

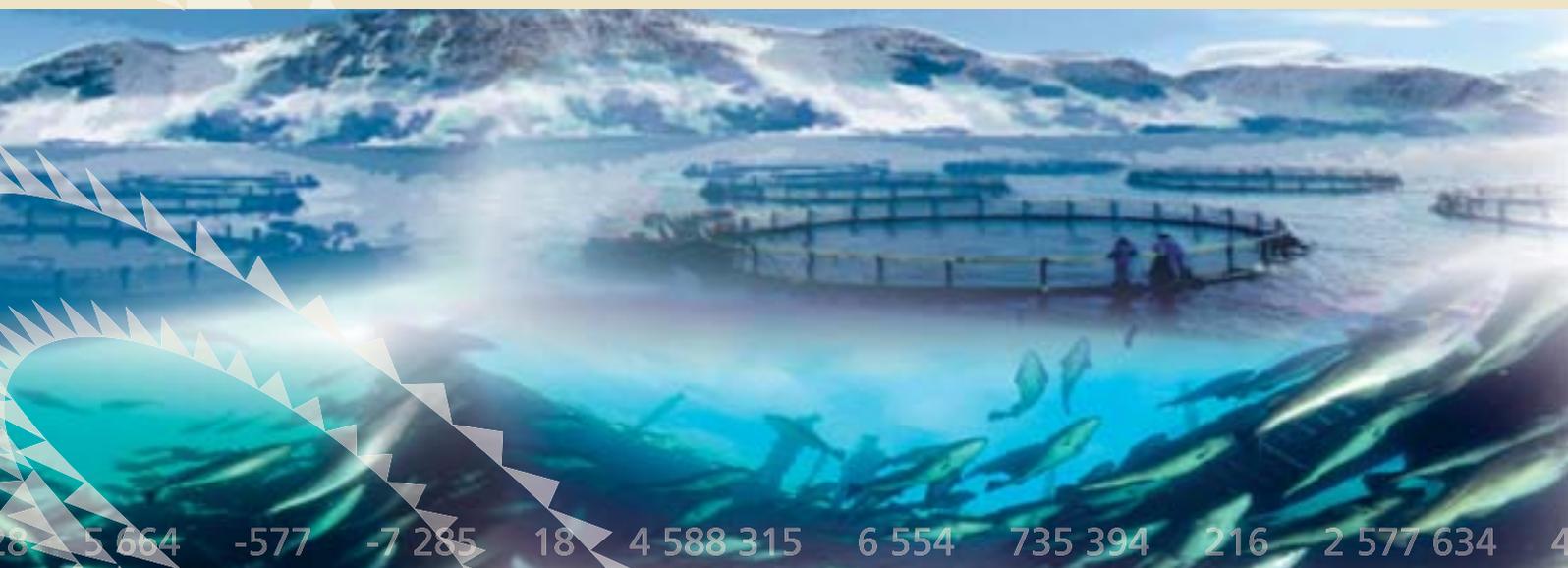


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Office of the Auditor General
of Norway

The Office of the Auditor General's investigation into the management of aquaculture

Document 3:9 (2011–2012)



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The Office of the Auditor
General's investigation into the
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Document 3:9 (2011–2012)

To the Storting

The Office of the Auditor General hereby submits Document 3:9 (2011–2012) *The Office of the Auditor General's investigation into the management of aquaculture*.

The Office of the Auditor General, 6 March 2012.

For the Board of Auditors General

Jørgen Kosmo
Auditor General

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The Ministry of Fisheries and Coastal Affairs

The Office of the Auditor General's investigation into the management of aquaculture

1 Introduction

The aquaculture industry has grown considerably since its inception in the 1970s. The total production of farmed fish and shellfish has doubled in the last ten years alone, from approximately 500,000 tonnes in 2000 to more than one million tonnes in 2010. Salmon accounts for around 90 per cent of the total production. The sales value of aquaculture production amounted to more than NOK 30 billion in 2010 (cf. Figure 1). Aquaculture is therefore an important industry for Norway. It creates jobs in rural areas, contributes to maintaining the settlement pattern along the coast and generates large export revenues.

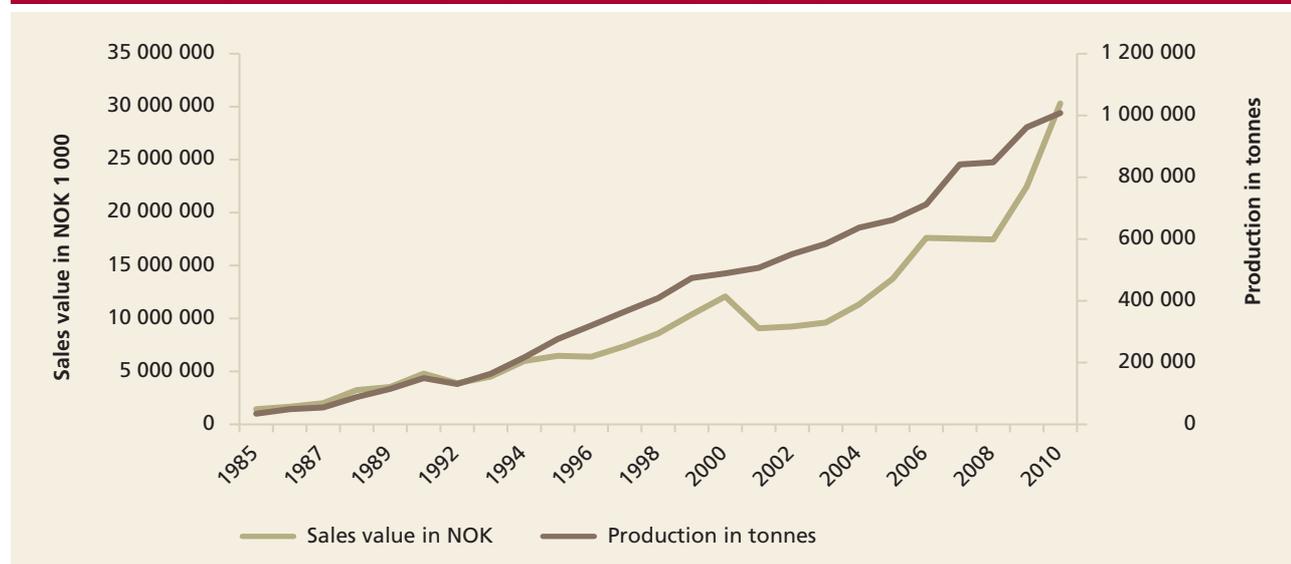
The overall vision for Norway's fisheries policy is that the riches of the sea represent the country's future. Striking a balance between environmental sustainability and further growth and development of the industry has been an important aquaculture policy goal for several years. Consideration for the environment shall be a fundamental premise for further development and growth, cf. for example, Report No 48 to the Storting (1994–1995) *Havbruk – en drivkraft i norsk kystnæring* ('Aquaculture – a driving force in Norway's coastal economy'), Report No 19 to the Storting (2004–2005) and Recommendation No 192 to the Storting (2004–2005).

Aquaculture has an impact on the environment in several areas, including through genetic interaction between escaped farmed fish and wild fish and through the presence of disease and lice. In addition to negative effects on the farmed fish, disease and lice can also be spread to wild fish stocks. The cultivation of fish also entails increased pollution through the discharge of nutrient salts, organic material and chemicals. Furthermore, the industry needs raw materials for feed for the farmed fish, which involves the harvesting of wild marine resources. The aquaculture industry also needs marine areas, which can give rise to conflicts with other interests. The location of an aquaculture facility in the sea also influences the risk of infection spreading between fish farms and it affects the total discharges in a wider area.

The goal of the investigation was to assess the extent to which the development and status of the aquaculture industry are in line with the national goal that the aquaculture industry shall be sustainable and environmentally sound, and to assess whether the authorities' use of policy instruments and follow-up is efficient and sufficient. Based on the goal for the investigation, the following primary lines of inquiry have been addressed:

- 1 To what extent are the development and status of the aquaculture industry in Norway in line

Figure 1 Production growth in the Norwegian aquaculture industry during the period 1985 to 2010



with the national goal that the aquaculture industry shall be sustainable and environmentally sound?

- 2 To what extent is the national goal of sustainable aquaculture achieved through the use of policy instruments?
- 3 Is the authorities' control sufficient to ensure that the development of the aquaculture industry is sustainable?

The Office of the Auditor General's report from the investigation is enclosed as an appendix. A draft of the Office of the Auditor General's report with assessments was presented to the Ministry of Fisheries and Coastal Affairs, the Ministry of Agriculture and Food and the Ministry of the Environment in a letter of 16 September 2011. The ministries issued a joint statement concerning the report in a letter of 21 October 2011. The comments are incorporated into the report and this document.

2 Implementation of the investigation

The audit criteria are derived from acts and regulations, reports to the Storting and propositions with pertaining recommendations. The investigation is also based on Norway's commitments made in international agreements. The investigation period was from 2007 to mid-2011. However, in order to shed light on the development of the aquaculture industry, it has been necessary to use statistics covering a longer period in several of the audited areas.

The investigation is based on document analysis, statistics, case reviews, interviews, lists of questions and vignette surveys. In order to investigate whether the aquaculture industry is sustainable and environmentally sound, and whether the use of policy instruments is effective, the following documents have been reviewed: studies and reports from the Directorate of Fisheries, the Norwegian Food Safety Authority, the Norwegian Climate and Pollution Agency, the Directorate for Nature Management, the Norwegian Institute of Marine Research, the Norwegian Veterinary Institute, the Norwegian Institute for Nature Research and the Norwegian Scientific Advisory Committee for Atlantic Salmon Management, and the recommendation from a committee that has evaluated the aquaculture industry's use of marine areas (Committee on the Use of Marine

Areas by Aquaculture 2011). The document review also included some reports produced by the Food and Agriculture Organization of the United Nations (FAO) as well as governing documents for the Directorate of Fisheries, the Norwegian Food Safety Authority and the county governor offices.

In order to shed light on the status and development of the aquaculture industry, statistical information was obtained from the Directorate of Fisheries, the Norwegian Food Safety Authority, the county governor offices, the Norwegian Institute of Marine Research, Statistics Norway, the Norwegian Veterinary Institute, the Norwegian Institute for Nature Research and the Norwegian Institute of Public Health. Figures have also been collected from a monitoring programme for discharges, from the International Council for the Exploration of the Sea (ICES) and FAO.

A vignette survey was carried out in order to investigate how the Norwegian Food Safety Authority and the county governor offices process aquaculture cases, including taking the environment and the principle of equal treatment into consideration. This type of survey is suitable for documenting how discretionary judgement is exercised in case processing, and how the regulations are applied. However, in the vignette survey, it was not possible for case officers to contact applicants to obtain supplementary information if they needed to. The vignette survey comprised six authentic cases. Three of them were sent to 19 selected offices of the Norwegian Food Safety Authority, while the other three cases were sent to eight county governor offices.

In order to pursue all the main lines of inquiry in the investigation and to supplement the information from the document review, the vignette surveys and the quantitative information, interviews were conducted with and lists of questions sent to relevant ministries, directorates and regional and local offices, as well as to relevant research institutes under the ministries.

3 Summary of the findings

Several ministries and agencies, as well as municipalities and county authorities, are responsible for parts of the management of aquaculture. The management regime is complex, but the roles and areas of responsibility of the various bodies generally appear to be clearly defined. It is also

positive that the Ministry of Fisheries and Coastal Affairs and the Ministry of the Environment now collaborate when decisions about production growth are to be studied, and that environmental considerations have been increasingly emphasised in these processes since 2007.

However, the investigation shows several shortcomings in the management of the aquaculture industry. In Report No 19 to the Storting (2004–2005) *Marin næringsutvikling* (Marine business development), it was pointed out that a strategy was to be developed for how the aquaculture industry's use of available areas could be made more efficient. New and amended licences to engage in salmonid farming have nonetheless been granted without an overall strategy being in place for how use of the marine areas can be made more efficient. When processing applications for licences to engage in fish farming, it is largely matters relating to the individual site and not to the overall load from several fish farms in an extended area that are assessed. Several of the environmental challenges facing the industry are due to the overall environmental load being too great. The environmental challenges are greatest in geographical areas where there are many fish farms. In these areas, there is increased prevalence of fish diseases and lice, and the proportion of escaped farmed salmon among wild fish is substantial. While this applies in particular to several areas in Western Norway, it can also be a challenge in other areas.

3.1 The goal of a sustainable and environmentally sound aquaculture industry

The escape of farmed fish and impacts on wild fish stocks

Norway has endorsed several international agreements on the conservation of wild salmon. It was a goal that impacts that threaten the genetic diversity of salmon were to be reduced to a non-harmful level by 2010. It is also a goal that the number of escaped farmed fish be kept to a minimum and that escaped fish do not lead to permanent changes in the genetic properties of wild stocks. The investigation shows that escaped farmed fish can represent a significant environmental problem through genetic interaction between farmed fish and wild fish, and that this can affect the wild fish's ability to survive. Escaped fish can also spread diseases and lice to wild fish. The investigation shows that the number of reported escaped farmed salmon increased from around 300,000 in 2001 to more

than 900,000 in 2006. The number decreased from 2007 and there have been between 100,000 and 300,000 escaped farmed salmon per year since then, including the first three quarters of 2011. Among other factors, this reduction can be attributed to more stringent technical requirements for fish farms. There is uncertainty attached to the reported figures for escaped fish, however. The actual figures are probably higher.

The investigation shows that the proportion of escaped farmed salmon among wild fish was more or less stable at between three and nine per cent per year during the period 1990 to 2010. The figures for the country as a whole in the autumn have been between 15 and 28 per cent during the period 2000 to 2010. There are large geographical variations, however. In the counties of Nordland and Rogaland, the proportion found in the autumn has been less than seven per cent, while in Hordaland county the proportion found has been more than 40 per cent. A limit on what is deemed to be an acceptable level of intrusion has yet to be established, but researchers have indicated a limit of between three and five per cent. The investigation therefore questions whether the Ministry of Fisheries and Coastal Affairs and the Ministry of the Environment have made sufficient use of expedient policy instruments to realise the goal that the environmental impacts shall not be a threat to wild salmon.

In their letter of response, the Ministry of Fisheries and Coastal Affairs, the Ministry of the Environment and the Ministry of Agriculture and Food point out that the proportion of escaped farmed fish is too high in many rivers. The ministries also point out that the goal that impacts that threaten the genetic diversity of salmon were to be reduced to a non-harmful level by 2010 has not been achieved for some areas. The Ministry of Fisheries and Coastal Affairs also points out that several new measures have been implemented that could contribute to both reducing the number of escaped fish and preventing genetic introgression between wild fish and farmed fish. The ministries also point out that the Ministry of the Environment has limited means at its disposal to prevent the serious and irreversible impacts that escaped farmed salmon have on the genetic diversity of wild salmon. The environmental authorities have secured genetic material from some threatened stocks through gene banks, however.

