Causal chain analysis

This section aims to identify the root causes of the environmental and socio-economic impacts resulting from those issues and concerns that were prioritised during the assessment, so that appropriate policy interventions can be developed and focused where they will yield the greatest benefits for the region. In order to achieve this aim, the analysis involves a step-by-step process that identifies the most important causal links between the environmental and socio-economic impacts, their immediate causes, the human activities and economic sectors responsible and, finally, the root causes that determine the behaviour of those sectors. The GIWA Causal chain analysis also recognises that, within each region, there is often enormous variation in capacity and great social, cultural, political and environmental diversity. In order to ensure that the final outcomes of the GIWA are viable options for future remediation, the Causal chain analyses of the GIWA adopt relatively simple and practical analytical models and focus on specific sites within the region. For further details, please refer to the chapter describing the GIWA methodology.

Introduction

During the task team meeting it was decided to make causal chain analyses for the impact issues chemical pollution and overexploitation.

Chemical pollution, the other prioritised GIWA issue no. 6, was found to have moderate impact in Faroe Plateau mainly due to the impact on human health through consumption of marine food. Overexploitation, the prioritised GIWA issue no. 14, has been reported for cod, haddock, saithe, Greenland halibut, redfish, blue ling, and blue whiting. However, the task team considered the impact to be moderate.

Immediate causes

Chemical pollution

The Faroese health authorities have issued dietary advice in relation to the utilisation of pilot whales as food (Weihe et al., 2003b). The major concern is the heavy metal mercury which occurs in such high concentrations in the whale liver that it gives cause for concern for the pilot whale (there are no indications of its impact on a population level, i.e., reproductive capacity etc), and these high mercury concentrations also mean that liver should not be used as food. Also, on the average, the concentration of mercury in pilot whale muscle tissue exceeds the EU limit for fish for consumption, and dietary advice to limit consumption has been issued. There is also particular concern regarding the persistent, lipid soluble pollutants such as PCB, DDT etc. as they occur in whale blubber which is also normally used as food, in concentrations which are above threshold levels in European countries. Therefore dietary advice to limit the utilisation of pilot whale meat and blubber as food has been given and with a special regard to the developing foetus, females have been advised as a safeguard to abstain from eating pilot whale blubber.

In addition to these considerations which are limited to the utilisation of one particular species from the marine environment, there is cause for concern about the present level of dioxin and PCB with dioxin-equivalent toxicity in especially lipid rich pelagic fish in the North-East Atlantic Ocean. The concentration of these substances is a problem for the utilisation of these species in the fish feed which is produced for the aquaculture market (Hites et al., 2004).

A special concern has arisen the last few years during monitoring of pollutants in seabirds because some of these species also carry high levels of persistent organic pollutants. The levels are such that the safety of continuing the utilisation of some of these seabird species for human food may be questioned.

Overall, there is a problem with the long-range transported pollutants in the Faroese environment. This problem is severe because such pollutants are biomagnified in the marine food chain which the Faroese populations are dependent of. Fish exports are vital for the Faroese economy as is hunting of marine mammals and seabirds for the Faroese culture.

Overexploitation

The Faroe Plateau cod and Faroe haddock were reduced to low levels during the mid-1980s to mid-1990s, due to the combined effect of poor recruitment and high fishing effort. In the period 1993–1995, ICES considered the populations to be well below minimum biologically acceptable levels and consequently advised no fishing (ICES, 2003). Both stocks have since increased due to improved recruitment and growth (Figure 6). The Faroe Bank cod stock seems to be at or slightly above average. The Faroe saithe has been increasing from the record low in 1992 to above biologically safe limits in 1998–2002.

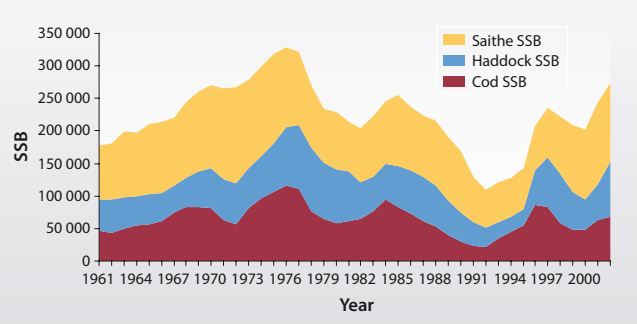

Figure 6 The Faroe demersal spawning stock biomasses (SSB) of cod, haddock, and saithe.
(Source: ICES, 2003)

Root causes

Chemical pollution

Long-range transport

The heavy metals assessment in AMAP focuses on mercury, lead, and cadmium (AMAP, 1998, 2002). Of the metals mercury pollution generate the greatest concern because levels in the Arctic are already high, and are not declining despite significant emissions reductions in Europe and North America (Macdonald et al., 2003). Coal burning, waste incineration and industrial processes around the world emit mercury to the atmosphere, where natural processes transport the metal.

Gaseous Elemental Mercury (GEM) has been measured on the Faroe Islands from May 2000 through March 2001 (Hoydal and Dam, 2003). The air concentration time series shows periods with elevated mercury concentrations (>1.5 ngHg/m3, the generally accepted global background average) which were attributed to two potential causes: local sources and long range transport. However, detailed analysis determined that local sources were not responsible for the elevated levels observed, and it was further determined that the elevated levels were caused by long-range transport from Europe, most notably from the UK.

Likewise, POPs mainly originate from the industrialised world from where POPs are transported to the Faroe Islands by air and ocean currents.

Overexploitation

An overall difficulty in fisheries assessment is to assess changes in the stocks due to both overfishing and environmental changes (e.g. changes in climate and ocean currents). For the Faroe assessment the collapse mid-1990s was also a result of fish leaving the area where neither the research vessels nor the commercial fishermen could find the fish and later on the fish came back. This is a very unusual event, which have never so clearly been seen before and which was only recognisable in retrospect. Faroe fish stocks can disappear again and growth can be reduced due to environmental changes. These changes can be difficult to detect soon enough to be of use in the management.

According to Steingrund et al. (2003) changes in primary production in the marine ecosystem and in the food availability for cod was most probably the driving force behind the collapse of the cod stock in 1991 as well as its rapid recovery in 1995.

Changes in primary production and the coupling to higher trophic levels (fish, sea birds, and marine mammals) are to a large extent coupled to changes in climate and ocean circulation (Figure 4; Gaard et al., 2002; Steingrund et al., 2003). Hence, climate is a driving force for production of marine resources and commercial harvesting on Faroe Plateau.

Conclusions

The vast majority of chemical pollution in Faroe Islands is due to long-range transported contaminants from outside the Islands.

The root causes for overexploitation are: inadequate management and increasing fishing take (mortality) due to new catch technology, which are to be solved within Faroe Islands and they are strictly not of

GIWA concern. However, climate change greatly influences the natural resources and is a very important factor for Faroese ability to manage the natural resources and the consequences for socio-economics.

Hence, the main problems for the Faroe Plateau, the biota and the society, are chemical pollution and unpredictable effects of climate change. These problems are caused by the industrialised world, and the lack of knowledge to predict and manage the effects of climate change. These problems are global international problems to be solved in international cooperation.