

Assessment

Table 3 Scoring table for the Faroe Plateau region.

Assessment of GIWA concerns and issues according to scoring criteria (see Methodology chapter)		The arrow indicates the likely direction of future changes.					
IMPACT 0	No known impacts	IMPACT 2	Moderate impacts	↗	Increased impact	→	No changes
IMPACT 1	Slight impacts	IMPACT 3	Severe impacts	↘	Decreased impact		
Faroe Plateau		Environmental impacts	Economic impacts	Health impacts	Other community impacts	Overall Score**	Priority***
Freshwater shortage	0* →	0 →	0 →	0 →	0 →	0	5
Modification of stream flow	0						
Pollution of existing supplies	0						
Changes in the water table	0						
Pollution	2* ↗	1 →	3 ↗	1 ↗	2	1	
Microbiological pollution	1						
Eutrophication	0						
Chemical	2						
Suspended solids	0						
Solid waste	0						
Thermal	0						
Radionucleid	0						
Spills	1						
Habitat and community modification	1* →	1 →	0 →	0 →	1	4	
Loss of ecosystems	1						
Modification of ecosystems	2						
Unsustainable exploitation of fish	2* ↘	1 ↘	0 →	0 →	2	2	
Overexploitation	2						
Excessive by-catch and discards	1						
Destructive fishing practices	2						
Decreased viability of stock	0						
Impact on biological and genetic diversity	0						
Global change	1* ↗	0 ↗	0 →	0 →	1	3	
Changes in hydrological cycle	1						
Sea level change	0						
Increased UV-B radiation	0						
Changes in ocean CO ₂ source/sink function	0						

* This value represents an average weighted score of the environmental issues associated to the concern.

** This value represents the overall score including environmental, socio-economic and likely future impacts.

*** Priority refers to the ranking of GIWA concerns.

This section presents the results of the assessment of the impacts of each of the five predefined GIWA concerns i.e. Freshwater shortage, Pollution, Habitat and community modification, Unsustainable exploitation of fish and other living resources, Global change, and their constituent issues and the priorities identified during this process. The evaluation of severity of each issue adheres to a set of predefined criteria as provided in the chapter describing the GIWA methodology. In this section, the scoring of GIWA concerns and issues is presented in Table 3.

IMPACT Freshwater shortage

The Faroes holds plenty of unpolluted water in the lakes.

Environmental impacts

Modification of stream flow

Not a problem in the Faroe Islands.

Pollution of existing supplies

No pollution of existing water supplies.

Changes in the water table

No evidence that extraction of water from aquifers exceeds natural replenishment.

Socio-economic impact

Economic impacts

No known impact.

Health impacts

No known impact.

Other social and community impacts

No known impact.

Conclusions and future outlook

Freshwater shortage is not an issue of major concern for the Faroe Islands at present.

Pollution

Environmental impacts

Microbiological pollution

Microbiological pollution is connected with discharge of domestic and to a lesser degree with industrial wastewater. In most cases there are small-scale outlets draining the overflow from sewage tanks. However, at localities where this wastewater is discharged to a recipient with limited water exchange, this discharge may lead to locally significant microbial pollution, which renders the water unfit for most uses.

Eutrophication

Eutrophication can occur locally, but is considered a minor problem.

Chemical pollution

Heavy metals and Persistent Organic Pollutants (POPs)

Analyses for contaminations with heavy metals and POPs have been made as part of the Arctic Monitoring and Assessment Program (AMAP) on the Faroe Islands in the period 1997-2001 (Larsen and Dam, 2003; Olsen et al., 2003).

In the period 1997-1998 the following species were analysed from the marine environments: Blue mussel (*Mytilus edulis*), queen scallop (*Clamys opercularis*), cod (*Gadus morhua*), fulmar (*Fulmarus glacialis*), grey seal (*Halichoerus grypus*), pilot whale (*Globicephala melas*) and from freshwater environments: brown trout (*Salmo trutta*) and Arctic char (*Salvelinus alpinus*) (Larsen and Dam, 2003).

In the period 1999-2001 analyses have been made on the following species from the marine environments: Short-horn sculpin (*Myoxocephalus scorpius*), black guillemot (*Cepphus grylle*), and pilot whale, and from the freshwater environment: Arctic char (Olsen et al., 2003; Hoydal et al., 2003).