Measured by the migration of salmon from the ocean to the Norwegian coast, the total stock of wild salmon has been reduced from one million fish in 1983 to 480,000 fish in 2010. The reduction in the stock can largely be attributed to poor survival in the ocean. Little is known, however, about the causes of the poor survival in the ocean. Strict regulation of fishing has been introduced in order to reduce harvesting and compensate for weaker stocks. Despite the reduction in the overall population, these regulations have succeeded in maintaining the total spawning stock of wild salmon.

Fish health and fish welfare

The investigation shows that many farmed fish are lost in the aquaculture industry every year, both relatively and in absolute figures. More than 47 million salmonids were lost in 2010. A large proportion of the fish were lost due to disease. The disease situation has not improved since 2000. The high loss figures also entail large financial losses for the industry, and they represent inefficient use of marine areas in the coastal zone. A certain amount of losses must be reckoned on in large-scale biological production. In light of the persistently high loss figures in the aquaculture industry, however, it was questioned in the investigation whether the Ministry of Fisheries and Coastal Affairs has introduced sufficient measures, such as regional regulation, in order to combat and reduce the loss of farmed fish as a result of disease. In its letter of response, the Ministry of Fisheries and Coastal Affairs states that sufficient measures have been introduced to combat and reduce the losses of farmed fish as a result of disease.

In addition to viral diseases, a high incidence of the parasite salmon lice has been one of the biggest health-related problems in the industry in recent years. Salmon lice harm the fish and make them more receptive to other diseases by weakening their immune systems. After-effects such as impaired growth, swimming ability and reproduction have also been observed. Increased mortality has also been found. The investigation shows that joint efforts to combat salmon lice and comprehensive regulations do not appear to have reduced the overall prevalence of salmon lice to any great extent. There are also challenges relating to resistance to several delousing agents, which has further reduced the possibilities of combating the problem. The Ministry of Fisheries and Coastal Affairs, the Ministry of the Environment and the Ministry of Agriculture and Food agree that the

lice situation for wild salmon and sea trout has been worrying in the period 2010–2011. The Ministry of Fisheries and Coastal Affairs also points out that work is being done on the introduction of new measures to limit the problem of lice.

Pollution and discharges

The production of farmed fish results in discharges of organic material, nutrient salts and chemicals, and it has been a goal for several years to ensure that these discharges do not exceed what the natural environment can tolerate. Monitoring of the pollution situation shows that the state of the environment at most fish farms is good. The environmental monitoring system (MOM) that is used to measure the state of the environment under fish farms is not adapted to today's large farms, however. Moreover, the fish farms are now located to a greater extent in marine areas with a hard seabed, while the monitoring system is designed for areas with a soft seabed. There is therefore a risk that the measurements of the state of the environment are misleading. The investigation also shows that there is a lack of knowledge about the regional effects of discharges from the aquaculture industry. The result is that agencies and expert groups differ in their assessment of the importance of discharges of nutrient salts. The result of this lack of knowledge is that no one knows how much nutrient salts and organic material the recipient and surrounding environment can tolerate. The Ministry of Fisheries and Coastal Affairs and the Ministry of the Environment have therefore appointed an expert committee to assess the importance of discharges from the aquaculture industry. It will conclude its work by the end of 2011. Work is also being done to ensure a better adapted system for measuring discharges.

A permit is not required to discharge chemicals from approved medicines from aquaculture facilities. Chemicals are therefore discharged untreated into the water from fish farms. The investigation shows that, because of the lice situation, so-called chitin inhibitors have again been introduced to combat the problem. Discharges of these chemicals increased from 0 kg in 2008 to 3.4 and 3 tonnes in 2009 and 2010, respectively. The ministries point out that the environmental authorities will assess whether the use of such medicines should be regulated in discharge permits. The ministries also point out that what is known about discharges of this kind indicates that the use of such substances should be closely monitored.

The industry's use of marine areas

Access to sufficient suitable areas has been emphasised as an important goal in the work of ensuring sustainable growth and development of the aquaculture industry. The current use of marine areas is the result of strong growth in production and of licences to engage in fish farming being allocated without this being based on an overall plan. Because the current use of marine areas is a contributory cause of some of the environmental challenges in the industry, the Ministry of Fisheries and Coastal Affairs is working on measures aimed at changing the area structure based on recommendations from the Committee on the Use of Marine Areas by Aquaculture.

It has been pointed out that municipal plans are an important policy instrument for ensuring environmentally friendly area use and for contributing to clarifying conflicting interests in the use of marine areas in the coastal zone. The investigation shows that most coastal municipalities have prepared plans that regulate the coastal zone. The plans are not sufficiently updated in more than 60 municipalities, however. Moreover, the municipalities do little to clarify the status of marine areas and conflicting area use interests in the plans. This means that the municipalities earmark marine areas for nature, transport, fishing, recreational and aquaculture use without distinguishing between these activities. The plans contain little assessment of the consequences aquaculture can have for the environment across municipal boundaries. The Ministry of the Environment points out that the new Planning and Building Act will put the municipalities in a better position to ensure good planning of marine areas.

Feed for farmed fish

The aquaculture industry is dependent on large amounts of wild fish for fish feed. Its feed requirements must be met without over-harvesting living marine resources. The investigation shows that the harvesting of these species, such as blue whiting, has contributed to a reduction in some of the stocks. A management regime has been established, however, that ensures that most of these stocks are managed at a sustainable level. At the end of 2011, it is primarily the disagreement between Norway, the EU, the Faeroe Islands and Iceland about the management of mackerel that in the long run can lead to a reduction in stocks of fish used in fish feed.

The investigation also shows that there is an untapped potential in the use of trimmings from

fish for human consumption. Only 35 per cent of the by-products from cod are used, for example. The Ministry of Fisheries and Coastal Affairs is working on regulations aimed at ensuring that a larger proportion of by-products from fish for human consumption are landed.

Control and follow-up

There are differing views among those responsible for the management of aquaculture regarding the extent and consequences of the environmental impact. Nor has the Ministry of Fisheries and Coastal Affairs developed indicators to any great extent that can measure the degree to which the management regime achieves the goal of a sustainable and environmentally sound aquaculture industry. The investigation shows that this has resulted in challenges relating to control of the management of aquaculture. The fisheries and environmental authorities are therefore collaborating on the development of a better knowledge base by specifying the sustainability elements in the aquaculture industry and developing indicators and threshold values. The Ministry of Fisheries and Coastal Affairs, the Ministry of the Environment and the Ministry of Agriculture and Food point out that the precautionary principle in the Nature Diversity Act means that lack of knowledge cannot be invoked as grounds for postponing or omitting to introduce management measures if there is a risk of serious or irreversible harm to natural diversity. The Ministry of Fisheries and Coastal Affairs and the Ministry of the Environment are therefore collaborating on how the knowledge base and the application of the precautionary principle should be emphasised in the management context in future.

3.2 The use of policy instruments to ensure a sustainable and environmentally sound aquaculture industry

Stipulating total production and the processing of individual applications.

The investigation shows that it is a material shortcoming in the management of aquaculture that, as of 2011, an overall plan has not been used as the basis for deciding the location of new aquaculture facilities. The processing of applications to engage in fish farming has not given sufficient consideration to the overriding goal of ensuring a sustainable and environmentally sound aquaculture industry, since little consideration is given to the overall environmental load from facilities in the same geographical area.

Licences to engage in fish farming are granted on the basis of individual applications. Several central government sector authorities are involved in the processing of the applications in addition to the county authority and the municipality in which the site is located. Pursuant to the Aquaculture Act Section 6, a licence shall only be granted to engage in aquaculture if it is environmentally justifiable. In Report No 19 to the Storting (2004–2005) *Marin næringsutvikling* (Marine business development), it was pointed out that a strategy was to be adopted for how the aquaculture industry's use of available marine areas could be made more efficient, in order, among other things, to ensure growth and safeguard the environment. While several of the challenges facing the aquaculture industry concern the overall environmental load from several facilities in large geographical areas, it is primarily factors relating to the individual site that are assessed when applications are considered. The total environmental load from several aquaculture facilities in the area surrounding the individual facility is not taken into account to any great extent when considering applications.

The Ministry of Fisheries and Coastal Affairs is responsible for setting a limit on the total amount of salmon produced. For other species, no upper limit is set for production volumes. In its efforts to ensure increased growth of the aquaculture industry, the Ministry of Fisheries and Coastal Affairs has increased the maximum allowed production capacity for salmonids in several allocation rounds since the 1980s. Up until 2007, few studies and assessments were carried out of whether there was room for an environmentally sound and sustainable expansion of production as the Instructions for Official Studies and Reports requires. However, the investigation shows that, prior to an expansion of the production volume through the issuing of 65 new licences to engage in salmon farming in 2009, a more extensive assessment was carried out of whether an increase in production was environmentally justifiable. In connection with the Ministry of Fisheries and Coastal Affairs' proposal to increase the biomass (the amount of fish) in existing facilities in 2010, more extensive assessments were also carried out of the environmental impact. This was thereby more in line with the requirements for environmental impact assessments set out in the Instructions for Official Studies and Reports.

The investigation shows that the exercise of discretionary judgement when assessing

environmental aspects of aquaculture cases can lead to the Norwegian Food Safety Authority arriving at different outcomes in identical cases. One main reason for this is a lack of overall guidance of the local offices that would ensure more uniform assessment of the sites' environmental suitability based on the requirement for good fish health and fish welfare. The vignette survey shows that the county governor offices' processing of aquaculture cases results in different outcomes to a lesser extent. However, in the applications that were considered by both the Norwegian Food Safety Authority and the county governors, there are weaknesses and shortcomings in the underlying documentation that is intended to shed light on whether the establishment of a facility is environmentally justifiable. The investigation shows that the extent to which case officers in both bodies check and verify this documentation varies. In the investigation, it is therefore questioned whether the consideration of individual cases contributes sufficiently to attainment of the overriding goal that the industry shall be sustainable and environmentally sound.

Supervision

Inspections are a fundamental method of ensuring sustainable growth and development of the aquaculture industry through control and appropriate sanctions. The investigation shows that, despite a high inspection frequency, both the Norwegian Food Safety Authority and the Directorate of Fisheries uncover breaches of the rules in more than half the inspections carried out. The Ministry of Fisheries and Coastal Affairs points out that both the Directorate of Fisheries and the Norwegian Food Safety Authority's supervisory activities are risk-based, and that the number of inspections in which breaches of the rules are uncovered is therefore relatively high. The ministries also point out that the Climate and Pollution Agency and the county governors' inspection activities will gradually be more coordinated with the inspection activities of the other sector authorities.

The investigation also shows that there are considerable regional and local differences in the use of sanctions by the Norwegian Food Safety Authority and the Directorate of Fisheries. The use of coercive measures, for example, has varied between around two per cent and 24 per cent between the Directorate of Fisheries' regions, while it has varied between nine and more than 17 per cent between the Norwegian Food Safety Authority's regions. The Ministry of Fisheries and Coastal Affairs points out that rules have been

laid down for the use of sanctions by both the Directorate of Fisheries and the Norwegian Food Safety Authority, but that the Directorate of Fisheries' use of sanctions has been subject to criticism. The Ministry of Fisheries and Coastal Affairs will, partly for this reason, carry out a follow-up control of the Aquaculture Act, which will also include reviewing and assessing the Act's sanction provisions.

All aquaculture production is stipulated and regulated in relation to the maximum allowed biomass. Checking compliance with the biomass provisions is therefore a central supervisory task for the Directorate of Fisheries. The investigation shows, however, that an expedient method has not been established for verifying the biomass figures reported by the fish farmers. It can therefore be demanding for the Directorate of Fisheries to confirm that the biomass is in compliance with the licences. The Ministry of Fisheries and Coastal Affairs points out that, in addition to several other reported items of information about the operation of the facilities that can be used to calculate the biomass, the Directorate of Fisheries can decide to carry out control weighing or control counting of the fish. The ministry therefore believes that it is possible for the Directorate of Fisheries to verify the biomass.

4 The Office of the Auditor General's remarks

Sustainable growth and development of the aquaculture industry is the overriding goal for the aquaculture policy adopted by the Storting. Aquaculture production has increased considerably over several years, and aquaculture is a central and important industry along large parts of the Norwegian coast.

Several ministries and agencies, as well as municipalities and county authorities, are responsible for parts of the management of aquaculture. The management regime is complex, but the roles and areas of responsibility of the various bodies are on the whole clearly defined. It is positive that the Ministry of Fisheries and Coastal Affairs and the Ministry of the Environment have started to collaborate when decisions about production growth in the industry are to be studied. Environmental considerations have also been given increasing emphasis in these processes since 2007.

At the same time, however, the Office of the Auditor General wishes to point out that the strong growth of the industry entails significant environmental challenges. Reference is made in this context to large losses of farmed fish because of disease and a high incidence of salmon lice. There is also a substantial proportion of escaped farmed fish among wild fish in rivers and water-courses. Escaped farmed fish can contribute to the spreading of diseases and lice to wild salmon and affect the genetic distinctiveness of wild salmon. In addition to the environmental challenges, the loss of several million fish a year represents inefficient use of marine areas and resources and leads to large financial losses for the industry. The diseases are also a health and welfare problem for the fish.

In the Office of the Auditor General's opinion, the environmental challenges in the aquaculture industry have become so extensive that it cannot be said that the development of the industry has been sufficiently adapted to the environment, as was the intention of the Storting. In the Office of the Auditor General's assessment, the environmental challenges in the industry are so extensive that they will require significant changes in the management of aquaculture and in how the aquaculture industry is regulated. The Office of the Auditor General therefore raises the question of whether important measures such as a production ceiling, individual licences and supervisory activities are so designed that they promote the overriding environmental goal of sustainable growth of the aquaculture industry to a sufficient extent.

The Office of the Auditor General would like to emphasise how important it is that the Ministry of Fisheries and Coastal Affairs follows up the work of the Committee on the Use of Marine Areas by Aquaculture and the proposals the committee has presented. Measures that to a greater extent ensure more coordinated regulation of several facilities in a larger area seem to have a particularly important role in reducing the overall environmental load. In the Office of the Auditor General's assessment, it is also very important that indicators and threshold values are developed and established as soon as possible for acceptable levels of losses, disease, salmon lice and genetic introgression. This can ensure that the industry operates in accordance with the national goals for aquaculture.

Moreover, the Office of the Auditor General registers that there are divergent views on the extent to which discharges from the aquaculture industry are a problem, and that an expert committee has been appointed to consider this matter. It is important to clarify the environmental impact of the use of chemical agents against lice. In the Office of the Auditor General's view, it is also important that the divergent views on the importance of discharges are harmonised between the fisheries and environmental protection authorities.

The Office of the Auditor General also wishes to point out that the aquaculture industry has a great need for feed resources and that the Ministry of Fisheries and Coastal Affairs is therefore expected to continue its efforts to ensure that all wild marine resources used as part of this feed come from sustainable fisheries. Reference is also made in this context to the potential for increasing the use of by-products of fish for human consumption.

