany, Greenland, United Kingdom, mainly otter board trawlers of the same type as the Faroese otter board trawlers also fish around the Faroe Islands. The smaller of these vessels, mainly from the United Kingdom and Greenland, target cod, haddock, and saithe, whereas the larger vessels, mainly French and German trawlers, target saithe and deep-sea species like redfish, blue ling, grenadier, and black scabbardfish. As for the longliners, these vessels fish under a bilateral fishery agreement with the Faroes, obtaining a total quota of these species; the numbers of vessels can vary from year to year.

Pair trawlers <1000 HP. These vessels fish mainly for saithe, however, they also have a significant bycatch 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 bycatch 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. The number of vessels in the two pair trawlers fleets is 31.

Gillnetting 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.

Poor recruitment in the late 1980s combined with high fishing effort reduced the SSBs of Faroe Plateau cod and Faroe haddock to low levels, and in the period 1993–1995 ICES considered these stocks to be well below minimum biologically acceptable levels and consequently advised no fishing. Both stocks have since increased due to improved recruitment and growth. The most recent SSB estimate of Faroe Plateau cod is below the precautionary SSB level ($\mathbf{B}_{pa}$) whereas SSB of haddock is far above $\mathbf{B}_{pa}$. The fishing mortality on both Faroe Plateau cod and Faroe haddock was reduced during the crisis in first half of the 1990s and has since then increased and is now above the precautionary level ($\mathbf{F}_{pa}$). The Faroe Bank cod stock seems to be at or slightly above average. The SSB of Faroe saithe has been increasing from the record low in 1992 to above the $\mathbf{B}_{pa}$ in 1998–2003; in 2004, however, it has been estimated below $\mathbf{B}_{pa}$. The fishing mortality is above the precautionary level ($\mathbf{F}_{pa}$).

1.3 Assessments and advice

Fisheries advice

Mixed fisheries and fisheries interactions

The pelagic fisheries exploit stocks that occur widely in the Northeast Atlantic. Since these fisheries are single-species fisheries, management of these stocks should be done based on single-species upper boundary considerations and should consider exploitation in all areas where these stocks are fished, see Volume 9.

Most demersal fisheries are mixed species fisheries; exceptions are gillnet fisheries for Greenland halibut and gillnet fisheries for anglerfish where bycatches are small.

Some of the demersal stocks are local, whereas others like Greenland halibut, anglerfish, redfish, and most deep-sea stocks occur over a wider area than the Faroese waters and management of them should consider exploitation in all areas where these stocks are fished.

At present, only a few stocks are assessed among those currently exploited in Faroese waters. Proper mixed fisheries considerations should include several other species that are not currently assessed. If proper fishery-based advice taking mixed fisheries issues into account should be given for the fishery in Vb, ICES would need to evaluate the status of these stocks.

In the present management regime, the stocks of cod, haddock, and saithe are regulated by gear and fleet specifications, area closures, and number of fishing days. Consequently, the status of each of the stocks must be taken into account in the regulation. Several of the fisheries could be described as mixed cod-haddock fisheries (i.e. the longline fisheries), whereas others (i.e. pairtrawlers and occasionally single trawlers) are saithe fisheries with bycatches of cod and haddock.

Single-stock exploitation boundaries and critical stocks

The state of stocks and single stock exploitation boundaries are summarised in the table below.

Species	State of the stock				ICES considerations in relation to single-stock exploitation boundaries			Upper limit corresponding to single-stock exploitation boundary for agreed management plan or in relation to precautionary limits. Tonnes or effort in 2006
	Spawning biomass in relation to precautionary limits	Fishing mortality in relation to precautionary limits	Fishing mortality in relation to highest yield	Fishing mortality in relation to agreed target	In relation to agreed management plan	In relation to precautionary limits	In relation to high long term yield	
Faroe Plateau Cod	Increased risk	Harvested unsustainably	Overexploited	Above agreed target	Reduce effort by more than 40%	Rebuilding plan Reduce effort by more than 50 %	N/A	Rebuilding plan that should at least reduce the fishing mortality to the $\mathbf{F_{pa}}$ level. This would amount to an effort reduction in the neighbourhood of about 50% compared to the recent level (≅ about 8600 tonnes).
Faroe Bank Cod								Effort not to exceed that of 1996-2002
Faroe Haddock	Full reproductive capacity	Increased risk	Overexploited	Below agreed target	The current F estimate is below the management target	Reduce effort by about 23%	The current F estimate is above $F_{0.1}$	Fishing effort be reduced to correspond to a fishing mortality below $\mathbf{F_{pa}}$=0.25, corresponding to an effort reduction of about 23% ≅ less than 18 000 t
Faroe Saithe	Increased risk	Harvested unsustainably	Overexploited	Below agreed target	The current F is estimated around that management target. The present effort can be maintained.	Reduce effort by at least 40%	The current F estimate is above $F_{0.1}$	Fishing effort in 2006 should be reduced to a level corresponding to a fishing mortality below $\mathbf{F_{pa}}$ = 0.28, corresponding to an effort reduction of about 40% (≅ 24 000 t. The present spawning closures should be maintained.

Advice for fisheries management

The Faroese effort management system links fishing mortality on the demersal stocks, i.e. that the effort level (number of fishing days) concurrently determines the fishing mortality on all three demersal stocks. The fishery for haddock and cod are closely linked. The fishery for saithe is a more directed fishery, albeit with bycatch of cod and haddock.

Fishing mortality for the Faroe Plateau cod in 2005 is more than twice the level that is recommended based on precautionary principles. For haddock and saithe the present fishing mortality is also above the precautionary level.

Therefore, ICES recommends a reduction of the fishing effort directed at the Faroe Plateau cod and haddock in the neighbourhood of 50%. For the saithe fisheries ICES recommends that effort be reduced by around 40%. This effort is predicated on the present low bycatch of cod and haddock in the saithe fisheries. If the bycatch of cod or haddock is observed to increase in the saithe fishery, then effort will have to be reduced proportional to the increase in bycatch rate. For Faroe Bank cod effort should be reduced to the 1996–2002 level.

Regulations in force and their effects

The catch quota management system introduced in the Faroese fisheries in 1994 was met with considerable criticism and resulted in discarding and in substantial misreporting 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 key elements in the Faroese fisheries management of the demersal stocks are:

1. A separation of the fishing vessels into fleet segments that are based on physical vessel attributes, mainly size (GRT and HP) and vessel types (trawlers, longliners etc.). The fleet segmentation is a central element in controlling capacity, effort and the fishing pattern.
2. A capacity policy aiming at maintaining the fleet capacity at the 1997 level. The capacity is in principle maintained within each fleet segment, but there are rules for allowing vessel transfers between groups (e.g. in conjunction with vessel replacement). The capacity policy is based on vessel licenses.
3. An effort system that allots a total number of fishing days for the coming fishing year to each of the fleet segments. The total fleet segment effort is subsequently divided between the individual vessels. Except for the small scale coastal fishery the general rule is that all vessels within the fleet segment gets an equal share. The small scale coastal fishery (fleet segment 5B) fishes on a common effort quota. The fishing days may be traded within fleet segments and with some restrictions between segments. The effort regulation is maintained through a fishing license system.
4. A complex system of area closures that regulates access to the fishing grounds for the various fleet segments. The main restrictions are: The trawlers are generally not allowed to fish within the 12 nautical mile limit and within other areas closed to trawlers, implying that large areas shallower than 200 m are closed to trawling. There are exceptions for small trawlers that are allowed a summer fishery for flatfish on the plateau. The near-shore area (inside the 6 nm line) is closed to the larger longliners. Gillnetters are only allowed to fish at depths deeper than 350 m.
5. A number of supplementary technical regulations such as: Spawning area closures, minimum mesh sizes, sorting grids, real-time closures to protect small fish, and minimum landing sizes. 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 summarised in Table 1.3.1.

The single trawlers that target deepwater resources (redfish, saithe, blue ling, Greenland halibut, and others) are not covered by the effort regulation, and catches of cod and haddock are limited by maximum bycatch allocation. Similarly, the gillnetters that target monkfish and Greenland halibut are not included in the effort system – their catch of cod, haddock, and saithe is almost nil due to the depth of fishing and the large mesh sizes. One fishing day by longliners is considered equivalent to two fishing days for jiggers in the same size category. Longliners could therefore double their allocation by converting to jigging. Holders of individual transferable effort quotas who fish outside this line can fish for 3 days outside for each day allocated inside the line. The effort history and allocation of effort is summarised in Tables 1.3.2 and 1.3.3.

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.

The management system with individual transferable days introduced in 1996 had as an objective to maintain the fishing mortality at an average of 0.45 for both plateau cod, haddock, and saithe. The current assessment shows that saithe and haddock have on average been harvested within this objective, whereas for cod the fishing mortality has exceeded the objective and in the most recent years has been around double of the target.

The fishing law also prescribes the percentage of total catches of cod, haddock, saithe, and redfish, which each fleet category on average is allowed to fish. However, these percentages are of little practical importance since they have not been used directly in the regulations since the abolishment of the quota system after the fishing year 1995–96. 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%

An overview of the average catchability of the principal fleets for the three major stocks in Division Vb does not indicate any long-term positive or negative trends in catchability for the period 1985 to 2003. Natural factors may have a larger influence than technological, at least for Faroe cod and haddock, where the longline fishing constitutes a large part of the catch. Hence the short-term trends in the catchability of both cod and the haddock may be a result of variability in the productivity in the ecosystem as explained above.

Under effort management there are incentives for vessels to optimise their catch and its value per effort unit through an increase of efficiency (catchability). This introduces "Technological creeping" which has been demonstrated for many fishing fleets. Such "creeping" needs therefore to be monitored closely and accounted for in the regulations.

The relative prices for the three commercial fish species (cod, haddock, and saithe) are important. In 2003 and 2004, the price for cod has been substantially higher than for haddock and saithe which may have contributed to an increased targeting and high fishing mortality for this species in these years. The relative prices will shift fishing focus from one stock to the other.

Quality of assessments and uncertainties

The resources in the area have in general been managed on the basis of long time-series of commercial catch-at-age information. There are two annual ground fish surveys available from the mid-1990s. Several commercial CPUE series are available. The commercial CPUE series include larger vessels (fleet segments 1-3) only and are based on logbooks from a few selected vessels that are considered representative for the fleets. Detailed CPUE statistics that cover the majority of all fishing operations exist but are not at present available for assessment. This impedes a comprehensive analysis of the development in catchabilities that is necessary to evaluate the implementation of the effort system used in the Faroes.

Except for some selected fisheries, no estimates of discards are available. However, since almost no quotas are used in the management of the demersal fisheries, the incentives to discard in order to highgrade the catches should be low. Moreover, according to Faroese legislation, all discarding is banned. The landings statistics are therefore regarded as being adequate for assessment purposes.

Table 1.3.1 Main regulatory measures by fleet in the Faroese fisheries.

	Fleet segment	Sub groups		Main regulation tools
1	Single trawlers > 400 HP	*none*		Bycatch quotas, area closures
2	Pair trawlers	*none*		Fishing days, area closures
3	Long-liners > 110 GRT	*none*		Fishing days, area closures
4	Coastal vessels>15 GRT	4B	Trawlers > 40 tonnes	Fishing days
		4B	Longliners>40 tonnes	Fishing days
		4A	Trawlers< 40 tonnes	Fishing days
		4A	Longliners<40 tonnes	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

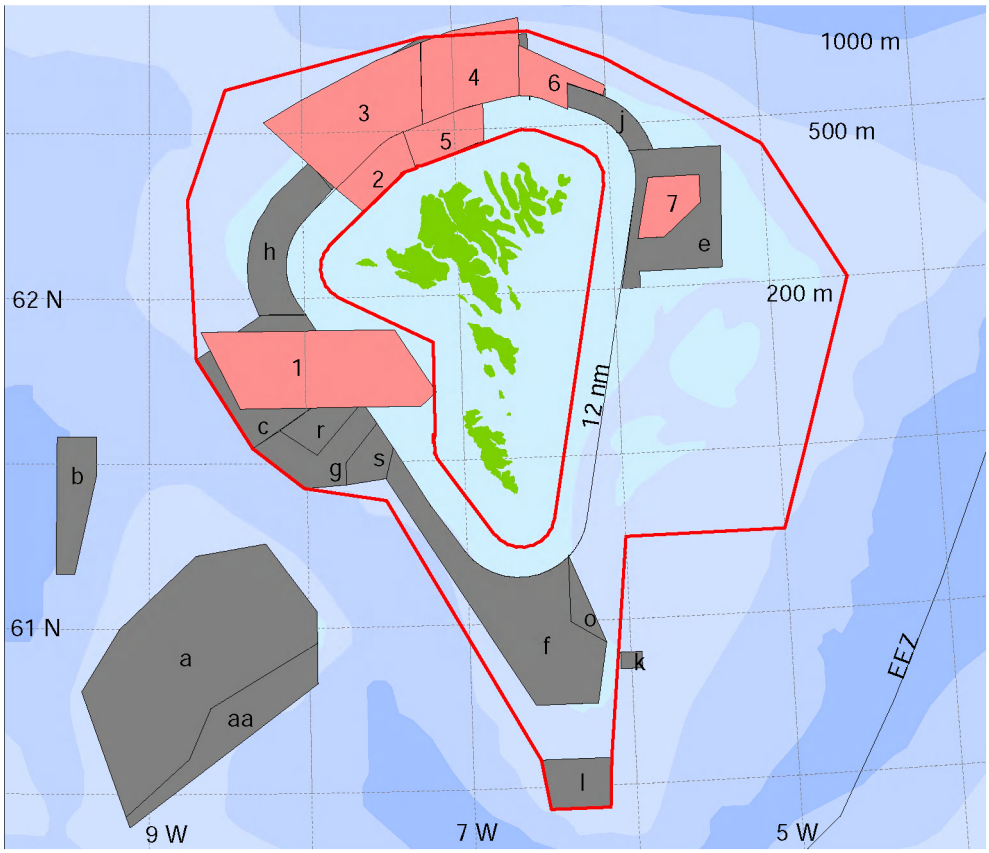
Table 1.3.2 Number of fishing days used by various fleet groups in Vb1 1985–1995 and 1998–2004. For other fleets there are no effort limitations. Catches of cod, haddock, saithe, and redfish are also regulated by bycatch percentages given in the text. In addition there are special fisheries regulated by licenses. (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
Average(98-01)	25945	2497	6816

* Preliminary, not all days included

Table 1.3.3 Number of allocated days inside the outer thick line in Figure 1.3.1.1 for each fleet group since the new management scheme was adopted, and the number of licenses per fleet.