In the period 1999-2001 the analysed heavy metals were: mercury (Hg), cadmium (Cd), and selenium (Se) and the analysed POPs were: PCB and organochlorinated pesticides (14 single congeners, chlordanes,

β -HCH), DDT (o,p-isomers and metabolites) and toxaphene (incl. total toxaphene and 5 single parlars).

The highest mercury concentrations were found in pilot whale muscle, with 3 mg/kg in adult males. Next highest mercury concentrations were found in black guillemot livers, and in sculpin livers. The mercury concentrations in the three years of sculpin samples spanned a wide range from 0.1 mg/kg to almost 1.5 mg/kg varying among the age-groups but more markedly between the years. Then comes black guillemots eggs with mercury concentrations around 0.5 mg/kg, and Arctic char with a mercury level around 0.2 mg/kg.

The highest mercury concentrations exceed Danish residue guideline concentrations, as the highest guideline concentration is 1 mg/kg (Anon., 2003b).

The changes over time of environmental background concentrations of mercury for long-finned pilot whales are unknown. However, trends of increasing mercury concentrations with time has been found in museum specimens of black guillemot in the Faroe Islands (Sommer and Appelquist, 1974; Appelquist et al., 1984, 1985), similar to what has been found in other seabird species foraging in the North-East Atlantic waters (Monteiro and Furness, 1995).

The mercury concentration in soft tissue from pilot whales can be traced back to 1977. The data available reveal differences in mercury concentrations between pods as well as individual differences, and a trend in the mercury concentration is not discernable (Dam and Bloch, 2000). It is assumed however, that the overall increase in anthropogenic mercury emission which may be traced in sediments and peat samples in many places on the northern hemisphere (Fitzgerald et al., 1998; AMAP, 1998) is reflected in the pilot whales as it is in for example Beaufort Sea Beluga (AMAP, 2002).

The highest concentrations of POPs were found in pilot whale blubber.

With the persistent organic pollutants there is growing evidence that the restrictions on their use that were put into action some decades ago have had an effect. There have been marked reductions in the last decade, particularly with the pesticide DDT (Dam et al., unpublished). Still, when the analysed biota is scrutinised with respect to chemical pollutants, the results are often that the concentrations of pollutants within them gives reason for concern as when compared to limits defined by food health authorities.

Dioxin is an unintended byproduct in various industrial processes and is also produced during incineration of wastes (Quass et al., 2000). Dioxin is lipid-soluble and relatively high concentrations are found in lipid-rich fish species (Leonards et al., 2001; Fiedler et al., 2000). The highest dioxin concentrations are found in areas influenced by the heavy populated and industrialised areas such as in the Baltic Sea (Robinson et al., 2000). In recent years, a decrease in dioxin in various foodstuff has been observed (Baars et al., 2004).

Solid wastes

There are two waste companies in the Faroes, which coordinate the collection, sorting and incineration, depositing or shipping to suitable processing facilities of all the wastes produced. Solid wastes are as a general rule incinerated, and incinerations are equipped with filters to hinder pollution with heavy metals. The capacity of the incineration plants is, however, becoming insufficient and new emission limits are imposed.

Waste collections from ships and fishing vessels are not functioning optimally and waste is often dumped at sea although forbidden by law.

Thermal

Approximately 60% of the electricity demand is produced at mineral oil fuelled electricity plants. These plants use seawater in the cooling system, which after use is discharged to sea. It seems unlikely that this discharge should lead to any significant thermal pollution except in the immediate vicinity of the outlets.

Radionuclide pollution

The Faroe Islands are subject to the radioactive pollution which stems from nuclear bomb-testing and the discharge to the sea and air which occurs from accidents and regular activity of for example nuclear reprocessing plants in Europe. There is no anthropogenic source of radioactivity stemming from the Faroe Islands.

According to studies by Joensen and Dahlgaard (2003), the average Caesium (¹³⁷Cs) activity in seawater is around 1.6 Bq/m³ for both 1999 and 2000, with a decline from trend from 1999 to 2000 in Tórshavn/Hoyvík and Kirkjubøur. The average ¹³⁷Cs/⁹⁰Sr concentration ratio from the measurements is 1.49, which corresponds to the global fallout ratio. Results for ¹³⁷Cs concentrations in marine biota all show low values, with cod having the relatively highest value of around 0.2 Bq/kg fresh weight.