In order to set sustainable production targets in the fish farming industry, it is important to have an overview of the total amount of fish. Since the whole industry is regulated through the maximum allowed amount of fish, an improved system is needed that will make it possible to verify the total amount of fish in fish farms. In the Office of the Auditor General's assessment, it is therefore crucial that the system for verifying the amount of fish in fish farms is used actively in inspection work.

The Office of the Auditor General would also like to point out that, in connection with supervision of the aquaculture industry, the use of sanctions varies between regions and that the inspections do not appear to have a sufficiently preventive effect. The review of the aquaculture legislation, including assessing the use of sanctions, announced by the Ministry of Fisheries and Coastal Affairs is therefore seen as important.

5 The Ministry of Fisheries and Coastal Affairs' response

The matter was submitted to the Ministry of Fisheries and Coastal Affairs, and, in a letter of 5 January 2012, the Minister replied as follows:

I refer to the letter dated 13 December 2011 enclosed with Document 3:9 (20011-2012) The Office of the Auditor General's investigation into the management of aquaculture, in which the

Ministry of Fisheries and Coastal Affairs is requested to issue a statement in consultation with the Ministry of the Environment and the Ministry of Agriculture and Food.

The goal of the Office of the Auditor General's investigation was to assess whether the development and status of the aquaculture industry are in line with the goal that the aquaculture industry shall be sustainable and environmentally sound, and to assess whether the authorities' use of policy instruments and follow-up is efficient and sufficient. The investigation's goal has been further pursued through three main lines of inquiry:

- To what extent are the development and status of the aquaculture industry in Norway in line with the national goal that the aquaculture industry shall be sustainable and environmentally sound?
- To what extent is the national goal of sustainable aquaculture achieved through the use of policy instruments?
- Is the authorities' control sufficient to ensure that the development of the aquaculture industry is sustainable?

The environmental challenges highlighted in the Office of the Auditor General's report are in the same areas as the Ministry of Fisheries and Coastal Affairs and other affected ministries are focusing on. Continuous efforts are being made to follow up the goals enshrined in, among other documents, the Government's Strategy for an Environmentally Sustainable Norwegian Aquaculture Industry.

Like all other food production, aquaculture affects the natural environment, and it is therefore important that it is clearly stated what is deemed to be an acceptable environmental impact. The sustainability strategy takes as its point of departure five main areas in which aquaculture impacts on the environment. They are:

- genetic impact and escape
- pollution and discharges
- diseases, including parasites
- the use of marine areas
- feed resources.

Even though work has been ongoing on these main areas for a long time now, the sustainability strategy has contributed to systematising and structuring the government administration and the industry's work on the environmental challenges. In this context, I would like to mention

that 29 of 32 measures set out in the strategy have been initiated or implemented.

I plan to submit a report to the Storting towards the end of 2012 that will address the whole seafood industry and, among other things, discuss issues such as what is an acceptable environmental footprint for the production of seafood, particularly in the aquaculture context. The report will discuss in more detail questions such as increasing the efficiency of the aquaculture industry's use of marine areas and the development of first-generation indicators and threshold values for environmental impact. Several of the issues highlighted in the Office of the Auditor General's report will thereby be considered in the work on the report.

As part of the follow-up of the sustainability strategy, the Ministry of Fisheries and Coastal Affairs appointed an expert committee in 2009 that was tasked with advising on more efficient and sustainable use of marine areas. The committee submitted its report in February 2011. The proposals in the report vary in nature. Some of them can be initiated quickly, for example work on establishing a register of currents for the Norwegian coast. Other proposals, such as the proposal for a completely new marine area structure in the aquaculture industry, are extensive measures that have already given rise to debate. The question of a forward-looking area structure will be discussed in more detail in the upcoming report to the Storting.

The Ministry of the Environment aims to provide better and more targeted guidance in order to contribute to better planning of marine areas. Better area planning will also be important when the area structure of the future is developed. The environmental authorities' guide to the county governors' processing of aquaculture cases will also be updated and revised in 2012.

The Office of the Auditor General points to the importance of developing and establishing indicators and threshold values for environmental load as soon as possible. In that connection, I can inform you that the Ministry of Fisheries and Coastal Affairs has recently given the Norwegian Institute of Marine Research the task of drafting a proposal for a first-generation measurement method for environmental impacts (impact indicator) for the genetic impact of farmed salmon on wild salmon, and the impact of salmon lice from aquaculture on wild salmonid stocks. This work

will be carried out in cooperation with the Norwegian Veterinary Institute and with assistance and advice from the Norwegian Institute for Nature Research.

In order to obtain a basis for political consideration of first-generation threshold values, the ministry has also requested proposals for threshold values for the same impact factors based on the proposed impact indicators. Threshold values for acceptable impact are, by nature, the kind of values that are set by the political authorities, because they involve weighing several different societal considerations against each other.

The substantial reduction in wild salmon stocks is the result of changes in the marine environment and a broad spectrum of regional and local anthropogenic impacts. Because of the challenges facing wild salmon, the Ministry of the Environment is working on a quality norm that, on the basis of the best available scientific knowledge, will clarify what is good environmental quality in wild salmon stocks. The work is based on assessments of production potential, harvesting potential and genetic integrity.

The experts have long debated the causes of the changes in ecosystems in some coastal areas where sugar kelp seems to have been affected. Climate change and discharges from the aquaculture industry have been mentioned as possible causes. In consultation with the Ministry of the Environment, the Ministry of Fisheries and Coastal Affairs appointed an expert committee in 2010 that was tasked with looking at the consequences of discharges of nutrient salts in coastal areas, with particular focus on the Hardangerfjord and the Boknafjord. The committee's report was submitted in December 2011. Partly based on the expert committee's assessments, the ministries will endeavour to ensure that the different views on discharges from aquaculture facilities are harmonised in the management of the aquaculture industry.

The Norwegian Food Safety Authority and the Directorate of Fisheries' supervisory activities are risk-based. In its overriding management signals to the Directorate of Fisheries, the ministry has pointed to the same challenges as the Office of the Auditor General has pointed out in its report as regards uniform and preventive inspections. In its allocation letter to the Directorate of Fisheries for 2012, the ministry has, among other things,

mentioned the need to review, study and rationalise inspections.

A large proportion of the Directorate of Fisheries' supervisory activity involves checking that the actual biomass at all times does not exceed the permitted limit. The Office of the Auditor General points out that a system is needed that enables the biomass to be checked more accurately. The Directorate of Fisheries' budget allocation has been increased by NOK 10 million with effect from 2010. The increased allocation is earmarked for aquaculture inspections. This produced results internally in the Directorate of Fisheries and, in part, also in the industry during 2011, but these efforts will be expected to have a greater effect over time.

The Directorate of Fisheries has used violation fines as a sanction for exceeding biomass limits, and several such cases are currently before the courts. The Ministry of Fisheries and Coastal Affairs will take steps to ensure that work continues on developing more precise tools that can verify the biomass in aquaculture facilities. This includes technological development, the development of more suitable control methods etc.

Considerations of equal treatment and efficiency shall be attended to in an adequate manner by the government administration. I have recently appointed a working group to assess the need for and submit a proposal for new provisions in the Aquaculture Act's chapter on sanctions. The work of this group is part of the ministry's follow-up control of the Aquaculture Act, and we aim to submit a bill to the Storting in late 2012.

As regards the Office of the Auditor General's remarks on the Norwegian Food Safety Authority's supervisory activities, I also refer to the Minister of Agriculture and Food's reply in connection with the Office of the Auditor General's review of the Norwegian Food Safety Authority's activities.

The Office of the Auditor General's work and investigation into the management of aquaculture has been a useful and educational experience for the ministries and their subordinate agencies. Work on following up the sustainability strategy and the various issues highlighted in the Office of the Auditor General's report is being carried out continuously and on a broad basis. A number of measures have already been introduced, and we will also consider several of the Office of the Auditor General's remarks in the ongoing work

on the report to the Storting on the Norwegian seafood industry. Following up the Office of the Auditor General's remarks will be a priority task in the time ahead.'

6 The Office of the Auditor General's statement

One of the main goals of Norway's aquaculture policy is to strike a balance between environmental sustainability and further growth and development of the industry. The aquaculture industry has grown considerably for several years.

The Office of the Auditor General notes that the Ministry of Fisheries and Coastal Affairs and the other affected ministries are focusing on the environmental challenges highlighted in the Office of the Auditor General's investigation, and that continuous efforts are being made to follow up the environmental goals adopted for the aquaculture industry. The Ministry of Fisheries and Coastal Affairs points out that most of the measures in the Government's sustainability strategy have been initiated or have already been implemented, and that a report will be submitted to the Storting in late 2012 in which several of the issues raised in the Office of the Auditor General's investigation will be addressed.

In light of the extensive environmental challenges facing the industry, the Office of the Auditor General expects the affected ministries to ensure that the aquaculture industry is better adapted to the environment in the future. In this context, special reference is made to the expectation that the losses in the industry, which are largely due to disease, will be reduced, and that fish health and fish welfare will be strengthened and the serious lice situation improved. The Office of the Auditor General also expects efforts to be made to strongly reduce the number of escaped fish, and that escaped farmed fish will no longer be a threat to wild salmon populations. It is also important to clarify the extent to which the total discharges from fish farms have a negative impact on the surrounding environment, and that necessary measures are, if necessary, introduced to combat discharges of this kind. It is also important in the Office of the Auditor General's view that the Ministry of Fisheries and Coastal Affairs continues its efforts to ensure that all wild marine resources used in feed for farmed fish come from sustainable fisheries.

It is positive that the Ministry of Fisheries and Coastal Affairs will continue to work on developing more precise tools for verifying the total amount of fish in fish farms, and that, through proposed new provisions in the Aquaculture Act, it will take steps to ensure greater equality of treatment and to improve the efficiency of inspections. The Office of the Auditor General would also like to point out that, even though roles and responsibilities in the management of aquaculture are for the most part clearly defined, the management regime is complex, involving several sector authorities and administrative levels. It is also important, therefore, that the overall management regime is perceived as clear and uniform by the industry.

The Office of the Auditor General also notes that work is being done to further develop the overall policy instruments available, among other things through better planning of the use of marine areas and increasing the efficiency of the use of marine areas by the aquaculture industry. Indicators and threshold values will also be developed for acceptable environmental impacts. In the Office of the Auditor General's view, the swift introduction of governing indicators and a stronger set of policy instruments that can address the complex environmental challenges facing the industry are crucial and necessary in order to ensure both environmental sustainability and further growth of the industry.

The report will be submitted to the Storting.

Adopted at the meeting of the Office of the Auditor General on 1 February 2012

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**Report: The Office of the Auditor
General's investigation into the
management of aquaculture**

Document 3:9 (2011–2012)

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Key terms used in the investigation

The Aquaculture Regulations	The Regulations relating to Operation of Aquaculture Establishments
The Aquaculture Act	The Act relating to Aquaculture
Anadromous salmonids	Fish that spawn and live in freshwater in their fry stage, but that normally live their entire adult lives in salt water. Salmon, sea trout and Arctic char are the best known species
Committee on the Use of Marine Areas by Aquaculture	An expert committee appointed by the Ministry of Fisheries and Coastal Affairs for efficient and sustainable use of marine areas in the aquaculture industry with a remit to submit proposals for a new overriding marine area structure. The committee's report was presented on 4 February 2011 – Effektiv og bærekraftig arealbruk i havbruksnæringen (Efficient and sustainable use of marine areas in the aquaculture industry).
BAT	Best Available Technology: Requirements warranted by the Pollution Control Act for the use of the best available technology in all industry, including fish farming.
The Berne Convention	The Council of Europe's Convention on the Conservation of European Wildlife and Natural Habitats
The Biodiversity Convention	The Convention on Biological Diversity
Biomass	Total amount of fish measured by weight
The sustainability strategy	The Government's Strategy for an Environmentally Sustainable Norwegian Aquaculture Industry, The Ministry of Fisheries and Coastal Affairs, 2009
The Animal Welfare Act	The Act relating to animal welfare
The Establishment Regulations	Regulations relating to Establishing and Expanding Aqua culture Establishments, Pet Shops, etc. The Norwegian Food Safety Authority
Eutrophication	Increased algae production caused by an increase in the input of nutrient salts. This can result in reduced water quality due to lack of oxygen. The reduced water quality does not necessarily include the whole water column. Lack of oxygen usually arises in the bottom sediments due to the degradation of organic material.
FAO	Food and Agriculture Organization of the United Nations
FHL	The Norwegian Seafood Federation

Fish welfare	A combination of biological factors (such as good health, normal growth and stress management), emotional factors (such as a feeling of well-being, being pain free etc.) and what is natural to the fish, i.e. the fish's species-specific needs.
The Pollution Regulations	The Regulations relating to pollution control
The Pollution Control Act	Act Concerning Protection Against Pollution and Concerning Waste
Aquaculture	All forms of cultivation-based production of fish and other aquatic organisms for food and other purposes in sea, brackish water and freshwater. Farming accounts for most aquaculture.
The Convention on the Law of the Sea	The United Nations Convention on the Law of the Sea
HSMI	Heart and skeletal muscle inflammation
ICES	The International Council for the Exploration of the Sea
ISA	Infectious salmon anaemia – a viral disease in fish
IMARPE	Instituto del Mar del Peru – a marine research institute in Peru
IPN	Infectious pancreatic necrosis – a viral disease in fish
Klif (the former SFT)	The Norwegian Climate and Pollution Agency, formerly the Norwegian Pollution Control Authority
EIA	Environmental impact assessment
The Salmonid and Fresh-Water Fish Act	Act relating to Salmonids and Fresh-Water Fish etc.
The Sea Lice Regulations	The Regulations relating to combating sea lice in aquaculture facilities
The Food Act	The Act relating to food production and food safety etc.
MOM	Environmental monitoring system: Modelling – Ongrowing fish farms – Monitoring
MOM-B	Standard environmental monitoring survey
MOM C	Extended environmental monitoring survey
NASCO	The North Atlantic Salmon Conservation Organization
The Nature Diversity Act	The Act relating to the Management of Biological, Geological and Landscape Diversity
NEAFC	The North East Atlantic Fisheries Commission
NIFES	The National Institute of Nutrition and Seafood Research

NINA	The Norwegian Institute for Nature Research
NSF	National salmon fjords
NYTEK	Technical requirements for fish farming installations
NEZ	Norwegian economic zone
OSPAR	The Convention for the Protection of the Marine Environment of the North-East Atlantic (the Oslo and Paris convention)
PD	Pancreas disease. The PD virus can be found in the pancreas, but only in the initial stage of the disease. Later, the virus can be detected in several organs, including the heart. It is presumed that injuries to the heart and skeletal musculature are the most common causes of mortality.
Recipient	River, body of water, watercourse or ocean area that receive discharges of pollution
RUBIN	Foundation that works for increased and more profitable utilisation of by-products from the fisheries and fish farming industries in Norway
TAC	Total Allowable Catch: total quotas
TEOTIL	Theoretical calculations of total discharges of nutrient salts produced by the programme Endringer i menneskeskapt utslipp av næringssalter til kystområdene (Changes in anthropogenic discharges of nutrient salts to the coastal areas)
IUU fishing	Illegal, unreported and unregulated fishing

1 Background

Since its inception in the 1970s, the aquaculture industry has grown substantially and is an important industry in Norway. It creates jobs in rural areas, contributes to maintaining the coastal settlement pattern and generates large revenues through exports. Fish is Norway's third most important export commodity after oil and gas and metals, and it accounts for almost six per cent of the total value of Norwegian exports.¹ Norway is one of the world's largest exporters of seafood, and farmed fish accounts for more than 60 per cent of the total value of all Norwegian seafood exports. The total production of farmed fish and shellfish has doubled during the last ten years, from approximately 500,000 tonnes in 2000 to over one million tonnes in 2010. The first-hand value amounted to more than NOK 30 billion in 2010 (cf. figure 1). Salmon accounts for around 90 per cent of the total sales of Norwegian farmed fish², and cod farming is a major priority area.