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



Closed areas to trawlings

Areas inside the 12 nm zone closed year round

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

Spawning area closures

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

Figure 1.3.1.1 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 depth (a, aa) is regulated separate from the Faroe Plateau. It is closed to trawling and the longline fishery is regulated by individual day quotas.

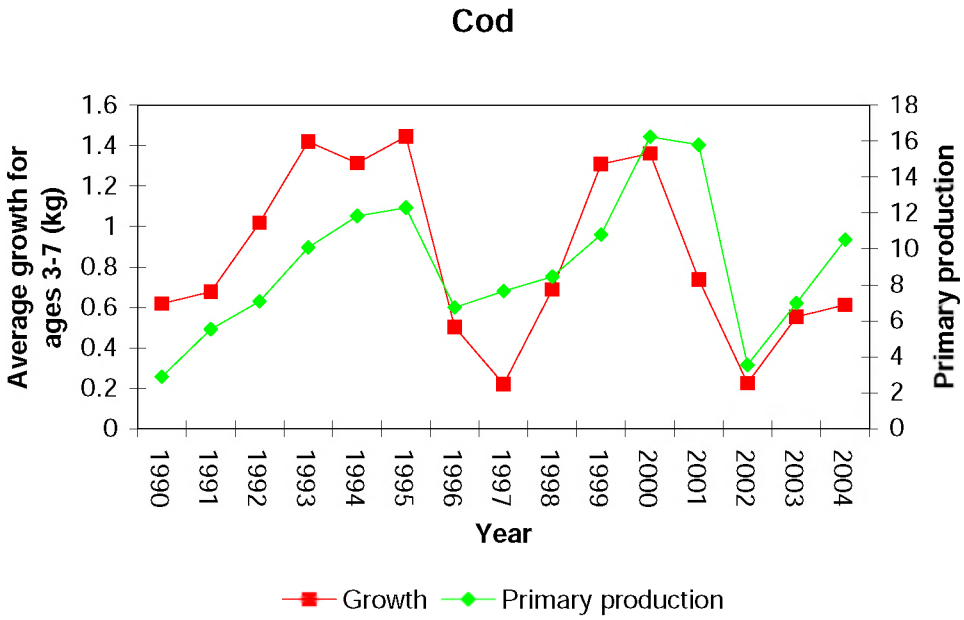


Figure 1.3.1.2 Faroe Plateau Cod. Relationship between primary production and growth of cod during the last 12 months.

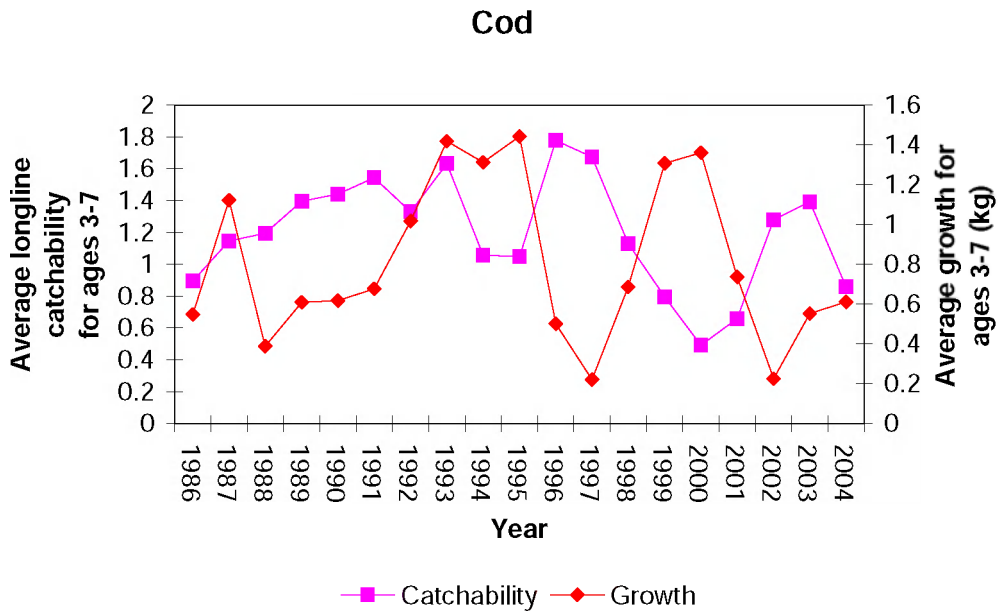


Figure 1.3.1.3 Faroe Plateau Cod. Relationship between long line catchability and growth of cod during the last 12 months.

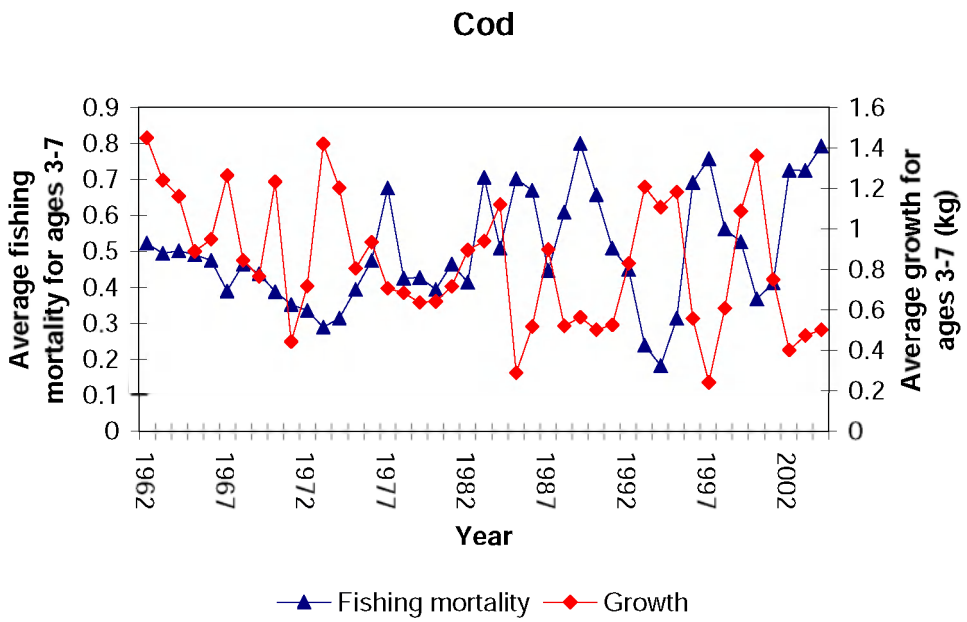


Figure 1.3.1.4 Faroe Plateau Cod. Relationship between fishing mortality and growth of cod during the last 12 months.

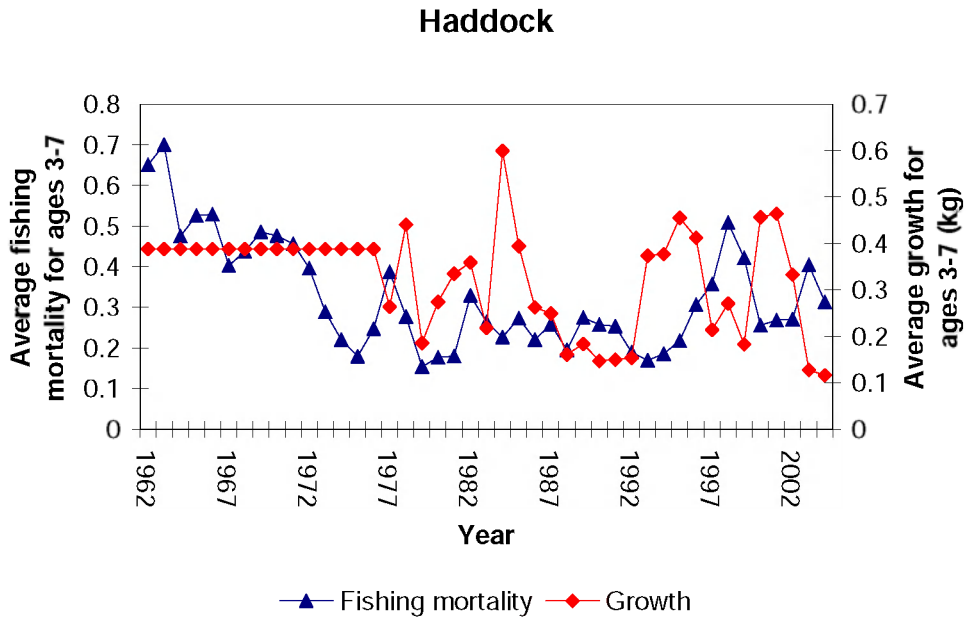


Figure 1.3.1.5 Faroe Haddock. Relationship between fishing mortality and growth of haddock during the last 12 months.

1.4 THE FAROE PLATEAU ECOSYSTEM

1.4.1 Faroe Plateau cod (Subdivision Vb_1)

State of the stock

Spawning biomass in relation to precautionary limits	Fishing mortality in relation to precautionary limits	Fishing mortality in relation to highest yield	Fishing mortality in relation to agreed target	Comment
Increased risk	Harvested unsustainably	Overexploited	Above agreed target	

Based on the most recent estimates of SSB, ICES classifies the stock as being at risk of reduced reproductive capacity. SSB in 2005 is on the same level as prior to the collapse in 1990. Based on the most recent estimates of fishing mortality ICES classifies the stock as being harvested unsustainably. The estimate of fishing mortality has been above the proposed $\mathbf{F}_{pa}$ since 1996. The spawning stock biomass was well above $\mathbf{B}_{pa}$ for several years, but has been below $\mathbf{B}_{pa}$ since 2004. The recruitment after the 2000 year class has been at or below average.

Management objectives

The management objective is to achieve sustainable fisheries. An effort management system was implemented in the Faroese demersal fisheries in Division Vb in 1996. From the outset the aim of the effort management system was to harvest on average 33% in numbers of the exploitable stock of cod. This translates into an average F of approximately 0.45, above the $\mathbf{F}_{pa}$ of 0.35. ICES considers this to be inconsistent with the Precautionary Approach.

Reference points

	ICES considers that:	ICES proposed that:
Precautionary Approach reference points	$\mathbf{B}_{lim}$ is 21 000 t.	$\mathbf{B}_{pa}$ be set at 40 000 t.
	$\mathbf{F}_{lim}$ is 0.68.	$\mathbf{F}_{pa}$ be set at 0.35.

Technical basis

$\mathbf{B}_{lim}$: $\mathbf{B}_{lim} = \mathbf{B}_{loss}$ (98).	$\mathbf{B}_{pa}$: $\mathbf{B}_{pa} = \mathbf{B}_{lim} e^{1.645\sigma}$, assuming a σ of about 0.40 to account for the relatively large uncertainties in the assessment.
$\mathbf{F}_{lim}$: $\mathbf{F}_{lim} = \mathbf{F}_{pa} e^{1.645\sigma}$, assuming a σ of about 0.40 to account for the relatively large uncertainties in the assessment.	$\mathbf{F}_{pa}$: Close to $\mathbf{F}_{max}$ (0.34) and $\mathbf{F}_{med}$ (0.38) values from 1998 assessment.

Yield and spawning biomass per Recruit
F-reference points:

	Fish Mort Ages 3-7	Yield/R	SSB/R
Average 1999–2004	0.56	1.37	3.01
$\mathbf{F}_{max}$	0.46	1.38	3.60
$\mathbf{F}_{0.1}$	0.25	1.27	5.40
$\mathbf{F}_{med}$	0.38	1.36	4.20

Single-stock exploitation boundaries

Exploitation boundaries in relation to existing management plans

The management objective implied in the effort management scheme is to achieve an average exploitation rate equivalent to a fishing mortality of 0.45. Assuming proportionality between effort and F and adherence to the management plan would imply a reduction in effort of more than 40% compared to the average F of the last 3 years.

Exploitation boundaries in relation to high long-term yield, low risk of depletion of production potential and considering ecosystem effects

The current fishing mortality estimated as 0.75 is above rates that would support optimal long-term yield and low risk of stock depletion ($\mathbf{F}_{0.1}$=0.25 and $\mathbf{F}_{max}$=0.46).

Exploitation boundaries in relation to precautionary limits

Rebuilding SSB to above $\mathbf{B}_{pa}$ in one year will require closing all directed cod fisheries in 2006. Rebuilding SSB over a longer period will require a rebuilding plan.