Due to the expected transport time of Technetium (⁹⁹Tc) to Faroese waters of 12-15 years, the results presented are therefore not related to the latest releases from Sellafield, but mainly to discharges in the

1970s and to global fallout from nuclear weapon tests (Joensen and Dahlgaard, 2003).

Oil spills

At present this is not considered a problem of concern. However, establishing environmental baselines to assess any future environmental pollution is important in light of the on-going exploration for offshore hydrocarbons around the Faroes (Anon., 1997, 2001). The exploitation of hydrocarbons could potentially result in adverse environmental effects.

Socio-economic impact

Economic impact

The fish oil derived from some pelagic species must at present be purified for dioxin and dioxin-like substances, a process which increases the expenses in the utilising of some pelagic fish stocks as fish feed in aquaculture. The economic will be impacted for families who have to reduce the consumption of whale products, because the whale meat is contaminated with pollutants.

Human health impact

Consumption of marine food in preference to other food is generally considered to be healthy and below the safe limits for contaminant set by the EU. However, in a few fish species levels of mercury above the EU safe limits have been found. The Faroese are known to be heavily dependent on seafood. In pilot whale the contamination levels of both POPs and mercury are above the EU safe limits. Thus the potential exposure to some pollutants is very high in the Faroe human population (Table 4).

The Faroese diet is dominated by marine food, e.g. cod, haddock and halibut. Seabirds are consumed in the season, especially fulmar, puffin and guillemot.

Table 4 Conclusions and recommendations on Human Health impacts of contaminants in the Faroe Islands.

Human health
<p>Exposure to methyl mercury and organochlorine compounds has been high in the Faroe Islands due to frequent ingestion of pilot whale meat and blubber.</p> <p>Cognitive deficits and other adverse effects have been demonstrated in children with prenatal exposure to these compounds in the Faroes.</p> <p>In August, 1998 the Faroese authorities issued an advisory that women who plan to become pregnant within three months, pregnant women, and nursing women should abstain from eating pilot whale meat.</p> <p>Furthermore, the best way to protect foetuses against the potential harmful effects of PCBs and other organochlorine compounds, is if girls and women do not eat blubber until they have given birth to their children.</p> <p>The results from a dietary survey among pregnant women in 2000 – 2001 have revealed a dramatic reduction in whale meat and blubber intake.</p> <p>Blood analyses showed a decrease corresponding to more than one order of magnitude with regard to mercury exposure. However, possibly because of their stability in the body, the PCB levels were still high and must be considered to be a continued potential health problem in the Faroese community. The reasons for the persistent high PCB concentrations are not fully understood, and further research is needed to elucidate this phenomenon.</p> <p>Because of the advantages of conducting epidemiological studies in the Faroes and because of the continuing exposure to organochlorine compounds, research should be continued to explore the health consequences of the increased exposure levels.</p>

(Source: Deutch and Hansen, 2003)

The species of most relevance in the Faroese diet, which have been analysed in the AMAP programme are (Weihe et al., 2003a): Long-finned pilot whale, fulmar, cod, sheep (*Ovis aries*), hare (*Lepus timidus*), brown trout and Arctic char. The freshwater fish species, especially the Arctic char, though an important part of the diet in other northern communities, is of limited importance as food-item in the Faroes. First and foremost due to the limited abundance of Arctic char waters, and secondly due to the limited catch of these fishes, which are taken on a fishing rod by sports anglers only. Blue mussels and queen scallop have once been analysed for pollutants as a part of the AMAP Faroe program. These shellfish species are widely used as food. However, in the Faroes the consumption is very limited.

Most concern has been on the metals: Mercury, lead and cadmium. Most samples have been analysed for these metals. However, in some matrices selenium has also been analysed.