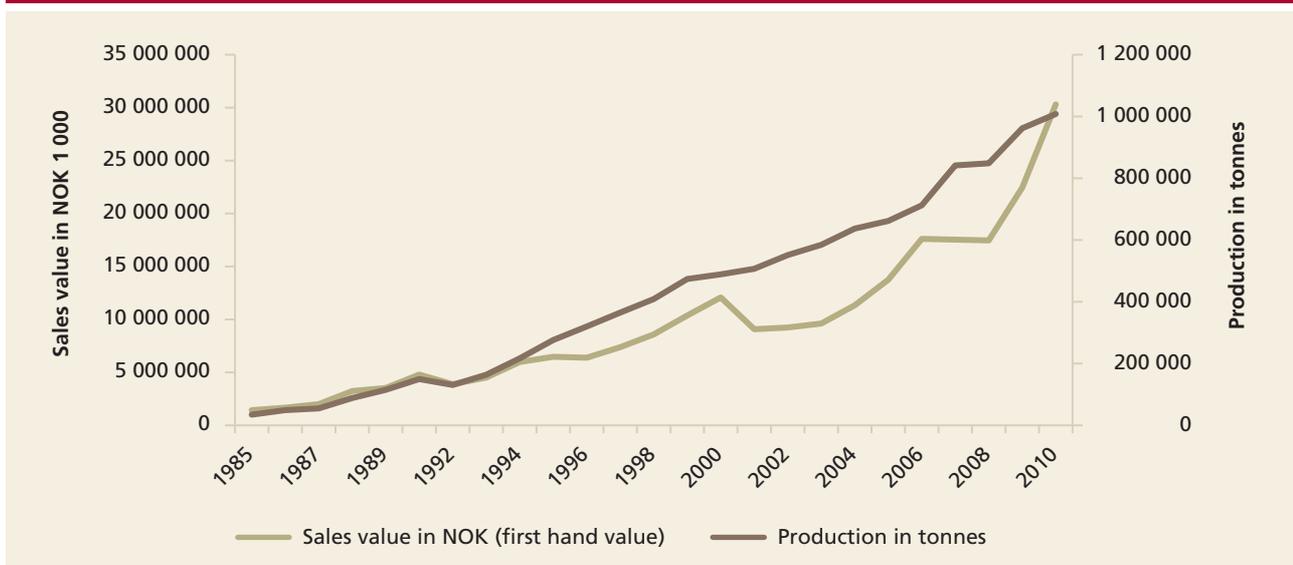
From a fisheries policy perspective, the riches of the sea are seen as representing Norway's future. For several years, a key goal of Norway's aquaculture policy has been to strike a balance between environmental sustainability and further growth and development of the industry – environmental considerations shall be a basic premise for future

development and growth. This goal shall be reached through good management of the resources.³

Aquaculture affects the environment in several areas, for example through genetic interaction between escaped farmed fish and wild fish and through increased prevalence of diseases that, in addition to having negative impact on the farmed fish, can spread to wild stocks. The cultivation of fish also entails increased pollution through the discharge of nutrient salts and organic material. Furthermore, the industry needs raw materials for feed for the fish, which involves the harvesting of wild marine resources. The aquaculture industry also needs sea areas, which can give rise to conflicts with other interests. The location of the aquaculture facilities in the sea also has a bearing on the risk of infection between facilities, and on discharges overall.

The Ministry of Fisheries and Coastal Affairs has overall responsibility for implementing the fisheries policy, and thereby also for the management of aquaculture. The management of aquaculture also involves a number of agencies and bodies with different tasks and areas of responsibility. The Directorate of Fisheries and the Norwegian Food Safety Authority have a central role in this connection. The Directorate of Fisheries administers

Figure 1 Production growth in the Norwegian aquaculture industry during the period 1985 to 2010



Source: Statistics Norway

1) Statistics Norway.
2) Statistics Norway.

3) See, among other things, Report No 48 to the Storting (1994–1995) *Havbruk – en drivkraft i norsk kystnæring (Aquaculture – a driving force in Norway's coastal economy)*, Report No 19 to the Storting (2004–2005) and Recommendation No 192 to the Storting (2004–2005).

the Aquaculture Act and is responsible for preventing farmed fish from escaping and for preventing unwanted genetic introgression among wild fish. The Norwegian Food Safety Authority is responsible for safeguarding fish health and fish welfare in accordance with the provisions of the Food Act and the Animal Welfare Act. Both these agencies supervise the aquaculture industry, and the Norwegian Food Safety Authority is also responsible for processing applications for licences for the operation of aquaculture facilities.

The Ministry of the Environment also has a role in the management of aquaculture through its responsibility for the management of wild salmonids and for the Pollution Control Act. The county governors, the Norwegian Climate and Pollution Agency⁴ and the Directorate for Nature Management are important subordinate agencies in this connection. The county governors supervise the industry and consider aquaculture applications. Pursuant to the Planning and Building Act, the Ministry of the Environment also has overall responsibility for planning. The municipalities and the county authorities are responsible for preparing plans for the use of the coastal zone. In addition, the Ministry of the Environment is responsible for coordinating the Government's environmental policy and ensuring that environmental policy goals are achieved across the ministries' areas of responsibility. The individual sectors also have an independent responsibility for taking account of the environment in their decisions.

The relevant bodies deal with aquaculture cases and supervise the industry on the basis of separate regulations. Chapter 5.2.1 contains a more detailed description of the case processing of aquaculture cases.

Both the fisheries authorities and the environmental authorities utilise various expert and research communities, such as the Norwegian Institute of Marine Research, the Norwegian Veterinary Institute, the Norwegian Institute for Nature Research and the Norwegian Scientific Advisory Committee for Atlantic Salmon Management, as important contributors to building knowledge and as administrative support in the management of aquaculture.

See Appendix 1 for a more detailed overview of roles and responsibilities in the management of aquaculture.

4) Hereinafter also called the Norwegian Climate and Pollution Agency when referring to the directorate while it was still called the Norwegian Pollution Control Authority.

1.1 Goal and lines of inquiry

The goal of the investigation is to assess the extent to which the development and status as regards the aquaculture industry are in line with the national goal that the aquaculture industry shall be sustainable and environmentally sound, and to assess whether the authorities' use of policy instruments and follow-up is efficient and sufficient.

Based on the investigation's goal, the following lines of inquiry have been pursued in the investigation:

- 1 To what extent are the development and status of the aquaculture industry in Norway in line with the national goal that the aquaculture industry shall be sustainable and environmentally sound?
 - 1.1 Are the development and status as regards escape and genetic pollution in line with national goals?
 - 1.2 Are the development and status as regards fish health in line with national goals?
 - 1.3 Are the development and status as regards pollution and discharges in line with national goals?
 - 1.4 Are the development and status as regards the use of marine areas in line with national goals?
 - 1.5 Are the development and status as regards the use of feed in line with national goals?
- 2 To what extent is the national goal of sustainable aquaculture achieved through the use of policy instruments, more specifically
 - 2.1 through the work of considering and stipulating the number of licences and maximum production?
 - 2.2 through the processing of new and changing of existing licences?
 - 2.3 through supervisory activities?
- 3 Is the authorities' control sufficient to ensure that the development of the aquaculture industry is sustainable?
 - 3.1 Have the goals for the management of aquaculture been clearly defined and operationalised?
 - 3.2 Have the roles and responsibilities of the different authorities been clearly defined?

2 Methodological approach and implementation

The investigation into the authorities' management of aquaculture is based on document analysis, quantitative data, lists of questions, vignette surveys, case reviews and interviews. A document analysis has also been carried out to identify audit criteria. This included a review of acts and regulations, and reports and propositions to the Storting with pertaining recommendations. Information from these documents has also been used in the facts section of the report.

Draft audit criteria were presented to the Ministry of Fisheries and Coastal Affairs, the Ministry of the Environment and the Ministry of Agriculture and Food for their opinion in a letter of 21 September 2010. A draft facts section with assessments was presented to the Ministry of Fisheries and Coastal Affairs, the Ministry of the Environment and the Ministry of Agriculture and Food in a letter of 16 September 2011.

2.1 Interviews and lists of questions

To address all the main lines of inquiry in the investigation and elaborate on the information from the document review, the vignette surveys (see chapter 2.3 for a more detailed description of the vignette survey) and the quantitative information, two interviews were conducted with the Ministry of Fisheries and Coastal Affairs and one interview was conducted with the Ministry of the Environment. The Ministry of the Environment has also answered some questions by letter.

In addition, interviews have been conducted with the Directorate of Fisheries, the Norwegian Food Safety Authority, the Norwegian Climate and Pollution Agency and the Directorate for Nature Management. In relation to subordinate agencies, interviews have been conducted with two of the Directorate of Fisheries' regional offices, with one regional office and three district offices of the Norwegian Food Safety Authority and with two county governor offices. The Norwegian Veterinary Institute and the Norwegian Institute for Nature Research have also been interviewed.

Minutes of all the interviews have been verified by the interviewees.

To expand on the interview surveys in the subordinate agencies and the analysis of quantitative data and the document review, lists of questions were sent to all the other five regional offices of the Directorate of Fisheries, eight of the Norwegian Food Safety Authority's district offices and seven county governor offices. The offices of the Norwegian Food Safety Authority and the county governor offices also answered questions relating to the vignette survey.

2.2 Line of inquiry 1 The status and development of the aquaculture industry

Statistics

Quantitative information has been important to shed light on line of inquiry 1.

To elucidate line of inquiry 1.1 concerning the escape situation for salmon, figures have been obtained from the Directorate of Fisheries for the period 2000 to 2011. The escape figures for cod are from the period 2004 to 2011. Figures concerning the intrusion of escaped farmed fish among wild fish have been obtained from the Norwegian Institute for Nature Research for the period 1989 to 2010.⁵

In line of inquiry 1.2 concerning disease among farmed fish and the extent of other losses of farmed fish, figures have been obtained from the Directorate of Fisheries and Statistics Norway for the period 2000 to 2010. The disease statistics has been supplemented by quantitative information from the Norwegian Veterinary Institute. An overview of the use of medication has been obtained from the Norwegian Institute of Public Health. Quantitative information that can shed light on line of inquiry 1.3 concerning the pollution situation was obtained from the Directorate of Fisheries and a surveillance programme for discharges of nutrient salts (Endringer i menneskeskapte utslipp av næringssalter til kystområdene (Changes in anthropogenic discharges of nutrient salts to the coastal areas) – TEOTIL) for the period 2000 to 2010.

5) Complete data are not available for the whole period.

As regards line of inquiry 1.4, figures have been obtained from the Directorate of Fisheries concerning the status of municipal plans that regulate marine areas.

In connection with line of inquiry 1.5 about the management of fish resources used in feed for farmed fish, figures have been obtained for quota recommendations, stipulated quotas and catch statistics from the Ministry of Fisheries and Coastal Affairs, ICES (the International Council for the Exploration of the Sea) and FAO (Food and Agriculture Organization of the United Nations), mainly for the period 1995 to 2010.

Document analysis

To investigate whether the aquaculture industry is sustainable and environmentally sound, a review was carried out in connection with lines of inquiry 1.1–1.4 of studies and reports from the Norwegian Food Safety Authority, the Norwegian Climate and Pollution Agency, the Norwegian Institute of Marine Research, the Norwegian Veterinary Institute, the Norwegian Institute for Nature Research and the Norwegian Scientific Advisory Committee for Atlantic Salmon Management, with the emphasis on publications from the period 2008 to 2011. The recommendation from the Committee on the Use of Marine Areas by Aquaculture (*Effektiv og bærekraftig arealbruk i havbruksnæringen* (Efficient and sustainable use of marine areas in the aquaculture industry) – report of 4 February 2011 to the Ministry of Fisheries and Coastal Affairs) and the Norwegian Institute of Marine Research's risk assessments for 2010 and 2011 have been key sources with respect to shedding light on several aspects of these lines of inquiry.

As regards line of inquiry 1.5 about whether the use of feed in Norwegian aquaculture is sustainable, a document review has been conducted of some reports prepared by FAO (Food and Agriculture Organization of the United Nations) and of articles about fisheries management in other countries that supply Norway with feed resources. (See Appendix 9 for a complete list of relevant reports and articles.)

2.3 Line of inquiry 2 The use of policy instruments in the aquaculture industry

Document analysis

Document analysis has been important in pursuing line of inquiry 2. To shed light on line of inquiry 2.1 concerning the Ministry of Fisheries and Coastal Affairs' use of policy instruments when

stipulating the maximum permitted production in aquaculture, a review was carried out of all relevant input, studies and consultation submissions from the Directorate of Fisheries, the Norwegian Food Safety Authority, the Norwegian Institute of Marine Research, the Norwegian Veterinary Institute, the Directorate for Nature Management and the Norwegian Climate and Pollution Agency that were included in the preparatory work and that were used as the basis for assessing whether to increase the permitted production capacity in the aquaculture industry in the period 2009 to 2011.

As regards line of inquiry 2.2 concerning the procedures for processing aquaculture cases, a review was carried out of general guidelines and guides from the Directorate of Fisheries, the Norwegian Food Safety Authority and the county governors.

To investigate line of inquiry 2.3 concerning the supervisory activities of the Directorate of Fisheries, the Norwegian Food Safety Authority and the county governor offices, a review was carried out of governing documents such as allocation letters, relevant letters of disposition and annual reports to and from subordinate agencies. For the Directorate of Fisheries and the county governors, this concerns the years 2007 to 2011, and for the Norwegian Food Safety Authority, it concerns the period 2008 to 2010. The same documents were also used for a review of the ministries' control of the management of aquaculture.

Statistics

To shed light on line of inquiry 2.3 concerning the supervisory activities of the Directorate of Fisheries, the Norwegian Food Safety Authority and the county governor offices, information was also obtained about the number of inspections, the number of detected breaches of the regulations and the use of reactions and sanctions for breaches of the regulations for the periods 2007 to 2010 for the Directorate of Fisheries and the county governors, and 2008 to 2010 for the Norwegian Food Safety Authority.