Such a rebuilding plan should at least result in a fishing mortality below $\mathbf{F}_{pa.}$ This would amount to an effort reduction of about 50% compared to the recent level.

Short-term implications

Outlook for 2006

Basis: F(2005) =0.75; SSB(2006) = 26; catch (2005) = 17.
The fishing mortality according to the management plan (F(management plan)) is 0.45.
The maximum fishing mortality which would be in accordance with precautionary limits (F (precautionary limits)) is 0.35.

Rationale	F (2006)	Basis	SSB (2006)	Landings (2006)	SSB (2007)	% change SSB [1]
Zero catch	0	F=0	26	0	43	63
Target ref. point	0.45	F(management plan)	26	10.6	31	19
Status quo	0.75	$\mathbf{F}_{sq}$	26	15.7	26	-1
Management plan	0.05	F(management plan) * 0.1	26	1.3	41	58
	0.11	F(management plan) * 0.25	26	3.1	39	51
	0.23	F(management plan) * 0.50	26	5.9	36	39
	0.34	F(management plan) * 0.75	26	8.4	34	29
	0.41	F(management plan) * 0.90	26	9.8	32	23
	0.45	F(management plan)	26	10.6	31	19
	0.50	F(management plan) * 1.1	26	11.5	30	16
	0.56	F(management plan) * 1.25	26	12.7	29	11
Precautionary limits	0.04	$\mathbf{F}_{pa}$ * 0.1	26	1.0	42	59
	0.09	$\mathbf{F}_{pa}$ * 0.25	26	2.4	40	53
	0.18	$\mathbf{F}_{pa}$ * 0.5	26	4.7	38	44
	0.26	$\mathbf{F}_{pa}$ * 0.75	26	6.7	35	35
	0.32	$\mathbf{F}_{pa}$ * 0.90	26	7.9	34	31
	0.35	$\mathbf{F}_{pa}$	26	8.6	33	28
	0.39	$\mathbf{F}_{pa}$ * 1.1	26	9.4	33	25
	0.44	$\mathbf{F}_{pa}$ * 1.25	26	10.4	32	20

All weights in ´000 tonnes.
Shaded scenarios are not considered consistent with the precautionary approach.
[1)] SSB 2007 relative to SSB 2006.

Management considerations

An expected benefit of the effort management system was more stability for the fishing fleet. The fleets were expected to target the most abundant fish species (cod, haddock, or saithe), thus reducing the fishing mortality on stocks being in

a bad shape. However, low prices on saithe and haddock and high prices for cod have kept the fishing mortality high on cod. Targeting of cod appears to be more influenced by economic factors than relative abundance of the stocks.

Management plan evaluations

The effort management system translates to an average F of 0.45. The management plan has not been fully evaluated by ICES in relation to the defined $\mathbf{B}_{lim}$. A full evaluation should take into account the relationship between fishing mortality and fishing days.

Ecosystem considerations

The effort management system needs to consider changes in catchability of the fishery. For baited hook gear, catchability is related to the amount of food available in the ecosystem. Therefore, low ecosystem production may decrease cod production and increase the catchability of longline gear. Primary productivity of the Faroe ecosystem in 2005 appears to be about average but may vary by a factor of five and has profound effects on fish stocks. Extended periods of low ecosystem production may require a reconsideration of the effort management system and a shift to catch-based management.

The productivity of the Faroe Shelf ecosystem has been shown to be of ultimate importance to the cod stock (Steingrund and Gaard, 2005). The index of primary production was considerably higher in 2004 than in 1990–1992, which may prevent a collapse in the fishery in the near future. The fishing mortality in 2004 was, however, very high when the low stock size is taken into account. Under the present fishing mortality, normal catches in the near future can only be achieved if the environmental conditions are favourable.

Factors affecting the fisheries and the stock

Regulations and their effects

An effort management system was implemented 1st of June 1996. Fishing days are allocated to all fleets fishing in shallow waters (< 380-m depth) for the period 1 September–31 August. In addition the majority of the shallow areas (< ca. 200 m) are closed for trawling, and are mainly utilised by longliners. The main spawning areas for cod are closed for nearly all fishing gears during spawning time.

Changes in fishing technology and fishing patterns

The effort management system invites improvement of fishing technology and fishing patterns. Some improvements were evident just after the introduction of the system, but no major improvements have been evident in subsequent years.

Scientific basis

Data and methods

The stock is assessed by an analytical method using survey and catch-at-age data. The technique was the same as the one used for last year's assessment, XSA calibrated by two research surveys.

The reference fishing mortality is based on a simple average of age group 3 to 7. In some years the fishing mortality of a particular age group may be unduly high and may more reflect sampling error rather than fishing mortality rates. Using a different basis for calculating reference F gives a different indication of the exploitation of this stock. However, this would require a re-evaluation of the F reference points.

Comparison with previous assessment and advice

The present assessment confirms the increase in fishing mortality in recent years. In last year's assessment the 2004 SSB and F were estimated at 30 000 t and 0.99, respectively. This year's estimate of the 2004 SSB and F are 34 000 t and 0.79.

Source of information

Report of the North-Western Working Group, 26 April–5 May 2005 (ICES CM 2005/ACFM:21).

Gaard, E., Hansen B., and Heinesen, S. P. 1998. Phytoplankton variability on the Faroe shelf. *ICES Journal of Marine Science*, Vol. 55: 688-696.

Steingrund, P., and Gaard, E. 2005. Relationship between phytoplankton production and cod production on the Faroe Shelf. *ICES Journal of Marine Science*, Vol. 62: 163-176.

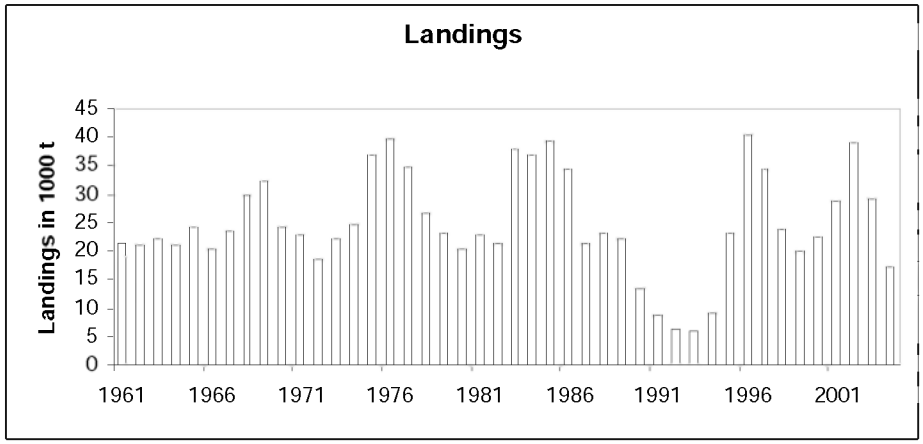
Year	ICES Advice	Predicted catch corresp. to advice	Agreed TAC	ACFM Catch
1987	No increase in F	<31		21.4
1988	No increase in F (Revised estimate)	<29 (23)		23.2
1989	No increase in F	<19		22.1
1990	No increase in F	<20		13.5
1991	TAC	<16		8.7
1992	No increase in F	<20		6.4
1993	No fishing	0		6.1
1994	No fishing	0	8.5/12.5[1,2]	9.0
1995	No fishing	0	12.5[1]	23.0
1996	F at lowest possible level	-	20[2]	40.4
1997	80% of F(95)	<24	-	34.3
1998	30% reduction in effort from 1996/97	-	-	24.0
1999	F less than proposed F_{pa} (0.35)	<19		19.9
2000	F less than proposed F_{pa} (0.35)	<20		22.4
2001	F less than proposed F_{pa} (0.35)	<16		28.9
2002	75% of F(2000)	<22		39.0
2003	75% of F(2001)	<32		29.3
2004	25% reduction in effort	-		17.3
2005	Rebuilding plan involving large reduction	-		
2006	Rebuilding plan involving large reduction	-		

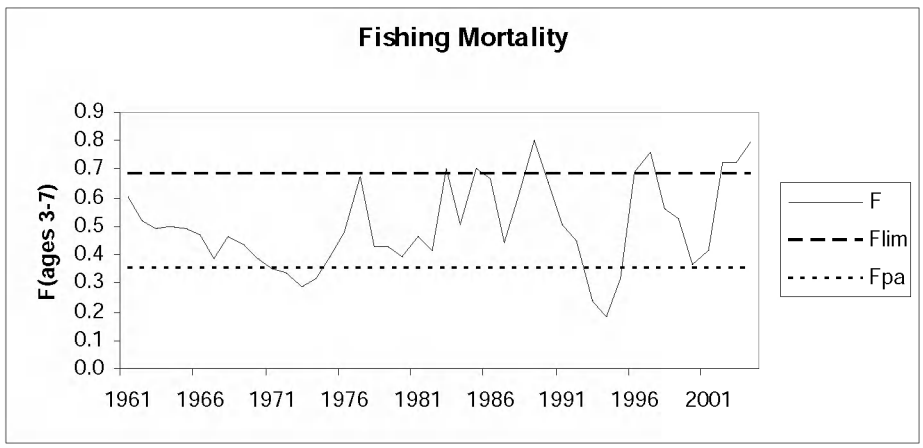
Weights in '000 t.

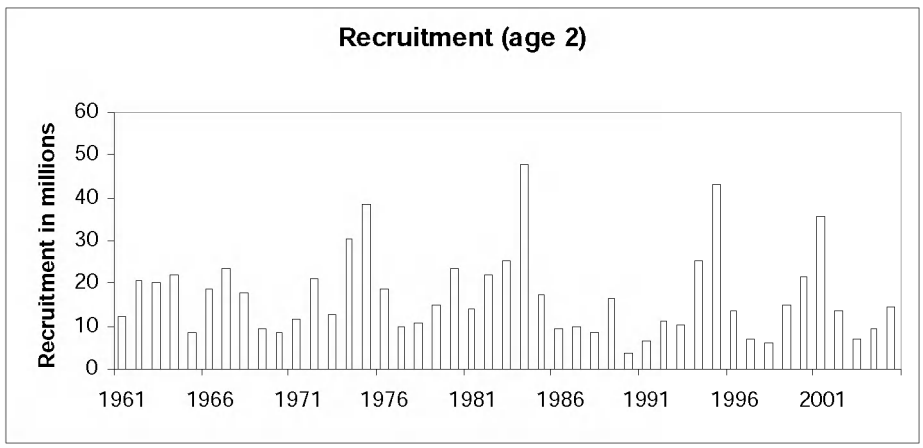
[1] In the quota year 1 September–31 August the following year.

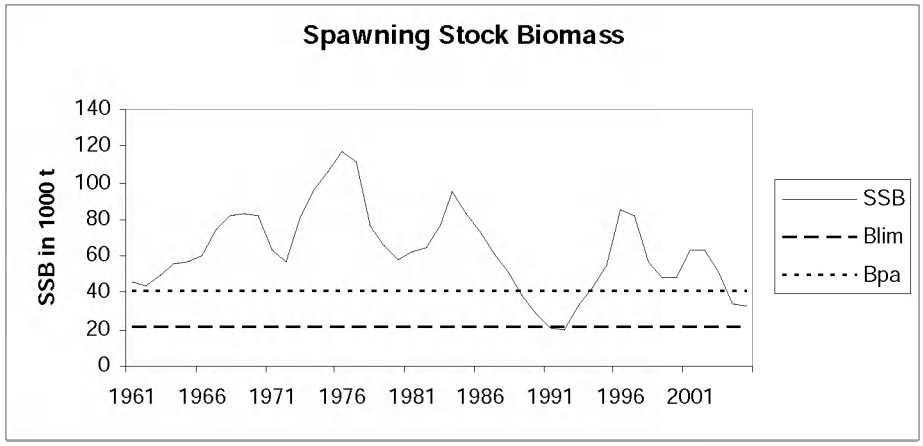
[2] The TAC was increased during the quota year.