Marine food/traditional food provide benefits because marine mammals and fish are rich in polyunsaturated fatty acids (PUFA). A diet high with PUFA has been associated with lower risk of heart disease. Whale skin and other marine foods are rich in selenium. Selenium may increase the body's antioxidant defense. Furthermore, high levels of vitamin A are found in animal liver and blubber. In general, traditional diets therefore provide a strong nutritional base for health (AMAP, 1998, 2002).

Mercury is of both scientific and public concern due to the high concentrations in e.g. pilot whales and higher predatory fish, where up to 3 ppm Hg has been measured (Dam et al., 2000; AMAP, 1998, 2002; Olsen et al., 2003). Furthermore, it has been shown that the present levels of mercury in sea animals may have a negative effect also on the health of the local human populations, when these animals are used as food supply (Grandjean et al., 1998; Deutch and Hansen, 2003).

Realising the hazard resulting from the present contaminations and as a consequence of the findings of studies in the Faroes, new recommendations on the consumption of whale products were issued by the health authorities in 1998 (Weihe et al., 2003b). According to Weihe et al. (2003b), adults should limit their intake to one or two dinners of whale meat (corresponding to 300g whale meat) each second week. Adults should eat blubber no more than once or twice per month. Girls and women are best advised not to eat blubber at all before the end of the reproductive period. Women who intend to get pregnant during the next three months, women who are pregnant or those who are breastfeeding should not eat any whale meat at all. Livers and kidneys of whale should not be eaten by anyone at all (Heilsufrøðiliga Starvsstovan, 1998). Whale meat contains about 1.9 mg mercury/kg. i.e. much higher

mercury concentrations than found in Faroese fish. The high mercury concentrations in whales are the background for the above-mentioned recommendations for the consumption of whale meat. Because of the beneficial effects of fish consumption, the long-term goal needs to be a reduction in the concentration of MeHg in seafood rather than a replacement of fish in the diet by other foods. In the interim, the best method of maintaining fish consumption and minimising Hg exposure is the consumption of fish known to have low mercury concentrations (Committee on the Toxicological Effects of Methylmercury, 2000).

Other social and community impacts

No known impact. However, the issued dietary advice by the Faroese health authorities of reduced intake of whale meat and blubber of especially young women may have socio-cultural impacts.

Conclusions and future outlook

Chemical pollution is very limited in the Faroes, a consequence of their rather remote position in the North Atlantic away from the dense populations and large industries of central Europe, and because of favorable ocean currents. This does not, however, make the Faroese people a 'reference population' with respect to environmental pollution loads, as one would expect, because the intake of pollutants from marine mammals is marked.

Dietary advice to limit the consumption of pilot whale meat was first issued in 1977, and this was apparently also the first time mercury was ever measured in Faroese pilot whale meat. Since then, heavy metals and persistent organic pollutants in these mammals have been measured. The best-studied species is probably the long-finned pilot whale. Measurements of contaminants in long-finned pilot whales and in the marine fauna of the Faroe Islands need to be continued in the future to keep the natural resources healthy and below the safe limits for contaminants in human food set by for example the EU.

IMPACT Habitat and community modification

Environmental impacts

The overall judgment by the task team experts of issue 12, losses of ecosystem or ecotones was a slight impact. However, certain coral-reefs of the reef-forming corals (e.g. *Lophelia pertusa*) were regarded as moderately impacted (score 2) by bottom trawling. The ecological value of these habitats is, however, poorly understood. Probably there is no loss of entire ecosystems due to bottom trawling. However, this

has not been investigated and little data exists. Issue 13, modification of bottom habitats and community structures, was assessed to be moderately impacted, mainly due to bottom trawl fishery.

Benthic communities

The damaging impact of bottom-trawling on the benthic fauna, e.g. reef-forming coral and large sponge accumulations, are by killing the animals both directly by crunching and indirectly by stirring up the bottom sediment and making it impossible for the benthic animals to respire and feed (Rogers, 1999; Hall-Spencer et al., 2001; Thiel and Kowlow, 2001). On the Faroe Plateau, two known localities are inhabited by the slow growing eight armed corals of genus *Paragorgia* spp. and *Primnoa* spp. these are in particular sensitive to trawling. In the fjords and along the edge of the plateau at around 90 m depth there are mussel beds, which are sensitive to dredging and trawling (O. Tendal, Zoological Museum, University of Copenhagen, pers. comm.).