Case review

To evaluate the case processing under line of inquiry 2.2, a review was also carried out of approximately 40 negative recommendations from the county governors in connection with the processing of aquaculture cases and of the extent to which the competent authorities followed these recommendations in the period 2007 to spring 2011.



Photo: Thomas Bjørkan, the Norwegian Aquaculture Centre

To investigate the content of the county governors' inspection work under line of inquiry 2.3, a case review was carried out of all inspection cases in the period 2007 to spring of 2011. Information about the type of breaches these inspections uncovered was especially important in this review.

Vignette survey

A vignette survey was carried out to shed light on line of inquiry 2.2 concerning the extent to which the sustainability aspect (see chapter 4) is taken into account in the Norwegian Food Safety Authority's and the county governors' processing of aquaculture cases. The application of the principle of equal treatment was also investigated. A vignette survey means that identical cases (vignettes) are sent to different bodies to investigate whether identical cases are treated identically. In this investigation, the vignettes were sent to selected district offices and regional offices of the Norwegian Food Safety Authority and selected county governor offices. The vignettes were actual aquaculture cases that had previously been processed by two district offices of the Norwegian Food Safety Authority and one county governor office, respectively. The purpose of the investigation is not to uncover whether decisions were incorrect, but to assess the extent to which there are variations between the offices of the Norwegian Food Safety Authority and the county governor offices in the processing of identical cases, including the use of criteria and exercise of discretionary judgement.

Three vignettes were sent to the offices of the Norwegian Food Safety Authority and three vignettes were sent to the county governor offices. All cases concerned applications for the start-up or moving of an aquaculture facility to a new site. When the vignettes were sent, it was requested that the cases be processed as ordinary cases and that a reasoned decision be made about whether the applicant should be authorised to

operate or expand the aquaculture facility at the site applied for. For the offices of the Norwegian Food Safety Authority, this involves assessing conditions relating to the site that are of importance to fish health and fish welfare, including current conditions and water quality. For the county governor offices, it means assessing whether the site is capable of resisting pollution, including what the recipient can tolerate.

Although the cases were to be treated in the ordinary manner, it was not possible for the case officers to clarify questions with the applicant during the case processing. Elements of the application that were irrelevant to the assessments of the Norwegian Food Safety Authority offices and the county governors were omitted from the vignettes. As part of the quality assurance of the cases, the vignettes sent to the Norwegian Food Safety Authority were reviewed by the authority's head office, and the cases sent to the county governor offices were reviewed by another county governor office before being dispatched.

The vignettes were sent to 19 offices of the Norwegian Food Safety Authority and eight county governor offices.

2.4 Line of inquiry 3 Control of the management of aquaculture

Document analysis

In connection with line of inquiry 3, a review was carried out of the budget propositions for the Ministry of Fisheries and Coastal Affairs, the Ministry of the Environment and the Ministry of Food and Agriculture for the years 2007 to 2011. A review was also carried out of the allocation letters and annual reports for the Directorate of Fisheries, the Norwegian Food Safety Authority and the county governors for the years 2007/2008 to 2010/2011.

3 Audit criteria

3.1 Overriding policy goals for the aquaculture sector – a sustainable and environmentally sound aquaculture industry

For several years, the overriding policy goal in the aquaculture sector has been to ensure sustainable growth and development of the industry. In Report No 48 to the Storting (1994–95) *Havbruk – en drivkraft i norsk kystnæring* (Aquaculture – a driving force in Norway's coastal economy) (p. 9), reference is made to the fact that the main elements of Norway's aquaculture policy will be unchanged, and that the main goal is that the aquaculture industry shall undergo balanced and sustainable development and be a profitable and viable rural industry. In its recommendation concerning Report No 48 to the Storting (cf. Recommendation No 150 (1995–96), p. 6), the Standing Committee on Business and Industry agrees with this and also makes reference to the fact that environmental considerations are an overriding goal in Norwegian aquaculture industry (p. 13).

The overriding goals were included in Report No 12 to the Storting (2001–2002) *Protecting the Riches of the Seas* and in Recommendation No 161 to the Storting (2002–2003)⁶, in Report No 19 to the Storting (2004–2005) *Marin næringsutvikling – den blå åker* (Marine business development – the Blue Field) and in Recommendation No 192 to the Storting (2004–2005)⁷ as well as in the Ministry of Fisheries and Coastal Affairs' annual budget propositions for the period 2007 to 2010⁸.

A general requirement for sustainable management has been enshrined in Article 110b of the Norwegian Constitution. It states that: 'Every person has a right to an environment that is conducive to health and to a natural environment whose productivity and diversity are maintained. Natural resources should be managed on the basis of comprehensive long-term considerations

whereby this right will be safeguarded for future generations as well.'⁹

The environmental aspect and the fish health perspective were included in the management of aquaculture through the Fish Farming Act of 1985.¹⁰ The requirement for sustainable growth and development of the aquaculture industry was explicitly stated in the objects clause of the revised Fish Farming Act of 1991.¹¹ Pursuant to the objects clause, the Act was to contribute to ensuring that the fish farming industry could achieve balanced and sustainable development and become a profitable and viable industry in rural areas. The Act relating to Aquaculture¹², which replaced the Fish Farming Act from January 2006, is intended to facilitate the development of aquaculture industry that is sustainable and socio-economically profitable. Pursuant to the Act's objects clause, the purpose of the Act is to '...promote the profitability and competitiveness of the aquaculture industry within the framework of a sustainable development and contribute to the creation of value on the coast'¹³. The Act contains provisions aimed at ensuring that environmental considerations are taken into account in all parts of the production chain.¹⁴

The overriding goal of sustainable growth and development in the aquaculture sector has been specified in various sub-goals that have guided Norwegian aquaculture policy for several years. In Report No 48 to the Storting (1994–95) *Havbruk – en drivkraft i norsk kystnæring* (Aquaculture – a driving force in Norway's coastal economy) (pp. 9, 26–27 and 72) and Recommendation No 150 to the Storting (1995–96) (p. 13), it is pointed out that priority has been given to the work on reducing the number of escaped farmed salmon and the spreading of disease to wild stocks. Emphasis was also to be placed on

6) See page 61 of the report and page 15 of the recommendation.

7) See page 47 of the report and page 8 of the recommendation.

8) See Proposition No 1 to the Storting (2007–2008 and 2008–2009) for the Ministry of Fisheries and Coastal Affairs (p. 13 and p. 11, respectively) and Proposition No 1 to the Storting (2009–2010) for the Ministry of Fisheries and Coastal Affairs (p. 11).

9) The Norwegian Constitution, Act of 17 May 1814; Article 110b was added by constitutional amendment of 19 June 1992 No 463.

10) Act of 14 June 1985 No 68 relating to the farming of fish, shellfish etc.

11) Proposition No 55 to the Storting (1990–91) Om lov om endring i lov 14. juni 1985 nr. 68 om oppdrett av fisk, skaldyr m.v. (On the Act amending the Act of 14 June 1985 No 68, relating to the farming of fish, shellfish, etc.).

12) Act of 17 June 2005 No 79 relating to aquaculture.

13) Act of 17 June 2005 No 79 relating to aquaculture Section 1.

14) See, among other things, the comments on the Act in Proposition No 1 to the Storting (2006–2007) for the Ministry of Fisheries and Coastal Affairs (p. 84).

limiting discharges of pharmaceuticals, chemicals and organic pollution and on ensuring responsible handling of waste and by-products. The report also referred to another goal, namely that of securing sufficient and satisfactory areas for aquaculture production that is justifiable environmentally and in health terms.

Several of the sub-goals were reiterated in Report No 12 to the Storting (2001–2002) Protecting the *Riches of the Seas* (p. 60–64) and Recommendation No 161 to the Storting (2002–2003) (p. 15), in Report No 19 to the Storting (2004–2005)¹⁵ *Marin næringsutvikling – den blå åker* (Marine business development – the Blue Field) pp. 47, 92 and 100, and Recommendation No 192 to the Storting (2004–2005) (p. 8). The sub-goals relating to the environment were presented as a whole in Proposition No 1 to the Storting (2009–2010) and Proposition No 1 to the Storting (2010–2011) for the Ministry of Fisheries and Coastal Affairs (p. 122 and 92, respectively) with reference to the Government's *Strategy for an Environmentally Sustainable Norwegian Aquaculture Industry* (the Sustainability Strategy). The strategy continues with the same priority areas aimed at ensuring an environmentally sustainable aquaculture industry. The goals are as follows:

- Genetic impact and escape: The goal is that aquaculture shall not contribute to lasting changes in the genetic properties of wild fish stocks.
- Disease, including parasites such as salmon lice: The goal is that disease in fish farming shall not have a regulating effect on stocks of wild fish, and that as many farmed fish as possible shall grow to slaughter age with minimal use of medicines.
- Pollution and discharges: The goal is that all fish farming sites in use shall be within acceptable environmental standards and not have discharges of nutrient salts and organic material that exceed the tolerance limit of the recipient.
- Use of marine areas: The authorities' goal is that the aquaculture industry's use of marine areas and the location of aquaculture facilities along the coast shall reduce the environmental impact and risk of infection.
- Feed resources: The aquaculture industry's need for raw materials for feed shall be covered without over-fishing of the wild marine resources.

15) In the report, reference is made to the fact that, in order to ensure sustainable development of the industry and avoid negative public opinion, it is important that the fish stocks used in the feed industry are managed in a justifiable manner.

In Recommendation No 8 to the Storting (2010–2011), the majority of the Standing Committee of Business and Industry notes that the Government will give priority to following up the sustainability strategy for the aquaculture industry. The majority also expects the Government to initiate the necessary measures to ensure sustainable development of the industry.

In the Act relating to the Management of Biological, Geological and Landscape Diversity¹⁶, the purpose is to ensure sustainable use and conservation of nature (cf. Section 1 of the Act). In Section 7 of the Nature Diversity Act, reference is made to the principles for official decision-making (cf. Section 8–12 of the Act) and to the fact that these principles shall serve as guidelines for the exercise of public authority and that decisions shall state how these principles have been applied in assessments. In the assessment of what is environmentally justifiable, the Act states that the precautionary principle shall be applied.¹⁷ This means:

'When a decision is made in the absence of adequate information on the impacts it may have on the natural environment, the aim shall be to avoid possible significant damage to biological, geological or landscape diversity. If there is a risk of serious or irreversible damage to biological, geological or landscape diversity, lack of knowledge shall not be used as a reason for postponing or not introducing management measures.'

Section 10 of the Nature Diversity Act on cumulative environmental effects applies when the environmental aspects of aquaculture shall be assessed. Pursuant to the principle, 'any pressure on an ecosystem shall be assessed on the basis of the cumulative environmental effects on the ecosystem now or in the future.' This is particularly important if the environmental load is at a critical limit where even a slight increase in the load will have a great impact on the ecosystem. In the objects clause of the Planning and Building Act,¹⁸ it is stated that the Act is intended to promote sustainable development for the good of the individual, society and future generations.

16) Act of 19 June 2009 No 100: The Act relating to the Management of Biological, Geological and Landscape Diversity (the Nature Diversity Act).

17) The Nature Diversity Act Section 9.

18) Act of 27 June 2008 No 71. The Act relating to Planning and the Processing of Building Applications.



Wild trout.

Photo: Børre Dervo

3.2 Preconditions for a sustainable and environmentally sound aquaculture industry

3.2.1 Genetic impact and escape

International commitments

Norway has ratified several international agreements on the conservation of wild salmon and wild cod. These agreements include the Convention on the Law of the Sea, the Biodiversity Convention, the Berne Convention on the Conservation of European Wildlife and Natural Habitats, and the Convention for the Conservation of Salmon in the North Atlantic Ocean.

Part XII of the UN's Convention on the Law of the Sea¹⁹ establishes a number of general commitments for all ocean areas as regards the conservation and preservation of the marine environment. Article 196 of the Convention on the Law of the Sea requires the states that have ratified the agreement to '...take all measures necessary to prevent, reduce and control pollution of the marine environment resulting from the use of technologies under their jurisdiction or control, or the intentional or accidental introduction of species, alien or new, to a particular part of the marine environment, which may cause significant and harmful changes thereto'.

Wild marine resources are an integrated part of the world's biodiversity and thereby also fall under the Convention on Biological Diversity of 1992.²⁰ Through this Convention, the parties undertake to, as far as possible and if expedient, initiate various measures to conserve and ensure sustainable use of biological diversity. Important biological resources, whether located in or

19) The Convention on the Law of the Sea was ratified by Norway in 1996, cf. Proposition No 37 to the Storting (1995–1996) and Recommendation No 227 to the Storting (1995–1996).

20) The Convention on Biological Diversity was adopted on 22 May 1992. It was ratified by Norway on 9 July 1993 and entered into force for Norway on 29 December 1993, cf. Proposition No 56 to the Storting (1992–93) and Recommendation No 168 to the Storting (1992–1993).

outside protected areas, shall be managed in a way that ensures conservation and sustainable use.²¹

The Council of Europe's Convention on the Conservation of European Wildlife and Natural Habitats (the Berne Convention) commits the states to initiating necessary measures to protect stocks of wild flora and fauna or adapting them to a level that corresponds with the existing ecological, scientific and cultural requirements in particular.²² The Convention consists of a main text and an appendix with lists of species that need special protection. Salmon is listed in Appendix III, which is the list of threatened, but not unconditionally preserved species.²³

Norway has ratified the Convention for the Conservation of Salmon in the North Atlantic Ocean. The Convention entered into force in 1983.²⁴ Article 3 of the Convention established the North Atlantic Salmon Conservation Organization (NASCO). The organisation works to protect, re-establish, strengthen and manage salmon stocks. NASCO's member states have agreed on a number of guidelines, such as a precautionary approach to salmon management.

NASCO's guidelines are not legally binding on the member states. However, in Proposition No 32 to the Storting (2006–2007) *Om vern av villaksen og ferdigstilling av nasjonale lakse-vassdrag og laksefjorder (On the conservation of wild salmon and the designation of salmon watercourses and salmon fjords)*, reference is made to the fact that Norway has a special responsibility for Atlantic wild salmon and should therefore be a leading country in terms of complying with the international guidelines for wild salmon management.

Other national goals and requirements

The Act relating to the Management of Biological, Geological and Landscape Diversity (the Nature

21) Norwegian Official Report NOU 2004:28 *Lov om bevaring av natur, landskap og biologisk mangfold (Act on the protection of the natural environment, landscape and biological diversity)* Chapter 13.3.5 The Biodiversity Convention.

22) The Convention on the Conservation of European Wildlife and Natural Habitats (the Berne Convention) was adopted on 18 June 1979 and entered into force on 1 June 1982. The Convention was ratified by Norway on 27 May 1986, cf. Proposition No 12 to the Storting (1985–86) and Recommendation No 92 to the Storting (1985–86).

23) See Appendix III to the convention and Norwegian Official Report NOU 1999:9 *Til laks åt alle kan ingen gjera? (Salmon – you can't please everyone?)*

24) Proposition No 31 to the Storting (1982–83) and Recommendation No 161 to the Storting. cf. also Proposition No 32 to the Storting (2006–2007) *Om vern av villaksen og ferdigstilling av nasjonale lakse-vassdrag og laksefjorder (On the conservation of wild salmon and the designation of salmon watercourses and salmon fjords)* and Recommendation no 183 to the Storting (2006–2007).