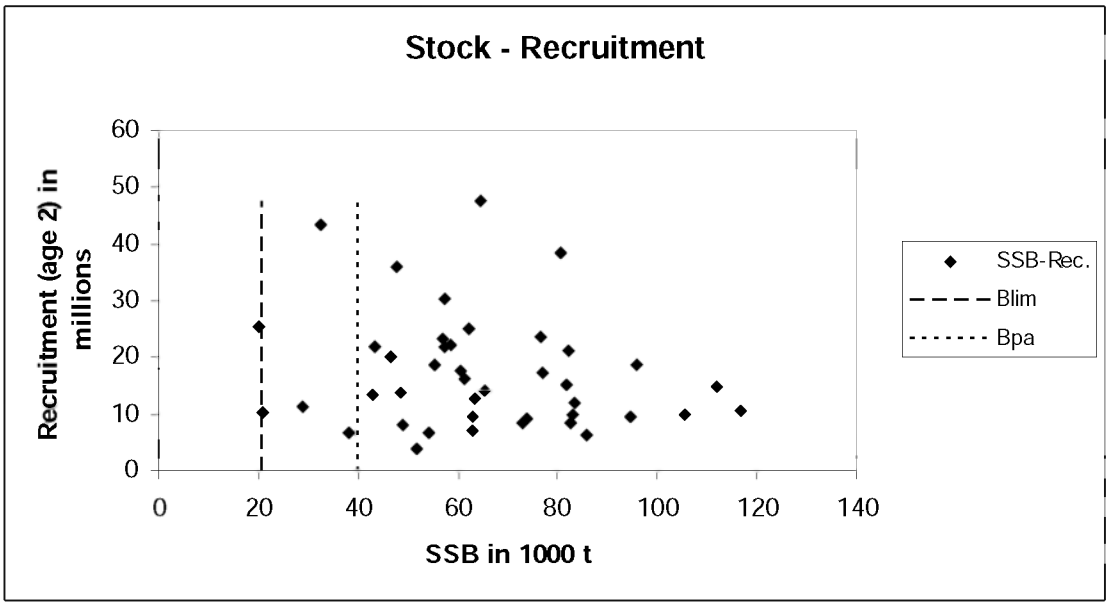
Faroe Plateau cod (Subdivision Vb_1)

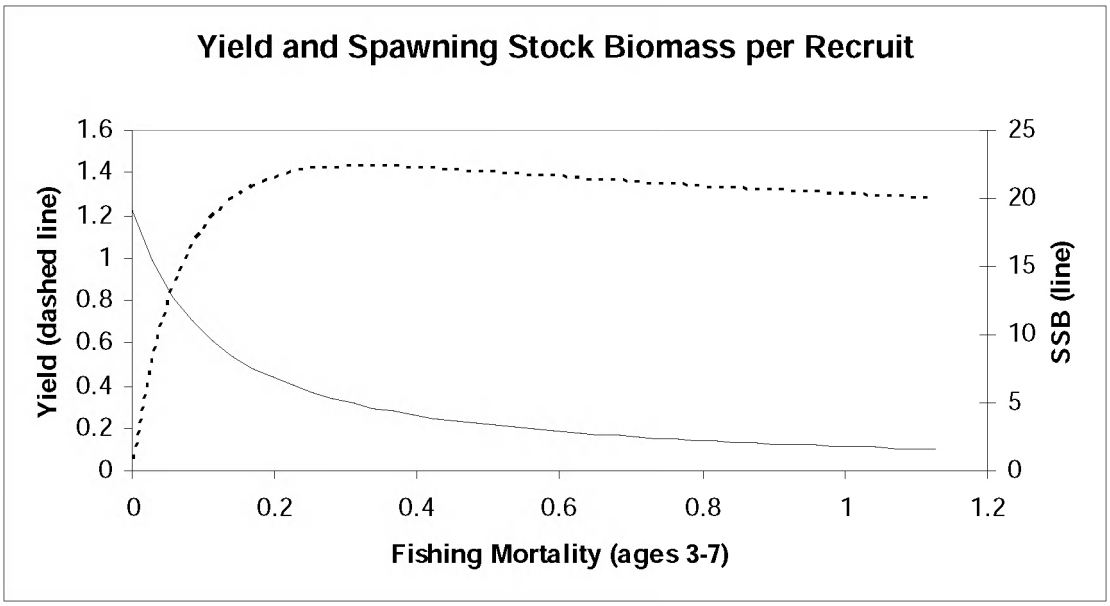









Stock - Recruitment
Recruitment (age 2) in millions
60
50
40
30
20
10
0
0
20
40
60
80
100
120
140
SSB in 1000 t
SSB-Rec.
Blim
Bpa


Yield and Spawning Stock Biomass per Recruit
Yield (dashed line)
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
SSB (line)
25
20
15
10
5
0
0
0.2
0.4
0.6
0.8
1
1.2
Fishing Mortality (ages 3-7)

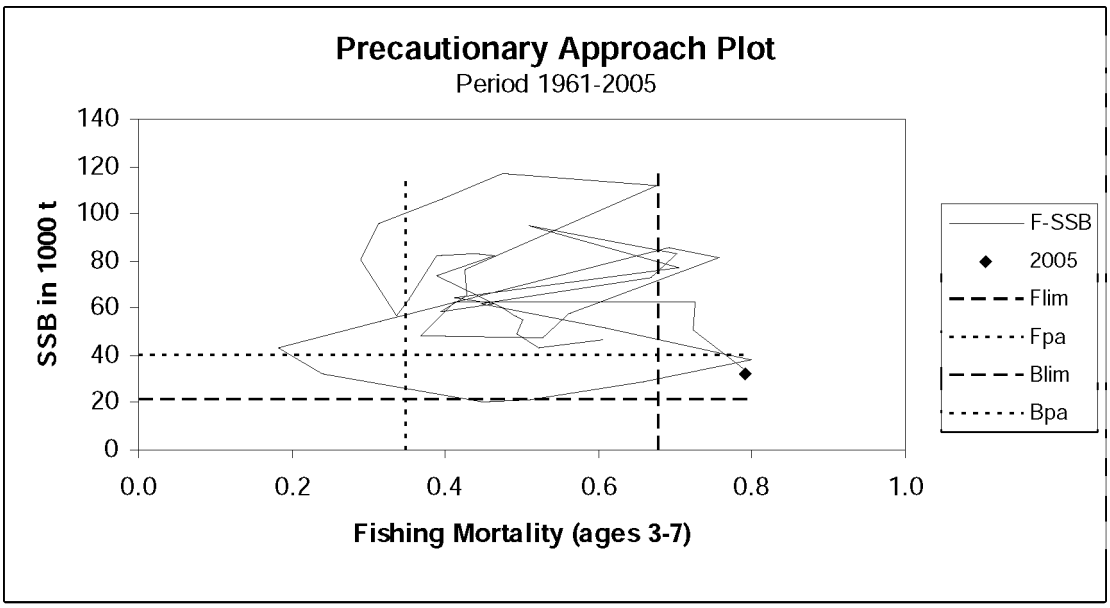

Precautionary Approach Plot
Period 1961-2005
SSB in 1000 t
140
120
100
80
60
40
20
0
0.0
0.2
0.4
0.6
0.8
1.0
Fishing Mortality (ages 3-7)
F-SSB
2005
Flim
Fpa
Blim
Bpa

Table 1.4.1.1 Faroe Plateau (ICES Subdivision Vb_1) COD. Nominal catches in 2004 as officially reported to ICES.

	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 *
Denmark	-					
Faroe Islands	19,156		29,762	40,602	30,259	17,619
France	- *	1	9 [2]	20	14	
Germany	39	2	9	6	7	3 [2]
Iceland	-	-	-	5	-	
Norway	450	374	531 *	573	527	414
Greenland	-	-	-	29 [2]	-	
Portugal						0
UK (E/W/NI)[2]	51	18	50	42	15	
UK (Scotland)[1]	-	-	-	-	-	-
United Kingdom						[1]
Total	19,696	395	30,361	41,277	30,822	18,036

* Preliminary

[1)] Included in Vb2.

[2)] Reported as Vb.

Table 1.4.1.2 Faroe Plateau (ICES Subdivision Vb_1) COD. Catch 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 *
Officially reported	19,696	395	30,361	41,277	30,822	18,036
Faroese catches in Vb1		21,793 *				
Correction of Faroese catches in Vb1 [1]			-1,766	-2,409	-1,795	-1,045
Greenland[2]						35
France[2]						2
Catches reported as Vb2:						
UK (E/W/NI)	-	-	-	-	-	-
UK (Scotland)	210	245	288	218	254	-
United Kingdom				-	-	259
Used in the assessment	19,906	22,433	28,883	39,086	29,281	17,287

[*)] Preliminary

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

[2)] Reported to Faroese Coastal Guard.

Table 1.4.1.3 Faroe Plateau cod (Subdivision Vb_1).

Year	Recruitment Age 2 thousands	SSB tonnes	Landings tonnes	Mean F Ages 3-7
1961	12019	46439	21598	0.6059
1962	20654	43326	20967	0.5226
1963	20290	49054	22215	0.4944
1964	21834	55362	21078	0.5017
1965	8269	57057	24212	0.4909
1966	18566	60629	20418	0.4743
1967	23451	73934	23562	0.3900
1968	17582	82484	29930	0.4642
1969	9325	83487	32371	0.4375
1970	8608	82035	24183	0.3882
1971	11928	63308	23010	0.3526
1972	21320	57180	18727	0.3358
1973	12573	80516	22228	0.2886
1974	30480	95831	24581	0.3139
1975	38319	105676	36775	0.3947
1976	18575	116736	39799	0.4749
1977	9995	111863	34927	0.6757
1978	10748	76608	26585	0.4259
1979	14997	65380	23112	0.4273
1980	23582	58386	20513	0.3945
1981	14000	62058	22963	0.4648
1982	22127	64695	21489	0.4138
1983	25157	76932	38133	0.7057
1984	47756	94847	36979	0.5082
1985	17316	83165	39484	0.7015
1986	9508	72952	34595	0.6694
1987	9917	61527	21391	0.4456
1988	8644	51648	23182	0.6082
1989	16271	38176	22068	0.7988
1990	3738	28781	13487	0.6570
1991	6705	20847	8750	0.5082
1992	11409	20223	6396	0.4493
1993	10114	32657	6107	0.2394
1994	25388	42866	9046	0.1818
1995	43332	54193	23045	0.3137
1996	13379	85826	40422	0.6914
1997	6808	81719	34304	0.7568
1998	6307	57389	24005	0.5622
1999	15224	47648	19906	0.5265
2000	21707	48538	22433	0.3671
2001	35840	63008	28883	0.4121
2002	13650	63133	39086	0.7255
2003	7193	51004	29281	0.7245
2004	9480	33782	17287	0.7922
2005	14488	32412		
Average	17079	63007	24853	0.5082

1.4.2 Faroe Bank cod

State of the stock

Spawning biomass in relation to precautionary limits	Fishing mortality in relation to precautionary limits	Fishing mortality in relation to highest yield	Fishing mortality in relation to agreed target	Comment
No reference points	No reference points			

In the absence of defined reference points, the state of the stock cannot be evaluated in this regard. The available information is inadequate to evaluate spawning stock or fishing mortality relative to risk. The summer survey indicates a decline in biomass since 2002 and suggests that the present exploitation rate may not be sustainable.

Management objectives

There are no explicit management objectives for this stock.

Reference points

No reference points have been defined for the stock.

Single-stock exploitation boundaries

Fishing effort on the Faroe Bank should not exceed that exerted annually from 1996 to 2002.

Short-term implications

There is no analytical basis for the advice.

Management considerations

The effort management system introduced in 1996 excluded trawlers from the Bank. The fishery is now exclusively hook fishermen. Effort on the Bank has more than doubled since the introduction of the effort management system. The number of fishing days decreased in 2004, but is still higher than the maximum prior to 2003. The decrease in survey indices suggests that the recent level of effort is not sustainable.

Since 1996 the vessels have been allowed to fish both on the Faroe Plateau and on the Faroe Bank during the same trip, making it difficult to assign landings to area or to implement management advice. Because the cod landings from the Faroe Bank are not known exactly, it is very difficult to provide reliable advice on effort and/or catches. 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 monitor and regulate the catch removed from each stock.

Factors affecting the fisheries and the stock

Regulations and their effects

Fishing on the bank is restricted to longliners and jiggers which are regulated through individual vessel effort quotas. For the fishing years from 1 September 2004 to 31 August 2005 the number of allocated fishing days has been reduced by 10%. In 2005 the authorities have introduced a total fishing ban during the spawning period, i.e. 1 March to 1 May.

Scientific basis

Data and methods

The assessment is based on trends in catch rates in two research surveys. The ratio of landings to the survey index provides an exploitation ratio.

Uncertainties in assessment and forecast

The spring and summer survey indices offer similar perceptions of stock development from 1996 to 2001, but the two surveys diverge in 2002 and 2003. The spring survey was discontinued, and the summer survey offers the only indication of present stock status.

The landing estimates are uncertain because since 1996 the vessels have been allowed to fish both on the Faroe Plateau and on the Faroe Bank during the same trip, making it difficult to assign landings to area. Given the relative size of the two fisheries, this causes greater uncertainty regarding catches for Faroe Bank cod than for Faroe Plateau cod, but the magnitude remains unquantified for both.

Source of information

Report of the North-Western Working Group, 26 April–5 May 2005 (ICES CM 2005/ACFM:21).

Year	ICES Advice	Predicted catch corresp. to advice	Agreed TAC	Official Landings
1987	No assessment	-		3.5
1988	No assessment	-		3.1
1989	Addition to Faroe Plateau TAC	~2.0		1.4
1990	Access limitation may be required	-		0.6
1991	Access limitation may be required	-		0.4
1992	No fishing	0.3		0.3
1993	TAC	0.5		0.4
1994	TAC	0.5		1.0
1995	Precautionary TAC	0.5		1.2
1996	Precautionary TAC	0.5	1.0	2.5
1997	Effort at present levels	0.7	Not applicable	3.9
1998	Effort at present levels	-		3.5
1999	Effort not to exceed that exerted in 1996–1997	-		1.3
2000	Effort not to exceed that of 1996–1998	-		1.2[1]
2001	Effort not to exceed that of 1996–1999	-		1.1[1]
2002	Effort not to exceed that of 1996–2000	-		1.8[1]
2003	Effort not to exceed that of 1996–2001	-		5.7[1]
2004	Effort not to exceed that of 1996–2002	-		4.3[1]
2005	Effort not to exceed that of 1996–2002	-		
2006	Effort not to exceed that of 1996–2002	-		

Weights in '000 t.
[1)] Working group estimates.