The Faroe Bank is an important fishing ground for the Faroese fishery accounting for approximately 10 % of the total annual catch within the Faroese fisheries zone. The bank supports a unique ecosystem of ecological and economic importance. Many of the species like the corals and sponges are very sensitive to physical damage and disturbance, as it is often caused by activities like trawling without proper management (Schmidt et al., 2003).

Sea birds

The increasing tourism in recent year has increased the pressure on some local sea bird breeding locations (Olsen, 1998, 2001), but a new law is being prepared to better protect these bird colonies from disturbance.

Socio-economic impacts

Economic impacts

No known impact

Health impacts

No known impact

Other social and community impacts

No known impact

Conclusions and future outlook

The benthic community is moderately impacted mainly by bottom trawling.

IMPACT Unsustainable exploitation of fish and other living resources

Environmental impacts

Important resources of fish, sea birds and marine mammals have large distribution areas, involving the waters of several nations. This means that fishery, hunting and other influences on one part of a population will eventually affect the rest of it, within as well as outside of Faroes waters. International cooperation on conservation and management of marine resources is thus essential. The Faroes participate actively in a number of international organisations which give advice on a sustainable use of marine resources of the Faroe Islands, e.g. International Council for the Exploration of the Sea (ICES), North East Atlantic Fishery Commission (NEAFC), North Atlantic Salmon Conservation Organisation (NASCO), North Atlantic Marine Mammal Commission (NAMMCO), International Whaling Commission (IWC), Northwest Atlantic Fishery Organization (NAFO), and International Marine Organization (IMO).

Overexploitation

Fishery

The Faroese fishing fleet has been regulated since the declaration of the fishing zone (FFZ) around the islands in 1977, initially through technical measures (e.g. limitations on gear size, closed areas, etc). A system of licences introduced in 1987 restricted entry into the fishery (Reinert, 2001a; ICES, 2003). This was accompanied by a limited buy-back scheme aimed at reducing the total level of fishing effort in the fishery. In 1994, following the sharp decline in cod catches, a series of individual transferable quotas (ITQs), effective for ten years, were imposed on the remaining fleet and a restrictive total allowable catch (TAC) was adopted to enable cod stocks to recover. This system was abandoned in 1996 and replaced by a system (valid for 8 years) whereby individual boats were allocated a permissible number of fishing days-at-sea. This individual effort quota system was supplemented by spatial control, the Faroe fishing zone (ICES Division Vb) being subdivided into three concentric zones within which access for particular kinds of fishing vessels was clearly defined (Figure 5)(Reinert, 2001a).

In recent years the Faroe Islands have built up a reputation of being foremost in fisheries management and sustainable fishing. In two international reports prepared in 2001, the Faroes fishing industry came out on top of the league for its fisheries management (Chuenpagdee and Alder, 2001) and also on the question of profitability the Faroes came out on top (EEC, 2002). This positive evaluation of the Faroes fishing performance is based on the successful new fishing regulation system started in 1996 including individual transferable effort quotas in days within fleet categories. However, the fishing system, as with

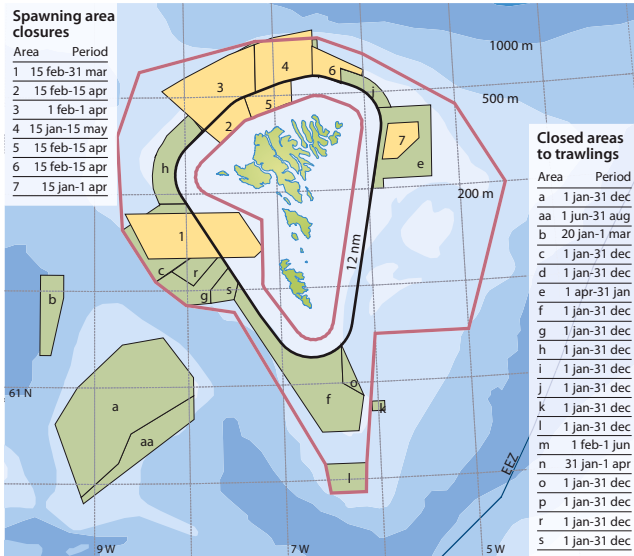


Figure 5 Fishing area regulations in Division Vb.