Diversity Act) is applicable here. On the basis of the Act's stated purpose, which among other things is to ensure conservation and sustainable use of nature (cf. Section 1 of the Act), Section 5 of the Act states that the objective is to maintain species and their genetic diversity for the long term and to ensure that species occur in viable populations in their natural ranges.

In the Act relating to Salmonids and Fresh-Water Fish etc. (the Salmonid and Fresh-Water Fish Act)²⁵ Section 1, the stated purpose is:

'to ensure that natural stocks of anadromous salmonids²⁶, fresh-water fish and their habitats, as well as other fresh-water organisms, are managed in accordance with the Nature Diversity Act and in such a way as to maintain natural diversity and productivity. Within this framework, the Act shall provide a basis for the improvement of stocks with a view to raising yields for the benefit of holders of fishing rights and sports fishermen.'

Through Proposition No 79 to the Storting (2001–2002) National Rivers and Salmon Fjords and Recommendation No 134 to the Storting (2002–2003), national salmon watercourses and salmon fjords have been established that will give special protection to a selection of the most important salmon stocks in Norway. According to the proposition, the establishment of salmon watercourses and salmon fjords is meant to make a significant contribution to the work of protecting Norwegian wild salmon.²⁷

More national fjords and salmon watercourses were established through Proposition No 32 to the Storting (2006–2007) Om vern av villaksen og ferdigstilling av nasjonale laksevassdrag og laksefjorder (On the conservation of wild salmon and the designation of salmon watercourses and salmon fjords) and Recommendation No 183 to the Storting (2006–2007). Among other things, the goal is to conserve and re-establish salmon stocks of a sufficient size and composition to ensure diversity for the species and its possibilities for reproduction. It was also a goal that impacts that threaten the genetic diversity of salmon were to be reduced to a non-harmful level by 2010.²⁸ The Standing Committee on Energy and the

Environment (p. 6) stresses that real monitoring and evaluation of national salmon watercourses and salmon fjords must be established, and that this must also apply to a sufficient number of fjords and watercourses that are not included in the scheme. The committee believes that it is important to allocate resources and policy instruments to stop further losses of populations (p. 6).

An important goal in relation to preserving the wild fish populations is that the escape of farmed fish be kept at a low level, and the overall vision is zero escapes.²⁹ In Recommendation No 183 to the Storting (p. 11), the Standing Committee on Energy and the Environment points out that more stringent requirements and stricter regulations relating to violations of the Aquaculture Act are required, as escape is to be kept to an absolute minimum. In Report No 12 to the Storting (2001–2002) Protecting the Riches of the Seas (p. 83), reference is made to a number of measures to prevent escape, and it is pointed out that: 'These measures will help achieving the political objective already adopted whereby escaped farmed fish shall no longer represent a threat to wild salmon by 2005'. Pursuant to the sustainability strategy, the ambition for cod is that a requirement for zero release of eggs and fry be introduced by 2015.

3.2.2 Fish health and fish diseases

International commitments

Pursuant to Report No 48 to the Storting (1994–95) Havbruk – en drivkraft i norsk kystnæring (Aquaculture – a driving force in Norway's coastal economy) (p. 9), adapting the veterinary provisions for fish to the EU is a priority task. The report also states that good legislation and regulations are a precondition for combating disease (p. 24).

Pursuant to the EU's fish health directive, the competent authorities shall prevent, contain and eradicate infectious diseases. The directive contains requirements for the establishment and operation of aquaculture facilities. The directive was incorporated into Norwegian law from 1 August 2008 through, among other things, the Regulations relating to infectious diseases in aquatic animals³⁰. The purpose of these regulations is to promote good health in aquatic animals. The

25) Act of 15 May 1992 No 47.

26) Fish that spawn and live in fresh water in their fry stage, but that normally live their entire adult lives in salt water. Salmon, sea trout and Arctic char are the best known species.

27) See p. 7 of the proposition.

28) See p. 27 of the proposition.

29) See, among other things, Proposition No 1 to the Storting (2006–2007) for the Ministry of Fisheries and Coastal Affairs (p. 16) and Proposition No 1 to the Storting (2009–2010) for the Ministry of Fisheries and Coastal Affairs (p. 14).

30) Regulations of 17 June 2008 No 819: Regulations relating to the placing on the market of aquaculture animals and products of aquaculture animals, prevention and control of infectious diseases in aquatic animals.

Regulations also group different diseases into three groups. Listed diseases shall be subject to official measures. In Proposition No 1 to the Storting (2009–2010) for the Ministry of Fisheries and Coastal Affairs (p. 124), it is pointed out that following up these Regulations is a prioritised task, which, among other things, means that the Norwegian Food Safety Authority shall develop action plans for the listed diseases.

Other national regulations, goals and requirements

In Proposition No 1 to the Storting (2006–2007) for the Ministry of Fisheries and Coastal Affairs (p. 92), it is pointed out that 'good fish health and good fish welfare are a prerequisite for positive development of the aquaculture industry'. According to the proposition, keeping the fish health and disease situation under control is a prerequisite for the success of fish farming. This means it is necessary to have an overview of the most important diseases and health problems in the aquaculture industry. It is also a goal to ensure that fish and seafood are produced under ethically acceptable conditions and that fish welfare is adequately attended to. This is repeated in recent years' budget propositions for the Ministry of Fisheries and Coastal Affairs, and it is also pointed out that good fish health is a prerequisite for sustainable development of the Norwegian aquaculture industry, and that public efforts in this area are to be strengthened.³¹ It is also emphasised that the figures for losses in the aquaculture industry must be kept to a minimum.³²

The Animal Welfare Act

The purpose of the Animal Welfare Act³³ is to promote good animal welfare and respect for animals, including fish. It is pointed out that animals have an intrinsic value irrespective of their utility value for people. Animals shall be treated well and be protected from the risk of unnecessary stress and strain. Pursuant to the Act, the animals' living environment shall stimulate good health and contribute to safety and well-being.

31) See Proposition No 1 to the Storting (2008–2009) for the Ministry of Fisheries and Coastal Affairs (p. 114) and Proposition No 1 to the Storting (2009–2010) for the Ministry of Fisheries and Coastal Affairs (p. 123). Proposition No 1 to the Storting (2007–2008) for the Ministry of Fisheries and Coastal Affairs (p. 108) also contains similar requirements for fish health and ethics.

32) Proposition No 1 to the Storting (2009–2010) for the Ministry of Fisheries and Coastal Affairs (p. 123).

33) Act of 19 June 2009 No 97: The Act relating to animal welfare (the Animal Welfare Act).

The Food Act

The Food Act³⁴ shall also promote good animal health. Section 19 Animal Health is particularly relevant to the aquaculture industry. Pursuant to this section, live animals shall not be placed on the market, moved or released if there is reason to suspect the presence of a disease that may have material consequences for society.

Relevant regulations

There are several regulations whose purpose is to promote fish health and fish welfare. In the Aquaculture Operation Regulations³⁵, which, among other things, is warranted by the Act relating to Aquaculture, there are several provisions relating to fish health and diseases in fish. One of the purposes of the Regulations is to promote good health in aquaculture animals and ensure good fish welfare. Section 5 of the Regulations contains a requirement that the operation of aquaculture facilities shall be acceptable with respect to sanitation, hygiene and fish welfare. In Sections 22 and 23 of the Aquaculture Operation Regulations on water quality, it is a requirement that the farmed fish have access at all times to sufficient amounts of water of a certain quality so that the fish do not risk undue suffering or injuries being inflicted on them, including subsequent injuries such as deformities. Facilities in the sea shall be ensured a good throughflow of clean water. Pursuant to Section 28 of the Regulations, the fish shall be kept in an environment that fosters good welfare and that affords the best protection against injury and undue suffering. The Regulations relating to Establishing and Expanding Aquaculture Establishments, Pet Shops, etc. (the Establishment Regulations)³⁶ and the Regulations relating to the transportation of aquaculture animals³⁷ are also intended to contribute to ensuring good fish health and fish welfare.

Aquaculture and the impact on the health condition of wild fish

In Report No 48 to the Storting (1994–95), reference was made to the fact that work would be carried out to reduce the spreading of diseases from farmed fish to wild stocks. According to Proposition No 1 to the Storting (2009–2010) for the Ministry of Fisheries and Coastal Affairs, aquaculture activities shall not be operated in a

34) Act of 19 December 2003 No 124: The Act relating to food production and food safety etc. (the Food Act)

35) Regulations of 17 June 2008 No 822: The Regulations relating to Operation of Aquaculture Establishments (the Aquaculture Operation Regulations).

36) Regulations of 17 June 2008 No 823.

37) Regulations of 17 June 2008 No 820.

manner that results in an unacceptable disease impact on wild stocks (p. 123). In addition to viral diseases and bacterial diseases, this also applies to parasites such as salmon lice.

In its consideration of Proposition No 32 to the Storting (2006–2007), the Standing Committee on Energy and the Environment referred to the fact that it is still important to implement measures against salmon lice, and that salmon lice are a serious threat to wild salmon, c.f. Recommendation No 183 to the Storting (2006–2007).

The purpose of the Sea Lice Regulations³⁸ is to combat sea lice in aquaculture facilities, so that the extent of the harm to fish in aquaculture facilities and wild fish is minimised and to reduce the development of resistance among sea lice. The Regulations contain provisions on the implementation of measures against salmon lice in aquaculture facilities. Measures such as medical treatment, mechanical removal through the use of wrasse, and coordinated operation and fallowing shall be implemented when an average of more than 0.5 adult female sea louse is detected per fish in the period from January to August. For the rest of the year, the limit for implementing measures is an average of more than one adult female sea louse per fish.

The Regulations relating to treatment against salmon lice, 2011³⁹, are a supplementary measure setting out requirements for coordinated winter and spring delousing to prevent and limit the harm caused by salmon lice to wild stocks of salmonids and to prevent resistance to the delousing agents.

3.2.3 Pollution and discharges

In Proposition No 1 to the Storting (2009–2010) for the Ministry of Fisheries and Coastal Affairs, it is emphasised that, in the work on ensuring an environmentally sustainable aquaculture industry, particular focus shall be placed on the challenges relating to pollution and discharges. In order to assess the environmental impact, knowledge is needed about how the discharges of infective agents of organic material, nutrient salts, chemicals and pharmaceuticals from fish farming affect the surrounding environment (p. 66). Pursuant to Proposition No 1 to the Storting (2006–2007), (2007–2008) and (2008–2009) for the Ministry

38) Regulations of 18 August 2009 No 1095: Regulations relating to combating sea lice in aquaculture facilities pertaining to the Act of 19 December 2003 No 124: The Act relating to food production and food safety etc. (the Food Act).

39) Regulations of 17 December 2010 No 1703: Regulations relating to coordinated treatment against salmon lice in winter and spring 2011.



Taking samples from the seabed, Hardanger.

Photo: R Bannister, the Norwegian Institute of Marine Research

of Fisheries and Coastal Affairs (pp. 143, 165 and 177, respectively), it is a goal to reduce discharges to the environment, especially from the aquaculture industry. It is also a goal to ensure that discharges of nutrient salts and organic material from aquaculture do not exceed what the natural environment can tolerate.

Pursuant to the Aquaculture Act Section 11 on environmental monitoring, as specified in the Aquaculture Operation Regulations Section 35 on environmental monitoring and Section 36 on measures to be implemented in connection with unacceptable environmental conditions, as well as the Salmon Allocation Regulations Section 36 on minimum requirements for applications, environmental surveys shall be conducted at aquaculture facilities. The regulations require that the condition of the seabed below the facility is monitored over time in the form of a so-called MOM survey pursuant to NS 9410 or corresponding international standard. These surveys will thereafter be carried out at the frequencies set out in the standard.

The Pollution Control Act⁴⁰ is intended to ensure that the quality of the environment is satisfactory, so that pollution and waste do not result in harm to human health or harm the productivity of the natural environment and its capacity for self-renewal. Pursuant to Section 2 of the Act, efforts shall be made to prevent any occurrence or increase of pollution, and to limit any pollution that does occur. The Act shall be used to achieve a level of environmental quality that is satisfactory on the basis of an overall evaluation of human health and welfare, the natural environment, the costs associated with any measures implemented and economic considerations.

40) Act of 13 March 1981 No 6: Act Concerning Protection Against Pollution and Concerning Waste (the Pollution Control Act).

In relation to the Pollution Control Act, chapter 25 of the Pollution Regulations⁴¹ is particularly relevant to the aquaculture industry. It concerns pollution from the washing and impregnating of fish farming nets. The purpose of the provisions is to prevent discharges of environmentally harmful chemicals and reduce pollution from facilities that clean, wash or impregnate nets. According to the Ministry of Fisheries and Coastal Affairs the ministry and the Ministry of the Environment shall cooperate with the industry to strengthen the work of stimulating further reduction in the use of chemicals and copper in fish farming.⁴²

3.2.4 Use of marine areas

In Report No 48 to the Storting (1994–95) *Havbruk – en drivkraft i norsk kystnæring (Aquaculture – a driving force in Norway's coastal economy)* (p. 72), reference is made to the fact that one of the sub-goals for ensuring sustainable growth and development in the aquaculture industry is making sufficient and satisfactory areas available for aquaculture production to be environmentally friendly and acceptable in health terms. In its consideration of the report, cf. Recommendation No 150 to the Storting (1995–1996) (p. 14), the Standing Committee on Business and Industry pointed out that the use of marine areas in the coastal zone is an important aspect of the aquaculture industry, and that environmentally-friendly and business-oriented use of marine areas must be ensured through national legislation and municipal and county plans.

Pursuant to Report No 19 to the Storting (2004–2005) *Marin næringsutvikling – den blå åker (Marine business development – the Blue Field)* (p. 122), it is a goal to ensure that the aquaculture industry has access to sufficient suitable marine areas. Further growth must occur with as little conflict as possible with other interests in the coastal zone. A strategy will be developed for how the aquaculture industry's use of available marine areas can be made more efficient and involve as little conflict with other interests in the coastal zone as possible. The report also points out that it is important that the municipalities and the county authorities take steps to facilitate close collaboration with the different sector authorities and other relevant players and that they utilise planning processes

for the use of marine areas to coordinate and prioritise between conflicting interests.⁴³ In its recommendation, the Standing Committee on Business and Industry agreed that such collaboration is important.⁴⁴

In Proposition No 1 to the Storting (2006–2007), (2007–2008) and (2008–2009) for the Ministry of Fisheries and Coastal Affairs (p. 88, p. 106 and p. 111), it is stated that:

'in order to meet the goals for sustainability and growth in the marine industries, access to sufficient marine areas must be secured. In addition, a strategy must be developed for how the aquaculture industry's overall use of these areas can be rationalised while taking into consideration different interests such as the environment, fish health and fish welfare, seafood safety, production growth, commercial and socio-economic interests and other users of these areas'.