Table 1.4.2.1 Faroe Bank (sub-division Vb2) cod. Nominal catches (tonnes) by countries 1986-2003 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	-
UK (Scotland) [1]	63	47	37	14	205	90	176	118	227	551
United Kingdom										
Total	1905	3479	3091	1412	566	425	330	385	953	1152
Used in assessment					289	297	122	264	717	561

	1996	1997	1998	1999	2000	2001	2002	2003	2004 *
Faroe Islands	2051	3459	3092	1001		1094	1840	5957	4535
France						- [2]			
Norway	55	135	147	88	49	51	25	72	18
UK (E/W/NI) [2]	- [2]	- [2]	- [2]	-	-	-	-	-	-
UK (Scotland) [3]	382	277	265	210	245	288	218	254	-
United Kingdom				-	-	-	-	-	259 [3]
Total	2488	3871	3504	1299	294	1433	2083	6283	4812
Correction of Faroese catches in Vb2						-65	-109	-353	-269
Used in assessment	2051	3459	3092	1001	1194	1080	1756	5676	4284

*) **Preliminary**

1) **Includes Vb1**

2) **Included in Vb1**

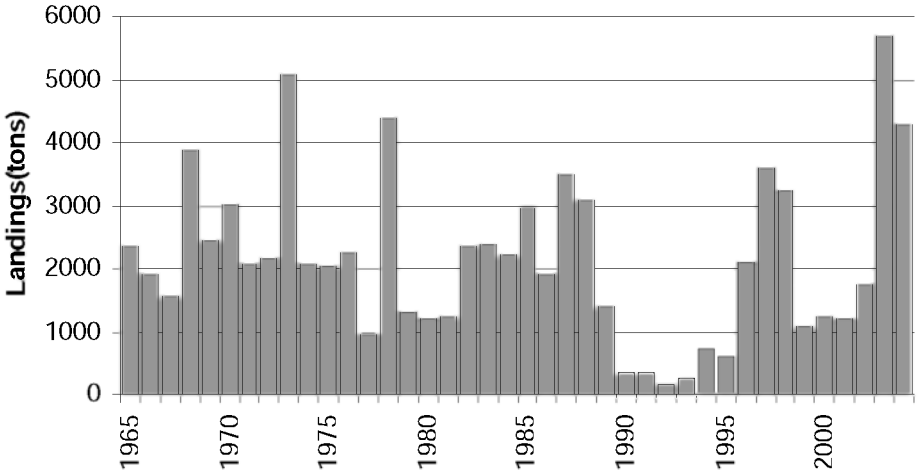


Figure 1.4.2.1 Faroe Bank (Subdivision Vb_2) cod. Reported landings 1965–2003. Since 1992 only catches from Faroese and Norwegian vessels are considered to be taken on Faroe Bank.

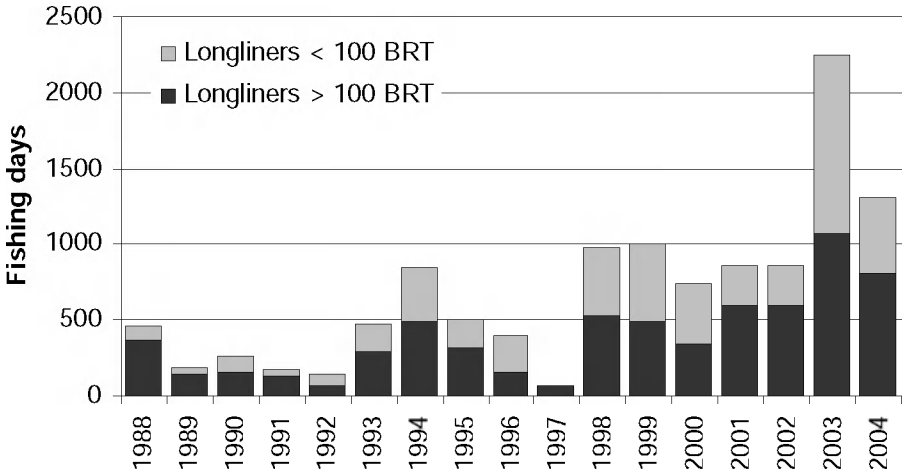


Figure 1.4.2.2 Fishing days for longliners.

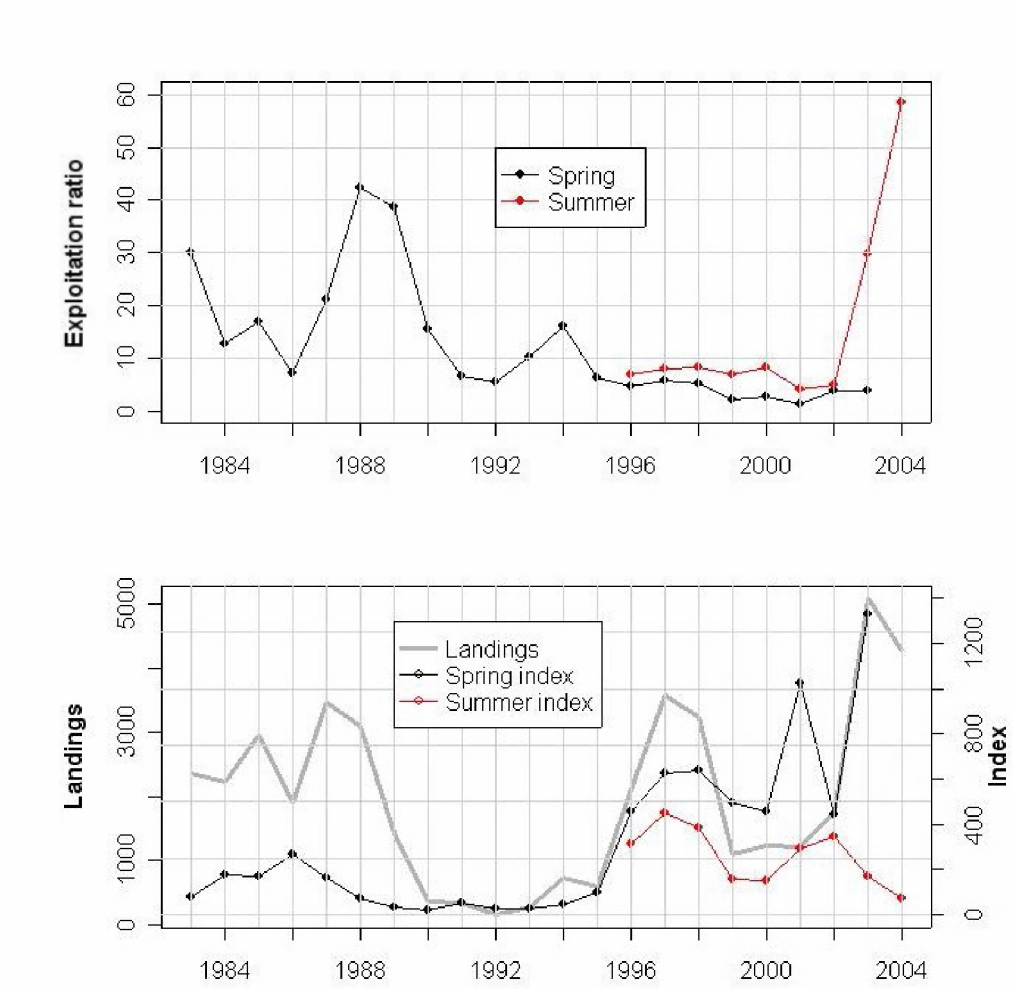


Figure 1.4.2.3 Faroe Bank (Subdivision Vb_2) cod. Exploitation ratio (ratio of landings to survey interpreted as an index of exploitation rate).

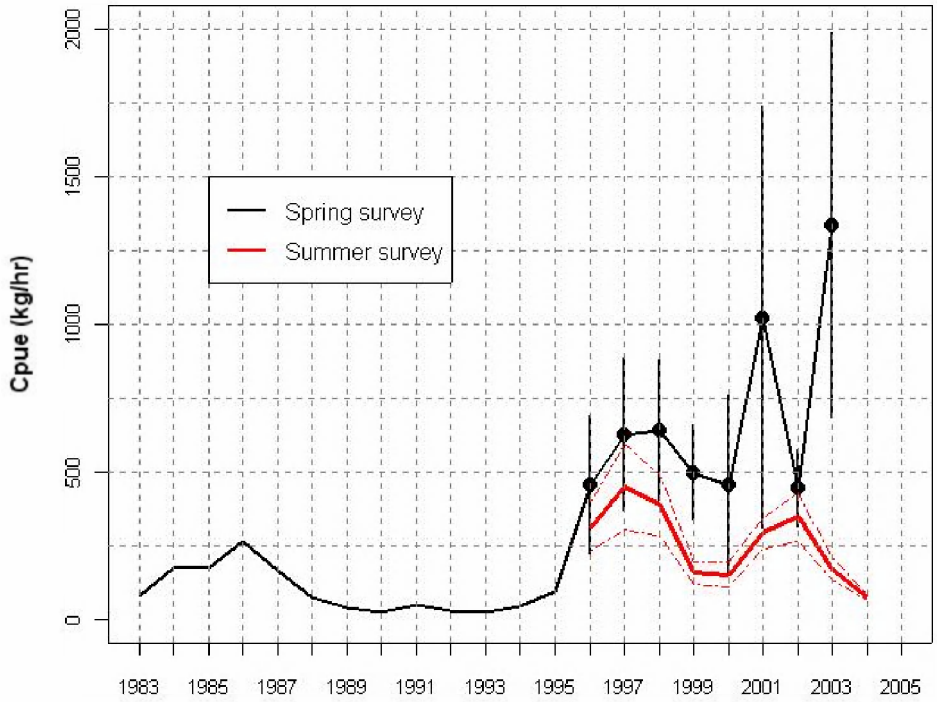


Figure 1.4.2.4 Faroe Bank (Subdivision Vb2) cod. Catch per unit of effort in the spring groundfish survey and summer survey.

1.4.3 Faroe Haddock ICES Division Vb

State of the stock

Spawning biomass in relation to precautionary limits	Fishing mortality in relation to precautionary limits	Fishing mortality in relation to highest yield	Fishing mortality in relation to agreed target	Comment
Full reproductive capacity	Increased risk	Overexploited	Below agreed target	

Based on the most recent estimates of SSB and fishing mortality, ICES classifies the stock as having full reproductive capacity and at risk of being harvested unsustainably. The 2004 estimate of fishing mortality is above $\mathbf{F}_{pa}$. SSB has increased in recent years to the highest in the observed series. This is a result of recent strong recruitment, including the record high 1999 year class.

Management objectives

The effort management system implemented in the Faroese demersal fisheries in Vb since 1996 aims at harvesting on average 33% of the haddock exploitable stock in numbers. This translates into an average F of 0.45, above the $\mathbf{F}_{pa}$ of 0.25. ICES considers this to be inconsistent with the Precautionary Approach.

Reference points

	ICES considers that:	ICES proposed that:
Precautionary Approach reference points	$\mathbf{B}_{lim}$ is 40 000 t	$\mathbf{B}_{pa}$ be set at 55 000 t
	$\mathbf{F}_{lim}$ is 0.40	$\mathbf{F}_{pa}$ be set at 0.25

Yield and spawning biomass per Recruit
F-reference points:

	Fish Mort Ages 3-7	Yield/R	SSB/R
Average last 3 years	0.347	0.670	2.430
$\mathbf{F}_{0.1}$	0.190	0.605	3.449
$\mathbf{F}_{med}$	0.299	0.662	2.597

Technical basis:

$\mathbf{B}_{lim}$: Former MBAL	$\mathbf{B}_{pa}$: based on inspection of the SSB-R scatter plot
$\mathbf{F}_{lim}$: 2 *std. Dev. Above $\mathbf{F}_{pa}$	$\mathbf{F}_{pa}$: $\mathbf{F}_{med}$ (1998) = 0.25

Single-stock exploitation boundaries

Exploitation boundaries in relation to existing management plans

No management plan is available for this stock, but the management objectives are an exploitation rate equivalent to a fishing mortality of 0.45 on average. The current F estimate (0.31) is below the management target.

Exploitation boundaries in relation to high long-term yield, low risk of depletion of production potential and considering ecosystem effects

The current fishing mortality estimated as 0.31 is above $\mathbf{F}_{0.1}$ (0.19).

Exploitation boundaries in relation to precautionary limits

The fishing effort should be reduced to correspond to a fishing mortality below F_{pa} = 0.25, corresponding to an effort reduction of about 23% assuming linearity in the realtionship between fishing effort and fishing mortality.

Short-term implications

Outlook for 2006

Basis: F(2005) =0.33; SSB(2006) = 77; catch (2005) = 29
The fishing mortality applied according to the agreed management plan (F(management plan)) is 0.45.
The maximum fishing mortality which would be in accordance with precautionary limits (F (precautionary limits)) is 0.25.