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 number of days. Long liners larger than 110 GRT are not allowed to fish inside the inner thick line on the Faroe Plateau. If long liners change from long line to jigging, they can double their number of days. The Faroe Bank shallower than 200 m depths (a, aa) is regulated separate from the Faroe Plateau. It is close to trawling and the long line fishery is regulated by individual day quotas.

any other system, must be regularly updated. Fisheries research has shown that effectiveness in fishing fleets generally increases with 2-3% per year. With the Faroe fishing day system, the aim is to fish as much as possible on a permitted day, therefore huge investments are made to increase efficiency. This can be as much as 5% per year. Although widely accepted, there is a risk for collapse of the Faroe fishing day system if agreement cannot be reached as to how the system should be updated.

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, long liners 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 trawling, 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 nearshore area (inside the 6 nm line) is closed to the larger long liners. Gill netters 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.
6. According to Faroese legislation, all discarding is banned.

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 by-catch allocation. Similarly, the gill netters 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 long liners is considered equivalent to two fishing days for jiggers in the same size category. Long liners 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 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 by-catch of cod and haddock. According to ICES (2004b) fishing mortality for the Faroe Plateau cod in 2003 was more than twice the level that was recommended based on precautionary principles. For haddock and saithe the present fishing mortality was also above the precautionary level. Therefore, ICES recommends a reduction of the fishing effort directed at cod and haddock in the neighbourhood of 2/3. For the saithe fisheries ICES recommends that effort be reduced by around 30%. This effort is predicated on the present low by-catch of cod and haddock in the saithe fisheries. If the by-catch of cod or haddock is

observed to increase in the saithe fishery, then effort will have to be reduced proportional to the increase in by-catch rate. For Faroe Bank cod effort should be reduced to the 1996-2002 level.

The stock of Greenland halibut in the Faroe Islands area (a stock shared between Greenland, Iceland and Faroe Islands) is considered at low levels, and catches have routinely exceeded ICES advice (ICES, 2003). The status of other demersal stocks is not so well known but deep-water species like blue ling and redfish are considered to be overexploited and are presently at low levels.

All the pelagic stocks entering the Faroese waters are widely migrating stocks and the proportion that enters the Faroese area might be affected by the size of the stocks. Therefore the Faroes will benefit from large stock sizes. Currently the Norwegian spring-spawning herring, blue whiting and mackerel are considered stable stocks in generally good shape, but they are fished at or above the recommended level (ICES, 2003a,b). The reason for overfishing on the latter stocks is inability to reach an agreement of political reasons. For blue whiting all parties want to catch as much as possible to have a good argument for getting a large quota when agreement is reached sometime in the future.

Sea birds hunting

No serious overexploitation is known, and the hunting has been regulated for centuries (Nørrevang, 1986).

Marine mammals hunting

The grey seal population may be overexploited locally (Bjarni Mikkelsen, Museum of Natural History, Faroe Islands, pers. comm.).

The pilot whale is an abundant species. As a small cetacean the whale is not covered by the regulations of the IWC. Working through NAMMCO, Faroese and international scientists keep a close watch on the size of the whale population. The most recent scientific abundance estimate based on regular sightings surveys is that there are approximately 780 000 animals in the North East Atlantic. The annual catch fluctuates with oceanic conditions, but the long-term average catch is approximately 1 000 animals, corresponding to only a small fraction of the annual natural rate of increase. Hence the catch is regarded as sustainable (Bloch, 1994; Weihe et al., 2003a).

Excessive by-catch and discards

Fish

Discarding is forbidden by law. However, in some fisheries, especially deep-water fisheries there are some discarding of non-commercial species. The management system in Faroese waters is based on number

of fishing days and several technical measures (Reinert, 2001a,b); this means that there should be no incentives to discard fish in order to maximise profit (as is often seen in TAC based management systems).

Seabirds

Seabirds are occasionally taken as by-catch especially fulmars which takes bait on long lines (Dunn and Steel, 2001). The number of seabirds taken as by-catch in long line fisheries at the Faroe Islands is unknown. However, the fulmar population is increasing and the fishermen try to get as few fulmars as possible. Therefore by-catch of seabirds is not considered a problem of concern.