All the propositions also refer to the fact that the ministry is working to develop a strategy for the efficient use of marine areas.

In the consideration of Report No 43 to the Storting (1998–1999) *Vern og bruk i kystsona – tilhøvet mellom verneinteresser og fiskerinæringane (Conservation and use in the coastal zone – the relationship between conservation interests and the fisheries industries)*, cf. Recommendation No 168 to the Storting (1999–2000), reference is made to the following statement from the Standing Committee on Business and Industry:

'The Committee would like to stress that, also in areas given protected status, greater emphasis must be placed on combining conservation with the utilisation of resources based on the principle of sustainability. The Committee would like to emphasise that aquaculture is not only a regional policy issue, it is also about facilitating value creation and welfare in a national perspective. The Committee believes there is reason to underline that the value creation potential of marine resources can only be realised if there is a management regime in place that takes both environmental and commercial considerations into account [...].'

41) Regulations of 1 June 2004 No 931: The Regulations relating to pollution control (the Pollution Regulations).

42) See Proposition No 1 to the Storting (2007–2008) (p. 165) and (2008–2009) (p. 177) and Proposition No 1 to the Storting (2009–2010) for the Ministry of Fisheries and Coastal Affairs (p. 186).

43) Report No 19 to the Storting (2004–2005) *Marin næringsutvikling – den blå åker (Marine business development – the Blue Field)* (p. 121).

44) See Recommendation No 192 to the Storting (2004–2005) (p. 8 and p. 22).

The Planning and Building Act allows municipalities and county authorities to integrate marine areas within one nautical mile outside the baseline in their overall marine area planning. Through planning, it is possible for municipalities and county authorities to achieve better, more coherent and coordinated control of the use of marine areas and individual decisions in the coastal zone.⁴⁵

3.2.5 Feed

As pointed out above, one of the goals in connection with ensuring sustainable growth of the aquaculture industry is that the aquaculture industry's feed requirements shall be met without over-fishing living marine resources.⁴⁶

According to Report No 19 to the Storting (2004–2005) *Marin næringsutvikling* (Marine business development – the Blue Field) (p. 92), one of the authorities' roles is related to sufficient good quality feed. The report (p. 100) also points out that, in order to ensure the sustainability of the aquaculture industry, it is important that the fish stocks used as feed for farmed fish are managed in a sound manner. Proposition No 1 (2006–2007) and (2007–2008) for the Ministry of Fisheries and Coastal Affairs (p. 85 and p. 104, respectively) also refers to the fact that it is challenging to secure enough raw materials for feed of satisfactory quality that are harvested in a sustainable manner. It is an important principle for ensuring sustainable management of fish resources that the fish stocks are regulated and that compliance with the regulations is monitored.⁴⁷ In Report No 1 to the Storting (2008–2009) for the Ministry of Fisheries and Coastal Affairs, reference is made to the fact that relevant research work emphasises studying good alternatives to the marine raw materials fish oil and fish-meal. 'Alternative raw materials for feed will be necessary in order to ensure sustainable farming of cod and salmon in future' (p. 76).

In Proposition No 1 to the Storting (2009–2010) for the Ministry of Fisheries and Coastal Affairs (p. 178), it is also stated that, in order to ensure sustainable use of feed resources, Norway will work at the international level to prevent illegal, unreported and unregulated fishing. The UN's Convention on the Law of the Sea requires coastal states to take the necessary measures to promote the objective of optimal utilisation of

living marine resources while at the same time ensuring that the resources are not endangered by over-exploitation, cf. Part V Articles 61 and 62 of the Convention. In Article 63, it is stated that coastal states that share stocks must seek to conserve and develop such stocks together.

Pursuant to Proposition No 1 to the Storting (2010–2011), the fisheries authorities shall ensure the best possible utilisation of the resources that are harvested, including improved utilisation of by-products from living marine resources used as feed in the aquaculture industry.

3.3 Use of policy instruments to achieve the goal of a sustainable and environmentally sound aquaculture industry

3.3.1 The ministry's methods for stipulating the total number of aquaculture licences and maximum allowed biomass

Pursuant to the Aquaculture Act Section 4, the ministry may grant a licence to engage in aquaculture. Pursuant to Section 5 of the Act, the ministry may issue detailed provisions relating to the content of aquaculture licences, including their extent and time limitations. The number of licences that can be granted for the production of salmonids is limited, and pursuant to Section 7 of the Aquaculture Act, it is the Ministry of Fisheries and Coastal Affairs that decides the total number of licences.⁴⁸ In this connection, the ministry can demand compensation for the allocation of licences for the production of salmonids. In cases where compensation is required that will have a bearing on the national budget, the matter must be presented to the Storting.

General requirements for studies and reports by the ministry

The Appropriations Regulations require that the national budget proposal must explain the content of and grounds for appropriations proposals.⁴⁹ In the recommendation from the Storting's Standing Committee on Scrutiny and Constitutional Affairs concerning the Instructions for the activities of the Office of the Auditor General, it was a requirement that matters presented to the Storting must be adequately studied.⁵⁰

45) See the Planning and Building Act Section 3-6.

46) See, among other things, Proposition No 1 to the Storting (2009–2010) for the Ministry of Fisheries and Coastal Affairs (p. 122).

47) See, among other things, Proposition No 1 to the Storting (2009–2010) for the Ministry of Fisheries and Coastal Affairs (p. 11).

48) The number of licences for other aquatic resources is not limited.

49) The Appropriations Regulations Section 9. Adopted by the Storting on 26 May 2005.

50) Recommendation No 136 to the Storting (2003–2004) (p. 5), cf. the Act and Instructions relating to the Office of the Auditor General Section 9 e.

As regards the general duty of disclosure in relation to the Storting, reference is made to the report of the Frøiland Committee, which was appointed to study and report on the Storting's scrutiny function, Document No 14 (2002–2003) and Recommendation No 210 to the Storting (2002–2003). Among other things, the Committee states that the Government must have a duty to allow serious expert objections to be presented in connection with a matter even if they are in conflict with the Government's proposal.

The Government's internal regulations, including the Instructions for Official Studies and Reports, also apply in this connection.⁵¹ The Instructions for Official Studies and Reports contain requirements for how reports shall be prepared within the scope of the Instructions. The Instructions apply to work on official reports, regulations, reforms and measures, as well as propositions and reports to the Storting. Matters that fall under the scope of the Instructions for Official Studies and Reports must include an impact assessment, including the consequences for the central government, county and municipal administration and for private parties, including businesses and individuals. It is the body that initiates a matter that is responsible for ensuring that an impact assessment is carried out. The impact assessment must be appropriate to the importance of the matter and the significance of the consequences. The impact assessment shall contain an analysis of the financial and administrative consequences. In addition, the impact assessment shall consider the consequences in relation to all overall and general considerations of importance to the matter in question.⁵²

3.3.2 Case processing of aquaculture applications

The processing of new and amended licences for aquaculture shall contribute to ensuring sustainable growth and development of the aquaculture sector. Pursuant to Sections 4 and 6 of the Aquaculture Act, the Ministry of Fisheries and Coastal Affairs may, on application, grant a licence to engage in aquaculture provided that the applicant meets specific conditions. The processing of applications for a licence pursuant to the Aquaculture Act must take place on the basis of several other acts and pertaining regulations for which the respective sector authorities are responsible. They are the Food Act and the

Animal Welfare Act (the Norwegian Food Safety Authority) and the Pollution Control Act (the environmental protection authorities represented by the county governors). The county governors may also issue statements on individual cases that concern nature protection, vulnerable nature, biological diversity and interests relating to outdoor pursuits, fishing and wild game (cf. also the provisions of the Nature Diversity Act). The Directorate of Fisheries can issue statements on traditional fisheries interests. In addition, applications shall be considered pursuant to the Act relating to Harbours and Fairways (the Norwegian Coastal Administration), the Water Resources Act (the watercourse authorities) and the Planning and Building Act (the municipalities).

Official decisions that can affect biological, geological and landscape diversity shall be assessed in light of the principles that follow from the Nature Diversity Act Section 7, cf. Sections 8 to 12. The assessments shall be described in the decision. This means that the discretionary judgement exercised by each sector authority and the allocation authority shall be in accordance with Section 7 of the Nature Diversity Act. It also follows from Proposition No 52 to the Odelsting (2008–2009) (p. 57 and p. 375) that the objects clause in Section 1 of the Nature Diversity Act and the management objectives set out in Sections 4 and 5 are of importance when exercising discretionary judgement pursuant to acts other than the Nature Diversity Act.

When considering aquaculture applications pursuant to the Food Act and the Animal Welfare Act, the provisions are specified in the Establishment Regulations.⁵³ Pursuant to Section 7 of the Regulations, the Norwegian Food Safety Authority shall consider in particular factors that influence the risk of infection at the aquaculture facility applied for and the surrounding environment. Pursuant to Proposition No 1 to the Storting (2009–2010) for the Ministry of Agriculture and Food, the Norwegian Food Safety Authority shall prioritise the follow-up of the Government's strategy plan for an environmentally sustainable aquaculture industry and the allocation of new aquaculture licences.⁵⁴

When the county governors assess whether to grant a discharge permit, it is particularly the

51) The Instructions were adopted by Royal Decree on 18 February 2000 and revised by Royal Decree on 24 June 2005.

52) See Section 2.1 of the Instructions for Official Studies and Reports – General information on impact assessments.

53) Regulations of 17 June 2008 No 823. The Regulation relating to Establishing and Expanding Aquaculture Establishments, Pet Shops, etc.

54) Page 54 of the proposition.

sites' capacity to tolerate the discharges that must be considered.⁵⁵ Waste treatment is also relevant to the aquaculture industry in connection with cases involving the expansion of facilities. It is regulated by the Pollution Control Act chapter 5.

When all the sector authorities have made decisions, the allocation authority at the county authority shall reach a decision in accordance with the Aquaculture Act after an overall assessment.⁵⁶

The requirement for equal treatment is important in case processing by the public administration. The equal treatment requirement is deemed to follow from provisions of the Public Administration Act and from non-statutory principles concerning equal treatment of identical cases unless reasonable grounds for discrimination exist. Furthermore, the equal treatment requirement can be said to follow from the ethical principle of good administrative practice.⁵⁷

Several international agreements set limits on Norwegian planning work. One such agreement is the *EU's Directive on the assessment of the effects of certain plans and programmes on the environment*, which was adopted by the EU on 27 June 2001⁵⁸, and is intended to ensure a high degree of environmental protection by making environmental impact assessments a requirement. Pursuant to the Directive, the competent authority shall prepare reports on the impact the plan or programme will have on the environment. Among other things, the Directive requires cooperation with the environmental authorities and that the grounds for adopted plans and programmes be stated in reports. The provisions of the Directive are included in the Planning and Building Act's chapter on environmental impact assessments. The purpose of environmental impact assessments is that considerations relating to the environment, natural resources and society are taken into account when preparing plans or measures and when considering whether plans or measures can be implemented.

55) *Fylkesmannens behandling av oppdrettssaker (The county governors' processing of aquaculture cases)*. Guidelines 99:04 (TA-1653/1999).

56) See, among other things, the Aquaculture Act Section 8 and Proposition No 61 to the Odelsting (2004–2005) *Om lov om akvakultur (akvakulturloven) (On the Act relating to Aquaculture (the Aquaculture Act))* (p. 62).

57) See Graver (2002), Eckhoff and Smith (1994), Bernt and Rasmussen (2003), Hesjedal (2001).

58) The Strategic Environmental Assessment (SEA) Directive 2001/42EC was included in the EEA Agreement through Proposition No 7 to the Storting (2003–2003). The amending legislation required to adapt the directive to Norwegian law was proposed by the Ministry of the Environment in Proposition No 47 to the Odelsting (2003–2004).

Pursuant to the Regulations on Environmental Impact Assessments (EIA)⁵⁹ the allocation authority shall decide whether an environmental impact assessment is required, how the case processing shall be carried out and whether any study carried out in connection with the matter is satisfactory. Pursuant to Appendix II to the Regulations on Environmental Impact Assessments, large aquaculture facilities and smolt farms with a capacity exceeding five million smolt require an environmental impact assessment. The purpose is to ensure that environmental and societal considerations are taken into account during the processing of aquaculture cases.⁶⁰

3.3.3 Use of supervisory activities to ensure a sustainable and environmentally sound aquaculture industry

The Directorate of Fisheries

Pursuant to the Act relating to Aquaculture Section 21, the Directorate of Fisheries shall carry out supervisory activities to ensure compliance with the provisions of the Act. If the provisions set out in or pursuant to the Act are contravened, the supervisory authorities may order measures to be carried out to remedy the illegal situation and bring it to an end.⁶¹ Chapter VII of the Act concerns coercive measures at the Directorate of Fisheries' disposal.

To ensure that Norwegian seafood is safe and known for its high quality and that the seafood is of a high standard as regards the environment, public health, fish health and fish welfare, it is pointed out in Proposition No 1 to the Storting (2009–2010) for the Ministry of Fisheries and Coastal Affairs that it is the industry that is responsible for ensuring that the seafood is of good quality. In addition, the authorities have a right and a duty to supervise the enterprises in order to ensure that they meet their obligations. According to the Ministry of Fisheries and Coastal Affairs, inspections shall be risk-based, i.e. that the inspections target areas where the likelihood for and consequences of unacceptable incidents are greatest. In this connection, the ministry points out that, in order to have control of diseases and escapes, it is necessary to increase the inspection frequency for both

59) Regulations of 26 June 2009 No 855: Regulations on Environmental Impact Assessments pursuant to the Act of 27 June 2008 No 71 relating to Planning and the Processing of Building Applications (the Planning and Building Act) Section 4-2 and Section 14-6.

60) *Konsekvensutredninger av akvakulturtiltak (Environmental impact assessments of aquaculture measures)* (2009), the Directorate of Fisheries.

61) The Aquaculture Act Section 27.

seafood enterprises and aquaculture facilities.⁶² Reference is also made to the fact that inspections are a key method in relation to ensuring that the aquaculture industry is environmentally sustainable (p. 11). Fish health, fish welfare and food safety are among the Norwegian Food Safety Authority's areas of responsibility.

Corresponding goals are described in Proposition No 1 to the Storting (2008–2009) for the Ministry of Fisheries and Coastal Affairs (p. 119), where it is stated that control and inspections of aquaculture facilities are intended to ensure compliance with the applicable conditions and that the aquaculture production is environmentally justifiable. Different control tools are used based on risk considerations and appropriateness, including audits, spot checks and control campaigns. Among other things, the controls are intended to contribute to preventing and limiting escapes through monitoring compliance with the requirements of the NYTEK Regulations, ensuring that the requirements of the Aquaculture Operation Regulations are complied with and ensuring that the biomass from the production of salmon and trout does not exceed the maximum allowed biomass. According to the budget proposition, the Directorate of Fisheries will place greater emphasis on further developing risk-based inspections of aquaculture facilities. The directorate will ensure that, based on a risk assessment, a sufficient number of aquaculture facilities are inspected and that violations are followed up in an efficient and correct manner. The directorate will carry out coordinated inspections with other sector authorities when possible.