Rationale	**F (2006)**	**Basis**	**SSB 2006**	**Landings** 2006	**SSB (2007)**	**%SSB change** [1)]
Zero catch	0	F=0	77	0	79	3
Target reference point	0.45	F_{target}	77	29	50	-35
Status quo	0.33	F_{sq}	77	22	57	-26
High long-term yield	0.19	F(long term yield) $F_{0.1}$	77	14	65	-16
Agreed management plan	0.05	F(man. plan) * 0.1	77	4	75	-3
	0.11	F(man. plan) * 0.25	77	9	70	-9
	0.23	F(man. plan) * 0.50	77	16	63	-18
	0.34	F(man. plan) * 0.75	77	23	56	-27
	0.41	F(man. plan) * 0.90	77	27	52	-32
	0.45	F(man. plan)	77	29	50	-35
	0.50	F(man. plan) * 1.1	77	31	48	-38
	0.56	F(man. plan) * 1.25	77	34	45	-41
Precautionary limits	0.03	$F(F_{pa})$ * 0.1	77	2	77	0
	0.06	$F(F_{pa})$ * 0.25	77	5	74	-4
	0.13	$F(F_{pa})$ * 0.5	77	10	69	-10
	0.19	$F(F_{pa})$ * 0.75	77	14	65	-15
	0.23	$F(F_{pa})$ * 0.90	77	16	63	-18
	0.25	F_{pa} ($=F_{sq}$ *0.77)	77	18	61	-20
	0.28	$F(F_{pa})$ * 1.1	77	19	60	-22
	0.31	$F(F_{pa})$ * 1.25	77	21	57	-25
Mixed fisheries	0.17	Coupling with cod; F_{sq} * 0.5	77	12	67	-13

Weights in ´000 tonnes.
Shaded scenarios are not considered consistent with the Precautionary Approach.
[1)] SSB 2007 relative to SSB 2006.

Management considerations

An expected benefit of the effort management system was more stability for the fishing fleet. The fleets were expected to target the most abundant fish species (cod, haddock, or saithe), thus reducing the fishing mortality on stocks that are in bad shape. However, low prices on saithe and haddock and high prices for cod have kept the fishing mortality lower than expected for haddock. Targeting appears to be more influenced by economic factors than relative abundance of the stocks.

Management plan evaluations

The effort management system translates to an average F of 0.45. The management plan has not been fully evaluated by ICES in relation to the defined $\mathbf{B}_{lim}$. A full evaluation should take into account the relationship between fishing mortality and fishing days.

Ecosystem considerations

The effort management system needs to consider changes in fishery catchability. For baited hook gear, catchability is related to the amount of other food available. Therefore, low ecosystem production may decrease cod production and increase the catchability of longline gear. Primary productivity of the Faroe ecosystem in 2005 appears to be about average, but may vary by a factor of five and has profound effects on fish stocks. Extended periods of low ecosystem production may require a reconsideration of the effort management system and a shift to catch-based management.

Factors affecting the fisheries and the stock

Regulations and their effects

An effort management system was implemented 1st of June 1996. Fishing days are allocated to all fleets fishing in shallow waters (< 380-m depth) for the period 1 September–31 August. In addition the majority of the shallow areas (< ca. 200 m) are closed for trawling, and are mainly utilised by longliners.

Changes in fishing technology and fishing patterns

The effort management system invites improvement of fishing technology and fishing patterns. Some improvements were evident just after the introduction of the system, but no major improvements have been evident in subsequent years.

Scientific basis

Data and methods

The advice is based on an analytical assessment (XSA) using commercial catch-at-age data and age-disaggregated indices from two research surveys. Recruitment estimates were available from the surveys.

Comparison with previous assessment and advice

With the additional year of data the 2005 assessment of Faroe haddock is slightly more optimistic than last year's assessment. The basis of the advice is the same.

Uncertainties in assessment and forecast

There is a systematic overestimation of fishing mortality and underestimation of SSB in recent years, based on the current model formulation.

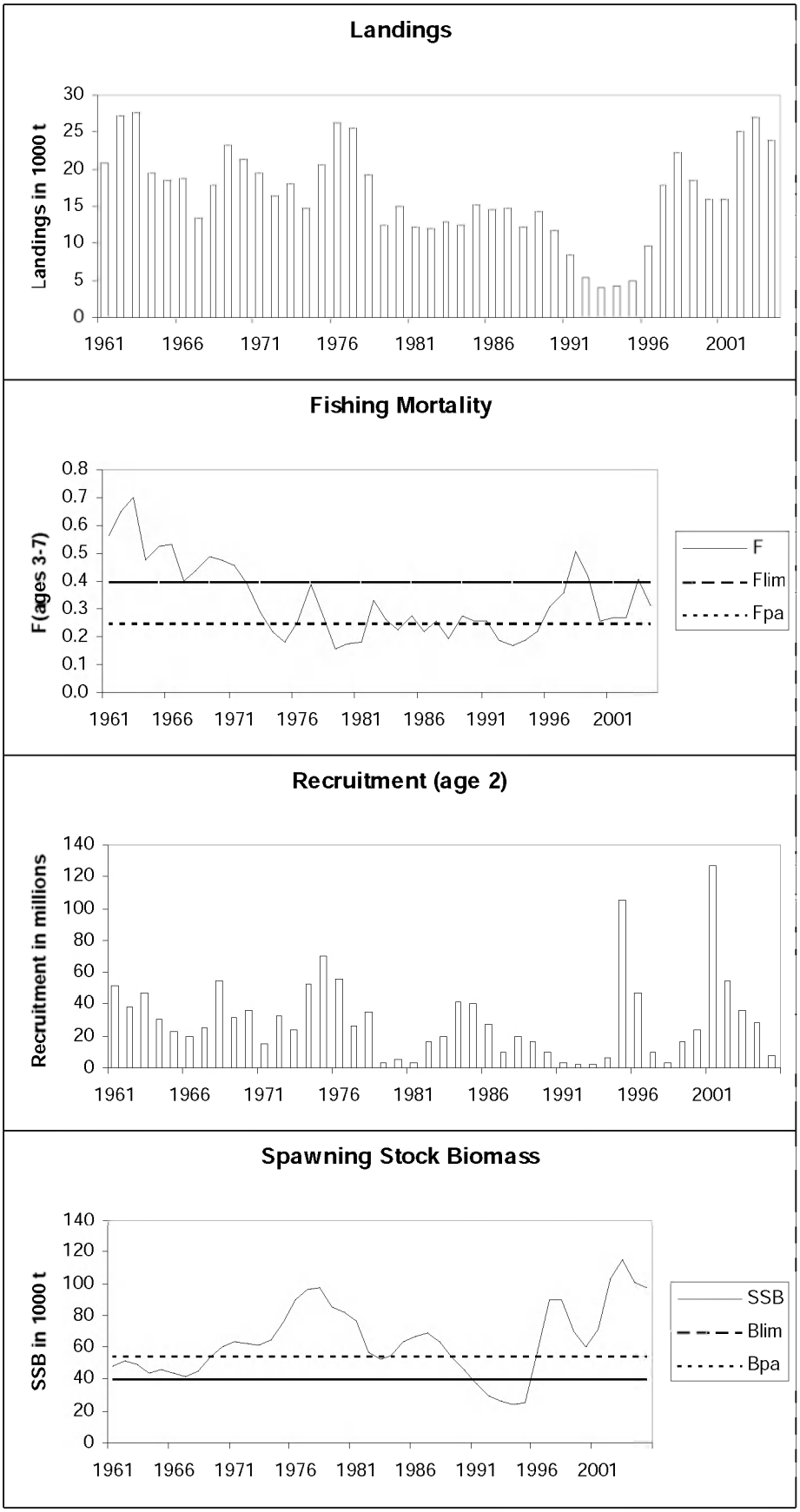
Source of information

Report of the North-Western Working Group, 26 April–5 May 2005 (ICES CM 2005/ACFM:21).

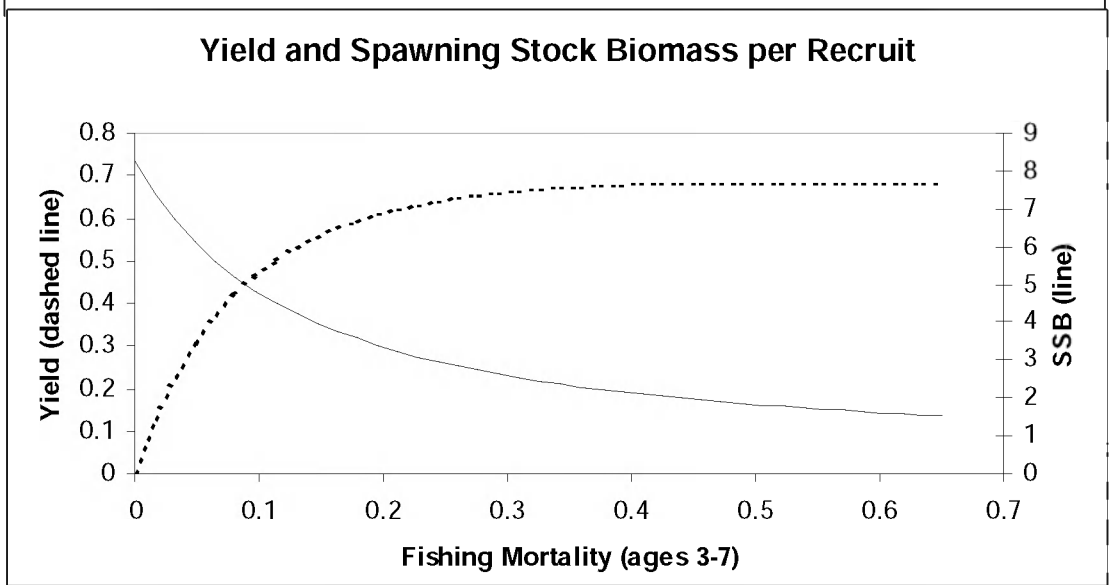
Year	ICES Advice	Predicted catch Corresp. to advice	Agreed TAC	ACFM Catch
1987	No increase in F	17		14.9
1988	No increase in F	18		12.2
1989	No increase in F	11		14.3
1990	No increase in F	11		11.7
1991	TAC	11		8.4
1992	TAC	13-15		5.5
1993	Reduction in F	8		4.0
1994	No fishing	0	6.2	4.3
1995	No fishing	0	6.2	4.9
1996	TAC	8.3	12.6	9.6
1997	F= F(95)	9.3		17.9
1998	F =F(96)	16		22.2
1999	F < proposed $\mathbf{F}_{pa}$ (0.25)	9		18.5
2000	F < proposed $\mathbf{F}_{pa}$ (0.25)	22		15.8
2001	F < proposed $\mathbf{F}_{pa}$ (0.25)	20		15.9
2002	No fishing	0		25.0
2003	F<proposed $\mathbf{F}_{pa}$ (0.25)	12		27.0
2004	F<proposed $\mathbf{F}_{pa}$ (0.25)	21		23.8
2005	F<proposed $\mathbf{F}_{pa}$ (0.25)	19		
2006	F<proposed $\mathbf{F}_{pa}$ (0.25)	18		

Weights in '000 t.

Faroe haddock (Division Vb)




Stock - Recruitment
Recruitment (age 2) in millions
140
120
100
80
60
40
20
0
0
20
40
60
80
100
120
SSB in 1000 t
SSB-Rec.
Blim
Bpa


Yield and Spawning Stock Biomass per Recruit
Yield (dashed line)
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
9
8
7
6
5
4
3
2
1
0
SSB (line)
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
Fishing Mortality (ages 3-7)

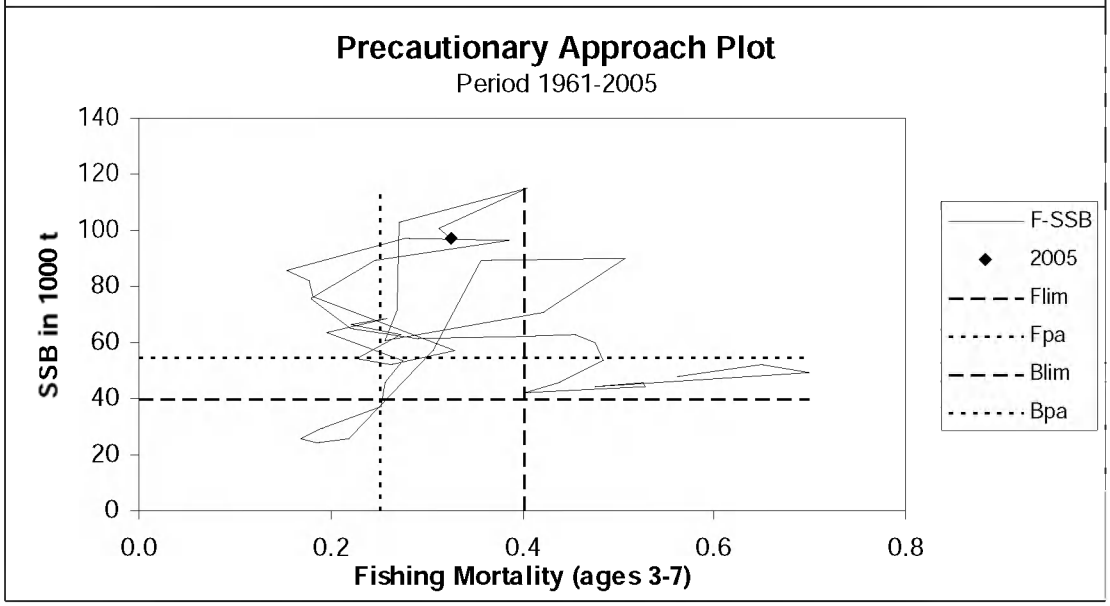

Precautionary Approach Plot
Period 1961-2005
SSB in 1000 t
140
120
100
80
60
40
20
0
0.0
0.2
0.4
0.6
0.8
Fishing Mortality (ages 3-7)
F-SSB
2005
Flim
Fpa
Blim
Bpa

Table 1.4.3.1 Faroe Plateau (Subdivision Vb1) HADDOCK. Nnominal catches (tonnes) by countries 1982-2004, as officially reported to ICES, and the total Working Group estimate in Vb.