Marine mammals

Some seals and whales may be lost due to sinking. However, this is not of conservation concern for pilot whales (see above on whaling). Some seals are shot by salmon farmers. There is no significant by-catch of marine mammals in fishing gear.

Destructive fishing practices

There will always be some impact from trawl fishing on the bottom habitat. However, there are large areas on the Faroe Plateau closed to all trawl fisheries (Reinert, 2001a; ICES, 2003). During the late 1970's and in the 1980's when the trawl fishery expanded to deeper waters, there were severe impacts on the bottom habitat especially coral reefs. In recent years this problem is regarded as minor, and some areas with corals are closed to trawling.

Decreased viability of stock through pollution and disease

No known impact.

Impact on biological and genetic diversity

No known impact.

Socio-economic impacts

Economic impacts

The system for management of the Faroes fisheries has worked well and been a benefit for the economy, but more experience with system is needed to draw conclusions.

Health impacts

No known impact.

Other social and community impacts

No known impact.

Conclusions and future outlook

The task team experts found unsustainable exploitation of fish and other living resources to have moderate impact. Overexploitation was assessed to have moderate impact. By-catch and discards were considered to have slight impact, while bottom trawling was assessed to have moderate impact on the bottom habitat especially corals. In recent years the problem with corals was regarded minor because closing of areas with corals.

Global change

Environmental impacts

Changes in oceanography

Direct current meter observations since 1995 shows that the volume transport of Norwegian Deep Water from the Greenland and Norwegian Seas into the North Atlantic is decreasing. Extrapolation back to 1950 using ocean hydrography at a weather ship station in the Norwegian Sea indicates that the decreasing trend has lasted at least over the last half century, with acceleration in the decreasing trend over the last decade (Hansen et al., 2001).

Although it is suggested that this change in the ocean currents may have some effect on the ecosystem, there is no evidence for a direct link between observed variations in the ecosystem and the decrease in the deep water overflow.

The possible impact of global changes in climate and hydrological cycles on marine biota and contaminant pathways in the Faroe Islands have been described in Heide-Jørgensen and Johnsen (1998), Gaard et al. (2002), OSPAR Commission (2000), and Macdonald et al. (2003).

The oceanographic conditions around Faroe Islands are linked to climate variability and the changes in the distributions of atmospheric pressures on the northern hemisphere, for example the North Atlantic Oscillation Index (NAO-index) and the Arctic Oscillation Index (OA-index) (e.g. Macdonald et al., 2003). Changes are expected at sea, although the uncertainty is also greatest here as long as the fate of the North Atlantic Current has not been clarified. Warmer deep water could result in a redistribution of pelagic and benthic communities. Impacts on plankton are unknown for the time being.

Productivity in marine natural resources are highly dependent on climate, sea currents, primary productivity and plankton distributions, which are linked (Figure 4; Gaard et al., 2002; Steingrund et al., 2003; Jacobsen et al., 2002; Jákupsstovu et al., 2003).

Effects on marine mammals and seabirds are expected mainly to concern spatial shifts in areas of food production and primary productivity (changes in upwelling sites), nesting and rearing sites, and increases in diseases and oceanic biotoxin production (from both temperature increase and current changes).

Sea level change

Analyses of tidal gauges for long time changes have not been carried out, but significant changes are not observed in available material.

Increased UV-b radiation as a result of ozone depletion

No known impact – no observations.

Changes in ocean CO₂ source/sink function

No known impact – no observations.

Socio-economic impacts

Economic impacts

No known impact.

Health impacts

No known impact.

Other social and community impacts

No known impact.

Conclusions and future outlook

Changes in oceanography were assessed to have slight impact now and in 2020. However, from the history it is known that even small changes in climate and ocean currents can influence the productivity in the marine resources and their distribution. Therefore, better understanding and predictions of the impact of global changes on climate, ocean circulation and marine productivity have high priority for the Faroese Fisheries Laboratory now and in the future (Jákupsstovu et al., 2003).

Priority concerns for further analysis

The Task Team agreed to prioritise the issues of concern as given in Table 3. Hence, the major concern themes were Pollution, Unsustainable exploitation of fish and other living resources, and Global change including their links.