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[4,8]	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 [2]
Faroe Islands	3,675	4,549	9,152	16,585	19,135	16,643		13,821	21,337	22,199	19,184
France[1]					2 [2]	- [2]	6	8 [5]	2	4	1
Germany		5	-	-		33	1	2	6	1	6
Greenland											
Iceland									4		
Norway	22	28	45	45 [2]	71	411	355	257 [2]	227 [2]	292	229
UK (Engl. and Wales)	31	23	5	22	30 [1]	59 [5]	19 [5]	4 [5]	11 [5]	14 [5]	
UK (Scotland)[11]	-	-	...	...	...						
United Kingdom											201 [5]
Total	3,728	4,605	9,202	16,652	19,238	17,146	381	14,092	21,587	22,510	19,621
Working Group estimate[4,8,9]	4,252	4,948	9,642	17,924	22,210	18,482	15,821	15,890	25,011	26,970	23,811

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) Reported as Division Vb.

6) Included in Vb2

7) Includes 14 reported as Vb

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

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

Table 1.4.3.2 Faroe Plateau (Subdivision Vb2) HADDOCK. Nnominal catches (tonnes) by countries 1982-2004, as officially reported to ICES, and the total Working Group estimate 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]
Faroe Islands	353	303	338	1,133	2,810	1,110		2,001	3,878	4,934	4,804
France[1]	-	-	-	-							
Norway	1	1	40	4	60	3	48	66	28	55	17
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 [4]	185 [4]	[1]
Total	524	343	440	1,272	2,972	1,306	233	2,215	4,083	5,174	4,821

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.

Table1.4.3.3 Faroe haddock (Division Vb).

Year	Recruitment Age 2 thousands	SSB tonnes	Landings tonnes	Mean F Ages 3-7
1961	51276	47797	20831	0.5624
1962	38537	51875	27151	0.6506
1963	47362	49547	27571	0.7002
1964	30111	44128	19490	0.4753
1965	22645	45556	18479	0.5260
1966	20206	43953	18766	0.5288
1967	25357	41960	13381	0.4030
1968	54849	45381	17852	0.4376
1969	31971	53425	23272	0.4853
1970	35589	59865	21361	0.4762
1971	15455	62918	19393	0.4563
1972	33183	61990	16485	0.3963
1973	23695	61599	17976	0.2893
1974	52351	64658	14773	0.2205
1975	70144	75442	20715	0.1798
1976	56050	89285	26211	0.2474
1977	26238	96488	25555	0.3869
1978	35180	97396	19200	0.2777
1979	2798	85582	12418	0.1547
1980	4956	82112	15016	0.1774
1981	3500	76089	12233	0.1807
1982	15901	57019	11937	0.3294
1983	19804	52063	12894	0.2639
1984	41191	54204	12378	0.2268
1985	40240	63214	15143	0.2733
1986	27050	66532	14477	0.2205
1987	9747	68612	14882	0.2589
1988	19285	63449	12178	0.1955
1989	16305	53393	14325	0.2750
1990	9688	45865	11726	0.2574
1991	3111	37351	8429	0.2537
1992	2723	29603	5476	0.1901
1993	1828	25843	4026	0.1702
1994	6513	24287	4252	0.1857
1995	104824	25570	4948	0.2184
1996	46561	56939	9642	0.3069
1997	9333	89175	17924	0.3568
1998	3666	89717	22210	0.5086
1999	15921	70377	18482	0.4218
2000	23964	60558	15821	0.2560
2001	126449	71418	15890	0.2687
2002	54798	102883	25011	0.2713
2003	35863	115100	26970	0.4043
2004	28964	100749	23811	0.3136
2005	8123	96932		
Average	30073	63509	16879	0.3325

1.4.4 Faroe saithe in Division Vb

State of the stock

Spawning biomass in relation to precautionary limits	Fishing mortality in relation to precautionary limits	Fishing mortality in relation to highest yield	Fishing mortality in relation to agreed target	Comment
Increased risk	Harvested unsustainably	Overexploited	Below agreed target	

Based on the most recent estimates of SSB and fishing mortality, ICES classifies the stock as being at risk of reduced reproductive capacity and to be harvested unsustainably.

The estimate of fishing mortality has been above the proposed $\mathbf{F}_{lim}$ since 2000. The spawning stock biomass has been below $\mathbf{B}_{pa}$ since 2001. Recruitment of the 1996 to 2000 year classes was above average, including the strong 1998 year class. The estimation of the 2001 year class is uncertain but is presently estimated to be record low.

Management objectives

The management objective is to achieve sustainable fisheries. An effort management system was implemented in the Faroese demersal fisheries (Division Vb) in 1996 and aims at harvesting, on average, 33% of the saithe stock in numbers. This translates into an average F of 0.45, above the $\mathbf{F}_{pa}$ of 0.28. ICES considers this F level to be inconsistent with the Precautionary Approach.

Reference points

	ICES considers that:	ICES proposed that:
Precautionary Approach reference points	$\mathbf{B}_{lim}$ is 60 000 t	$\mathbf{B}_{pa}$ be set at 85 000 t
	$\mathbf{F}_{lim}$ is 0.40	$\mathbf{F}_{pa}$ be set at 0.28

Technical basis

$\mathbf{B}_{lim}$: lowest observed SSB established in 1999 and corresponding to SSB in 1992	$\mathbf{B}_{pa}$: former MBAL
$\mathbf{F}_{lim}$: consistent with $\mathbf{B}_{lim}$ of 60 000 t	$\mathbf{F}_{pa}$: consistent with $\mathbf{F}_{lim}$ and previous estimate of $\mathbf{F}_{med}$

Yield and spawning biomass per Recruit
F-reference points:

	Fish Mort Ages 4-8	Yield/R	SSB/R
Average last 3 years	0.459	1.530	3.088
$\mathbf{F}_{0.1}$	0.119	1.323	7.773
$\mathbf{F}_{med}$	0.363	1.529	3.684

Single-stock exploitation boundaries

Exploitation boundaries in relation to existing management plans

The current F is estimated to be around the management target of F=0.45. The average fishing mortality for the period when this effort regulation scheme has been operative (1997–2004) is estimated at 0.40 per year. The agreed management plan implies no change in fishing mortality for 2006.

Exploitation boundaries in relation to high long-term yield, low risk of depletion of production potential and considering ecosystem effects

The current fishing mortality estimated as 0.44 is above rates that would support optimal long-term yield and low risk of stock depletion ($\mathbf{F}_{01}$= 0.119).

Exploitation boundaries in relation to precautionary limits

Fishing effort in 2006 should be reduced to correspond to a fishing mortality below $\mathbf{F}_{pa}$ = 0.28, corresponding to an effort reduction of about 40% if the relationship between fishing effort and fishing mortality is linear.

Short-term implications

Outlook for 2006

Basis: F(2005) =0.4585; SSB(2006) = 65; catch (2005) = 45.

The fishing mortality applied according to the agreed management plan (F(management plan)) is 0.45.
The maximum fishing mortality which would be in accordance with precautionary limits (F (precautionary limits)) is 0.28.

Rationale	F (2006	Basis	SSB (2006)	Landings (2006)	SSB (2007)	%SSB change [1)]
Zero catch	0	F=0	65	0	92	41
Target reference point	0.45	F(man. plan) $\mathbf{F}_{target}$	65	35	57	-13
Status quo	0.46	Fsq	65	36	56	-14
High long-term yield	0.12	$\mathbf{F}_{0.1}$(long-term yield)	65	11	80	23
Agreed management plan	0.05	F(man. plan) * 0.1	65	4	87	34
	0.11	F(man. plan) * 0.25	65	11	81	24
	0.23	F(man. plan) * 0.50	65	20	72	9
	0.34	F(man. plan) * 0.75	65	28	64	-3
	0.41	F(man. plan) * 0.90	65	33	59	-9
	0.45	F(man. plan)	65	35	57	-13
	0.50	F(man. plan) * 1.1	65	38	54	-17
	0.56	F(man. plan) * 1.25	65	41	51	-22
Precautionary limits	0.03	$\mathbf{F}_{pa}$ * 0.1	65	3	89	36
	0.07	$\mathbf{F}_{pa}$ * 0.25	65	7	85	30
	0.14	$\mathbf{F}_{pa}$ * 0.5	65	13	78	20
	0.21	$\mathbf{F}_{pa}$ * 0.75	65	19	73	12
	0.25	$\mathbf{F}_{pa}$ * 0.90	65	22	69	6
	0.28	$\mathbf{F}_{pa}$ (=$\mathbf{F}_{sq}$ *0.61)	65	24	67	3
	0.31	$\mathbf{F}_{pa}$ * 1.1	65	26	66	1
	0.35	$\mathbf{F}_{pa}$ * 1.25	65	29	63	-4
Mixed fisheries	0.18	Coupling with cod; $\mathbf{F}_{sq}$ * 0.4	65	16	75	16

Weights in '000 t.
Shaded scenarios are not considered consistent with the Precautionary Approach.
[1)] SSB 2007 relative to SSB 2006.

Management considerations

Maintaining the *status quo* fishing mortality implies that SSB is forecasted to be below $\mathbf{B}_{lim}$ in 2007.

Saithe is mainly taken in a targeted pair trawl fishery in the deeper parts of the plateau. Due to the higher prices of cod there are incentives to increase cod bycatches.

Given the high fishing mortality and low stock size, the present spawning closures should be maintained.

Management plan evaluations

The effort management system translates to an average F of 0.45. The management plan has not been fully evaluated by ICES in relation to the defined $\mathbf{B}_{lim}$. A full evaluation should take into account the relationship between fishing mortality and fishing days.

Ecosystem considerations

Blue whiting is a forage species for saithe. A proportion of the saithe stock is far off the shelf, probably preying on blue whiting. The blue whiting fishery thus also affects saithe by removing blue whiting.

Factors affecting the fisheries and the stock

Regulations and their effects

Limited measurements in the blue whiting fishery in Faroe waters indicate that bycatch of saithe may be significant. In order to get a reasonable estimate sampling is required on the blue whiting fishery.

Changes in fishing technology and fishing patterns

Development in gear technology and optimizing fishing operations has resulted in an increase in the catchability since the early 1990s, preliminarily estimated in the order of 20% in the last decade.

Scientific basis

Data and methods

The stock assessment is an analytical assessment using commercial catch-at-age data and commercial (pair trawler) catch and standardized effort data from logbooks. In the present assessment the commercial CPUE that has been used for tuning has been standardized, taking into account season, fishing area, and boat factors.

There are no recruitment indices available for ages younger than 3 in the terminal year. Existing research surveys may be of use in tuning, but this has not been fully evaluated.

Comparison with previous assessment and advice

Due to revised assessment data, the present estimate of fishing mortality in 2003 is 13% higher than estimated last year. SSB for 2004 is 36% lower than estimated in last year's assessment. This decline in SSB estimates is largely attributed to the observation of maturity-at-age and weight-at-age being lower than predicted last year.

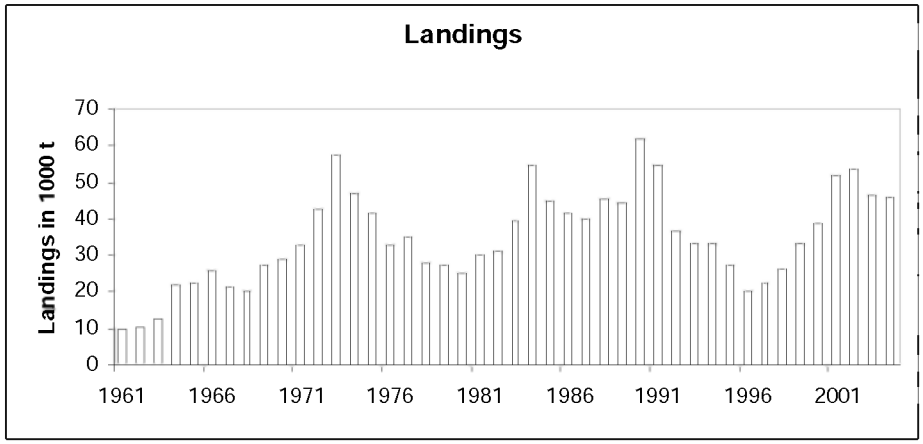
Source of information

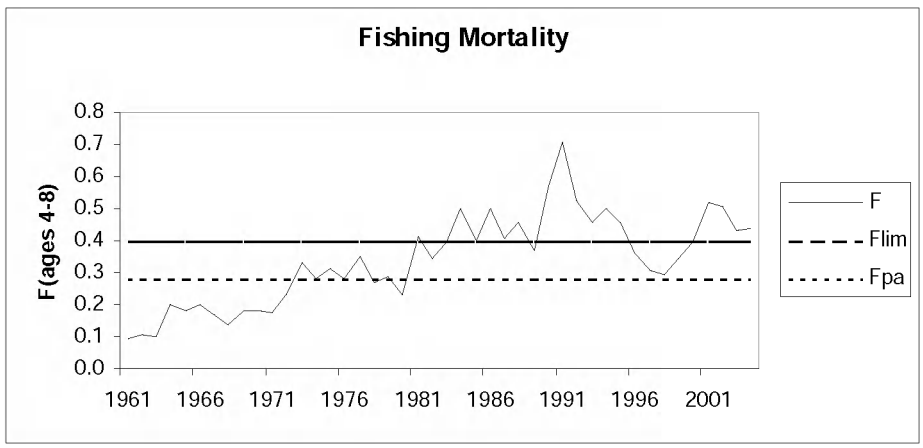
Report of the North-Western Working Group, 26 April–5 May 2005 (ICES CM 2005/ACFM:21).

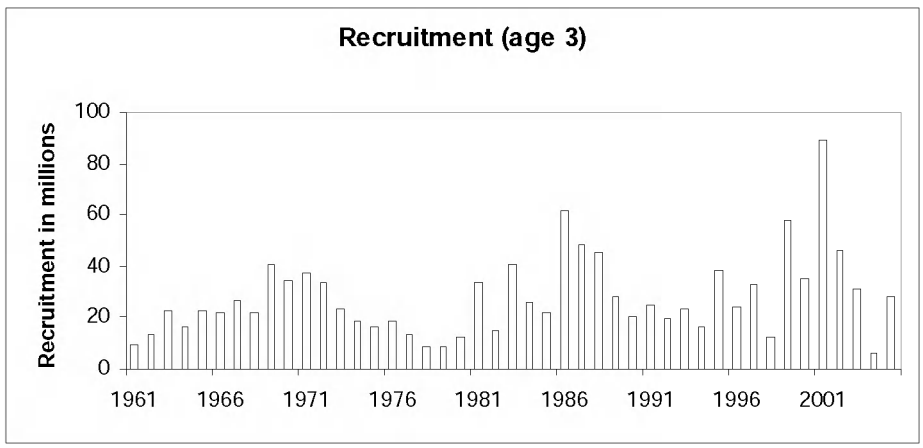
Year	ICES Advice	Predicted catch corresp. to advice	Agreed TAC	ACFM Landings
1987	No increase in F	<32		40
1988	No increase in F	<32		45
1989	Reduction in F	<40		44
1990	Reduction in F	<41		62
1991	TAC	<30		55
1992	Reduction in F	<27		36
1993	Reduction in F	<37		34
1994	TAC	<26	42[1]	33
1995	TAC	<22	39[1]	27
1996	TAC	<39	-	20
1997	20% reduction in F from 1995 level	<21	-	22
1998	30% reduction in effort from 1996/97 level	-	-	26
1999	F below $\mathbf{F}_{pa}$ (0.28)	<14		33
2000	F below than $\mathbf{F}_{pa}$ (0.28)	<15		39
2001	Reduce fishing effort to generate F well below $\mathbf{F}_{pa}$ (0.28)	<17		52
2002	Reduce fishing effort to generate F below $\mathbf{F}_{pa}$ (0.28)	<28		54
2003	Reduce fishing effort to generate F below $\mathbf{F}_{pa}$ (0.28)	<47		47
2004	Reduce fishing effort to generate F below Fpa (0.28)	<48		46
2005	Reduce fishing effort to generate F below $\mathbf{F}_{pa}$ (0.28)	<32		
2006	Reduce fishing effort to generate F below $\mathbf{F}_{pa}$ (0.28)	<24		

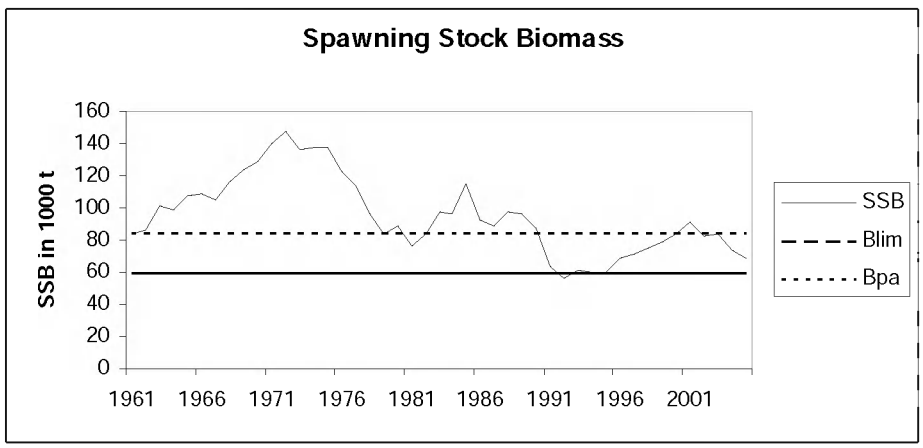
Weights in '000 t.

[1] In the quota year 1 September–31 August the following year.

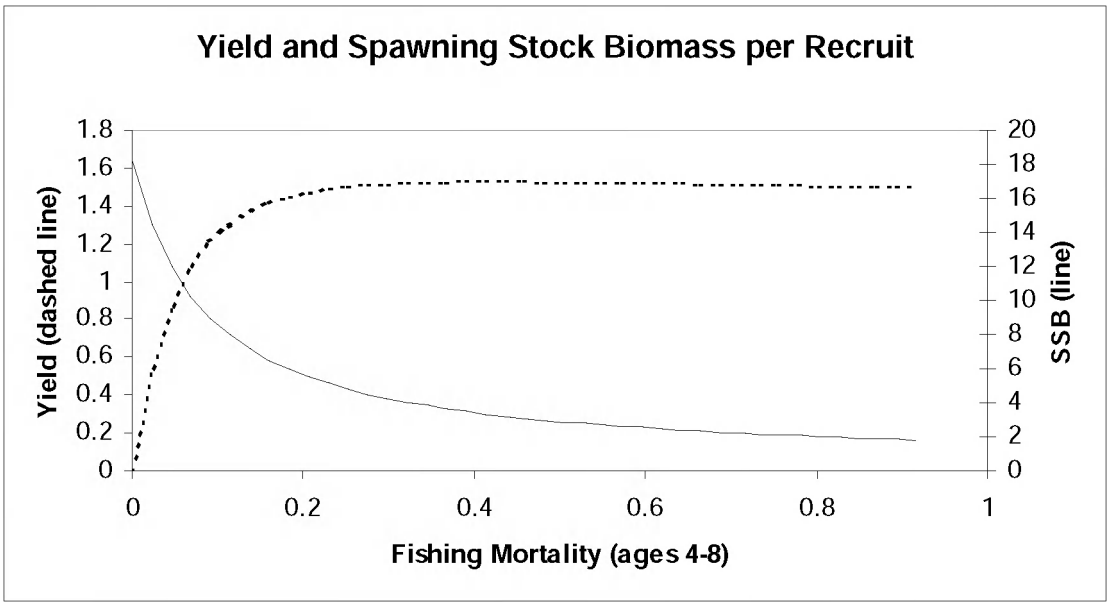

Landings
Landings in 1000 t
70
60
50
40
30
20
10
0
1961
1966
1971
1976
1981
1986
1991
1996
2001


Fishing Mortality
F (ages 4-8)
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
1961
1966
1971
1976
1981
1986
1991
1996
2001
F
Flim
Fpa


Recruitment (age 3)
Recruitment in millions
100
80
60
40
20
0
1961
1966
1971
1976
1981
1986
1991
1996
2001


Spawning Stock Biomass
SSB in 1000 t
160
140
120
100
80
60
40
20
0
1961
1966
1971
1976
1981
1986
1991
1996
2001
SSB
Blim
Bpa


Stock - Recruitment
Recruitment (age 3) in millions
100
90
80
70
60
50
40
30
20
10
0
0
50
100
150
200
SSB in 1000 t
SSB-Rec.
Blim
Bpa


Yield and Spawning Stock Biomass per Recruit
Yield (dashed line)
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
SSB (line)
20
18
16
14
12
10
8
6
4
2
0
0
0.2
0.4
0.6
0.8
1
Fishing Mortality (ages 4-8)

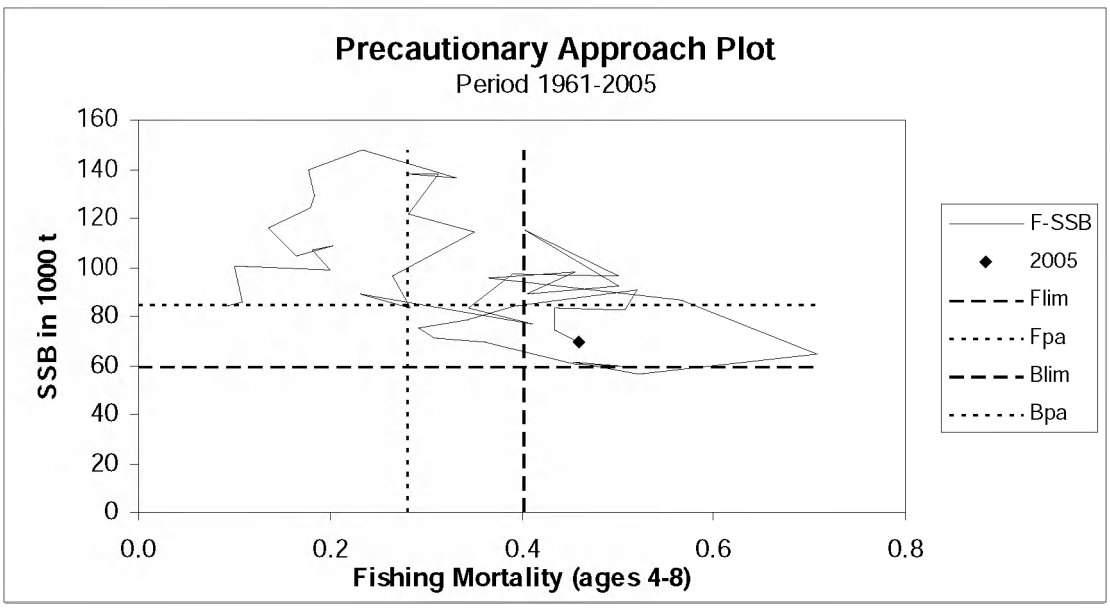

Precautionary Approach Plot
Period 1961-2005
SSB in 1000 t
160
140
120
100
80
60
40
20
0
0.0
0.2
0.4
0.6
0.8
Fishing Mortality (ages 4-8)
F-SSB
2005
Flim
Fpa
Blim
Bpa

Table 1.4.4.1 Saithe in the Faroes (Division Vb). Nominal catches (tonnes) by countries, 1989-2004, as officially reported to ICES.

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	-	32	-	-	-
Norway	51	46	103	85	279	156	10	16
UK (Eng. & W.)	-	-	5	74	425	151	21	53
UK (Scotland)	9	33	79	98		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 [1]
Estonia	16	-	-	-	-	-	-	-
Faroe Islands	21,721	25,995	32,439		49,676	55,165	47,933	47,866
France	9	17	-	273	934	607	370	
Germany	5	-	100	230	667	422	281	186
Greenland	-	-	-	-		442		426
Irland	-	-	-	-	5	-	-	-
Norway	67	53	160	72	60	77	94	82
Portugal	-	-	-	-	-	-	-	3
Russia	28	-	-	20	1	10	32	
UK (E/W/NI)	-	19	67	32	80	58	89	
UK (Scotland)	460	337	441	534	708	540	610	
United Kingdom								829
Total	22,306	26,421	33,207	1,161	52,131	57,321	49,409	49,392
Working Group estimate [4,5,6,7]	22,306	26,421	33,207	39,020	51,786	53,546	46,555	46,115

[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 2001-2004 catches from Faroe Islands, as stated from Faroese coastal guard service, are recalculeted because of discrepancy in converting gutted weight to round weight (factor 1.2 agains 1.11).

Table 1.4.4.2 Faroe Saithe (Division Vb).

Year	Recruitment Age 3 thousands	SSB tonnes	Landings tonnes	Mean F Ages 4-8
1961	9047	83798	9592	0.0911
1962	13663	85635	10454	0.1083
1963	22431	100631	12693	0.0996
1964	16192	98383	21893	0.2007
1965	22803	107215	22181	0.1827
1966	21830	108779	25563	0.2029
1967	26879	104635	21319	0.1660
1968	21514	115962	20387	0.1350
1969	40798	123795	27437	0.1790
1970	34135	129143	29110	0.1832
1971	37285	139500	32706	0.1769
1972	33607	147569	42663	0.2329
1973	23282	136682	57431	0.3328
1974	18897	137611	47188	0.2811
1975	16306	137886	41576	0.3127
1976	18910	122017	33065	0.2821
1977	12940	114098	34835	0.3514
1978	8414	96026	28138	0.2657
1979	8632	83557	27246	0.2846
1980	12450	88942	25230	0.2325
1981	33326	76327	30103	0.4125
1982	15215	83368	30964	0.3453
1983	40976	97192	39176	0.3915
1984	25961	96330	54665	0.5020
1985	22191	114869	44605	0.4023
1986	61704	91983	41716	0.5023
1987	48481	89315	40020	0.4045
1988	44973	97994	45285	0.4549
1989	28502	95873	44477	0.3662
1990	20654	86893	61628	0.5670
1991	24789	64327	54858	0.7076
1992	19528	56259	36487	0.5232
1993	23677	61393	33543	0.4542
1994	16747	59606	33182	0.5029
1995	38600	60285	27209	0.4548
1996	24047	69064	20029	0.3610
1997	32802	71294	22306	0.3081
1998	12747	75003	26421	0.2926
1999	58032	78443	33207	0.3428
2000	35036	84144	39020	0.3935
2001	89219	90737	51786	0.5193
2002	46268	82146	53546	0.5070
2003	31316	83524	46555	0.4335
2004	6463	73978	46115	0.4351
2005	27988*	69180		
Average	27761	94920	34718	0.3410

*Recruitment age 3 in 2005 is based on the geometric mean 1980–2004.