Pursuant to Proposition No 1 to the Storting (2006–2007) (p. 96) and 2007–2008 (p. 112) for the Ministry of Fisheries and Coastal Affairs, steps must be taken to ensure that a sufficient number of aquaculture facilities are inspected on the basis of a risk assessment and that different control tools are used based on their appropriateness. Violations shall be followed up in an efficient and adequate manner. The inspections shall include all sites with salmonids – both marine growers and smolt – in the national salmon fjords and salmon watercourses.⁶³

62) Cf. Proposition No 1 to the Storting (2009–2010) for the Ministry of Fisheries and Coastal Affairs (p. 46).

63) Cf., among other things, Proposition No 1 to the Storting (2007–2008) for the Ministry of Fisheries and Coastal Affairs (p. 108) and Proposition No 1 to the Storting (2009–2010) for the Ministry of Fisheries and Coastal Affairs (p. 123).

The Norwegian Food Safety Authority

Pursuant to the Food Act Section 23, the Norwegian Food Safety Authority's head office and regional and district offices carry out supervision. They may make such decisions as are necessary to ensure that the provisions laid down in or pursuant to the Act are implemented. If the provisions prescribed in or pursuant to the Act are contravened, the supervisory authority may order measures to be carried out to bring the illegal situation to an end. Chapter V of the Act concerns which coercive measures the Norwegian Food Safety Authority has at its disposal.

Pursuant to Section 30 of the Animal Welfare Act, the Norwegian Food Safety Authority shall also supervise compliance with the Act and make such individual decisions as are necessary to achieve compliance with provisions laid down in or pursuant to this Act.

According to the Ministry of Agriculture and Food, the Norwegian Food Safety Authority plays a central role in the work of ensuring safe food through guidance, inspections, mapping and monitoring of the whole food production chain.⁶⁴ The Norwegian Food Safety Authority shall also promote fish health, ethically justifiable fish farming and environmentally friendly production.⁶⁵

The individual facility is responsible for complying with the regulations, thereby ensuring that the seafood and production are safe. The Norwegian Food Safety Authority shall ensure that enterprises take their responsibilities seriously, among other things through audits of the enterprises' internal control systems, announced and unannounced inspections and monitoring and control programmes. Violations of regulations and other individual incidents are followed up by the Norwegian Food Safety Authority.⁶⁶ According to the Ministry of Agriculture and Food, inspections shall be carried out regularly and with a frequency that is in proportion to the risk associated with the enterprises' activities and what is known of the individual enterprise. The ministry also

64) See Proposition No 1 to the Storting (2006–2007), (2007–2008) for the Ministry of Agriculture and Food (p. 13), Proposition No 1 to the Storting (2008–2009) for the Ministry of Agriculture and Food (p. 12) and Proposition No 1 to the Storting (2009–2010) for the Ministry of Agriculture and Food (p. 14).

65) See Proposition No 1 to the Storting (2007–2008) for the Ministry of Agriculture and Food (pp. 48–49), Proposition No 1 to the Storting (2008–2009) for the Ministry of Agriculture and Food (p. 52) and Proposition No 1 to the Storting (2009–2010) for the Ministry of Agriculture and Food (p. 46).

66) See Proposition No 1 to the Storting (2006–2007) for the Ministry of Fisheries and Coastal Affairs (p. 89) and Proposition No 1 to the Storting (2009–2010) for the Ministry of Agriculture and Food.

points out how important it is that the different supervisory methods are used in targeted fashion, so that all enterprises are subject to supervision that results in maximum compliance with the regulations. This is also intended to contribute to serious breaches of the regulations being discovered quickly.⁶⁷ Pursuant to Proposition No 1 to the Storting (2008–2009) for the Ministry of Agriculture and Food, supervisory work relating to fish health shall be strengthened.

In order to ensure that it is safe for consumers to eat farmed fish, Norway is obliged through international regulations (EU Directive 96/23) to monitor the content of various pharmaceuticals and environmental toxins in farmed fish. The Norwegian Food Safety Authority is responsible for collecting samples. The requirement is implemented in Norwegian law through the Regulations relating to control measures for residues of specific substances in foodstuffs, production animals and fish to ensure food safety.⁶⁸ The requirement is minimum one sample per 100 tonnes of produced fish. Samples shall also be tested for illegal substances and the amount of residues of certain allowed substances, such as pharmaceuticals, in relation to certain stipulated proportions. It must be possible to collect samples without prior warning.⁶⁹

The county governors

Pursuant to Section 48 of the Act Concerning Protection Against Pollution and Concerning Waste, the pollution control authority shall be responsible for monitoring the general pollution situation and pollution from individual sources. The county governors are the pollution control authority for aquaculture. By providing advice, guidance and information, the pollution control authority shall endeavour to combat pollution and waste problems and ensure that the rules set out in the Act and decisions made pursuant to the Act are complied with. Chapters 9 and 10 of the Act concern the coercive measures at the pollution authorities' disposal in connection with violations of the Act.

The county governors are responsible for exercising supervision to ensure that the aquaculture facilities comply with the requirements

and any instructions issued. According to the Ministry of the Environment, the county governors' supervision of polluting activities will be strengthened.⁷⁰

3.4 The authorities' control of the management of aquaculture

Pursuant to Section 9 of the Appropriations Regulations, the desired results shall be described in the presentation of proposed appropriations in the annual budget propositions. Information shall also be provided about the results achieved in the last financial year.⁷¹

According to the Ministry of Fisheries and Coastal affairs, the management of fisheries shall be efficient. To achieve this goal, it is important to have good management systems based on goal and performance management, risk management, the management of subordinate agencies and systematic evaluations of how the agencies' perform their tasks.⁷²

Pursuant to the Regulations on Financial Management in Central Government, the ministries shall stipulate overriding objectives and management parameters for subordinate agencies. All agencies shall ensure that the stipulated objectives and performance requirements are achieved, that the use of resources is efficient, and that the agency is run in accordance with applicable laws and regulations, including the requirements relating to good administrative practice, impartiality and ethical behaviour. All agencies shall also ensure that sufficient management information and an adequate basis for decisions are provided.⁷³

In the Provisions on Financial Management in Central Government, reference is made to the fact that, in their internal management, the ministries shall define authority and responsibility to ensure compliance with the Regulations on Financial Management.⁷⁴

67) See Proposition No 1 to the Storting (2008–2009) for the Ministry of Agriculture and Food (p. 58) and Proposition No 1 to the Storting (2009–2010) for the Ministry of Agriculture and Food (p. 55).

68) Regulations of 27 January 2000 No 65.

69) Monitoring Program For Residues Of Therapeutic Agents, Illegal Substances, Pollutants And Other Undesirables In Farmed Fish (In accordance with Council Directive 96/23/EC) ANNUAL REPORT FOR 2009.

70) Proposition No 1 to the Storting (2009–2010) for the Ministry of the Environment (p. 180).

71) The Appropriations Regulations, adopted by the Storting on 26 May 2005.

72) See, for example, Proposition No 1 to the Storting (2009–2010) for the Ministry of Fisheries and Coastal Affairs.

73) The Regulations on Financial Management in Central Government Section 4.

74) Provisions on Financial Management in Central Government, chapter 2.2. Authority and responsibilities.

4 The facts: The development and status of the aquaculture industry seen in relation to the goal that it shall be sustainable and environmentally sound

This chapter describes the development and status of the five sustainability elements:

- a) escape and genetic impact
- b) fish health and fish welfare
- c) pollution
- d) use of marine areas
- e) feed resources for the aquaculture industry

In addition, a review will be included of the use of certain policy instruments, particularly relating to measures against diseases. A short presentation will also be given of the management tools used by the government administration in relation to the sustainability elements. Other use of policy instruments will be presented in chapter 5.

4.1 Escape and genetic impact

Escaped farmed fish and their genetic impact on wild fish is an area in which the aquaculture industry has a strong environmental impact. Salmon lice and escaped fish are a serious threat to wild salmon.⁷⁵ For several years now, it has been a priority task in the aquaculture forvaltningen ikke industrien industry to reduce escapes of farmed fish. When farmed fish escape, they may interact genetically with wild fish. Escaped farmed fish can also spread diseases and lice. Among other things, genetic interaction can affect the distinctiveness of wild salmon and its ability to survive and reproduce.

Norway has endorsed several international conventions on the conservation of animals and biological diversity that involve the conservation of wild fish, including the Convention for the Conservation of Salmon in the North Atlantic Ocean. It has been a goal for the authorities that impacts that threaten the genetic diversity of salmon were to be reduced to a non-harmful level by 2010.⁷⁶

In the last 30 years, the world's stocks of wild Atlantic salmon have been significantly reduced.⁷⁷ About one third of the Atlantic salmon spawn in Norway. According to the sustainability strategy, salmon have disappeared from about 45 watercourses in Norway, and about 100 of the remaining 400 stocks are classified as vulnerable. The decline in salmon stocks is primarily due to acidification, regulation and other encroachments on watercourses, the salmon parasite *Gyrodactylus salaris* and the unfavourable growing conditions in the Atlantic Ocean throughout most of the 1990s. The high prevalence of salmon lice is also a probable cause of the decline in some regions. Together with *Gyrodactylus salaris*, the intrusion of farmed fish into spawning stocks is considered to be the most serious threat to the wild salmon stocks. According to Proposition No 32 to the Storting (2006–2007) *Om vern av villaksen og ferdigstilling av nasjonale laksevassdrag og laksefjorder (On the conservation of wild salmon and the designation of salmon watercourses and salmon fjords)*, it is not clear whether the large proportion of escaped farmed fish has already contributed to the decline. However, recent investigations show that the large proportion of escaped farmed fish among spawning stocks can have a strong negative impact on the natural reproduction of wild salmon stocks in the short term.⁷⁸

Fifty-two national salmon watercourses and twenty-nine national salmon fjords have been established in order to give special protection to the most important wild salmon stocks. There are specific provisions in the regulations concerning the location of aquaculture facilities near these watercourses and fjords.⁷⁹

In this chapter, the status with respect to escapes and the proportion of farmed fish among wild fish will be reviewed. A description will also be included of the measures implemented to limit

75) Proposition No 1 to the Storting (2009–2010) *The Ministry of Fisheries and Coastal Affairs*.

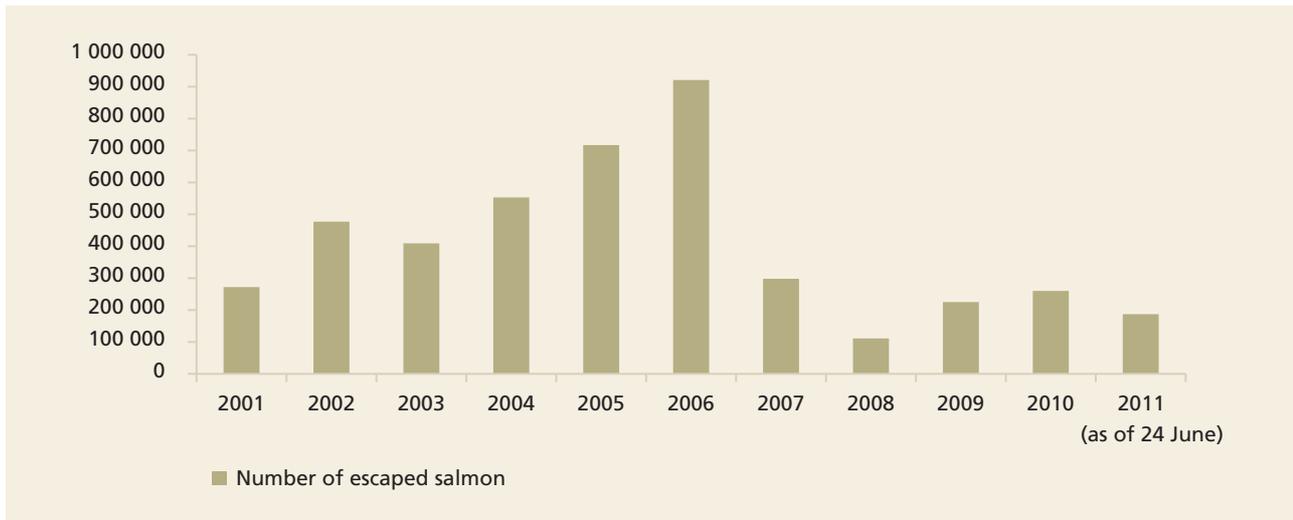
76) Proposition No 32 to the Storting (2006–2007) *Om vern av villaksen og ferdigstilling av nasjonale laksevassdrag og laksefjorder (On the conservation of wild salmon and the designation of salmon watercourses and salmon fjords)* (p. 27).

77) *Strategy for an Environmentally Sustainable Norwegian Aquaculture Industry* (2009), The Ministry of Fisheries and Coastal Affairs.

78) Proposition No 32 to the Storting (2006–2007) *Om vern av villaksen og ferdigstilling av nasjonale laksevassdrag og laksefjorder (On the conservation of wild salmon and the designation of salmon watercourses and salmon fjords)*.

79) Regulations of 22 June 2009 No 961 relating to specific requirements for aquaculture-related activities in or near national salmon watercourses or national salmon fjords.

Figure 2 Reported escape figures for salmon for the period 2001 to 2011



Source: The Directorate of Fisheries (the Directorate's figures were last updated on 24 June 2011)

escapes, and the possible effects and impacts of escaped farmed fish on wild fish.

4.1.1 Escape

On the basis of the impact escaped fish can have on wild stocks, keeping escapes of farmed fish to an absolute minimum is an important goal in relation to safeguarding wild fish populations.⁸⁰ The overall vision is zero escapes.⁸¹

The escape statistics are prepared by the Directorate of Fisheries on the basis of figures reported by the fish farmers themselves. Figure 2 shows the development of escape figures during the period 2001 to 2011.

Figure 2 shows that the reported escape figures for salmon increased steadily from 2001 up to and including to 2006, when over 900,000 escaped fish were reported. After 2007, the figure was reduced to about one third, and the figures have stabilised at about 100,000 to 300,000 escaped fish per year. As of mid-2011, approximately 187,000 salmon had escaped. The reported escape figures have also declined when seen in relation to the increase in production in the aquaculture industry (cf. Figure 1).

The escape figures can also be compared with the amount of wild fish caught. While 916,000

tonnes of farmed fish were produced in 2010, approximately 627 tonnes of salmon were caught through sea and river fishing. This means that the production of farmed fish is 1,400 times greater than wild salmon catches measured in tonnes.⁸² In 2010, 255,000 farmed fish escaped, while, by comparison, the total population of wild salmon spawning in Norwegian ocean areas was approximately 500,000 fish.

Reported escape figures for cod are shown in Appendix 2.

Figure 3 (on the following page) shows that there is great variation between the counties in terms of the number of reported escaped farmed fish, also when seen in relation to production. The production figures (columns) should be seen in relation to the left axis, while the escape figures (line) should be seen in relation to the right axis.

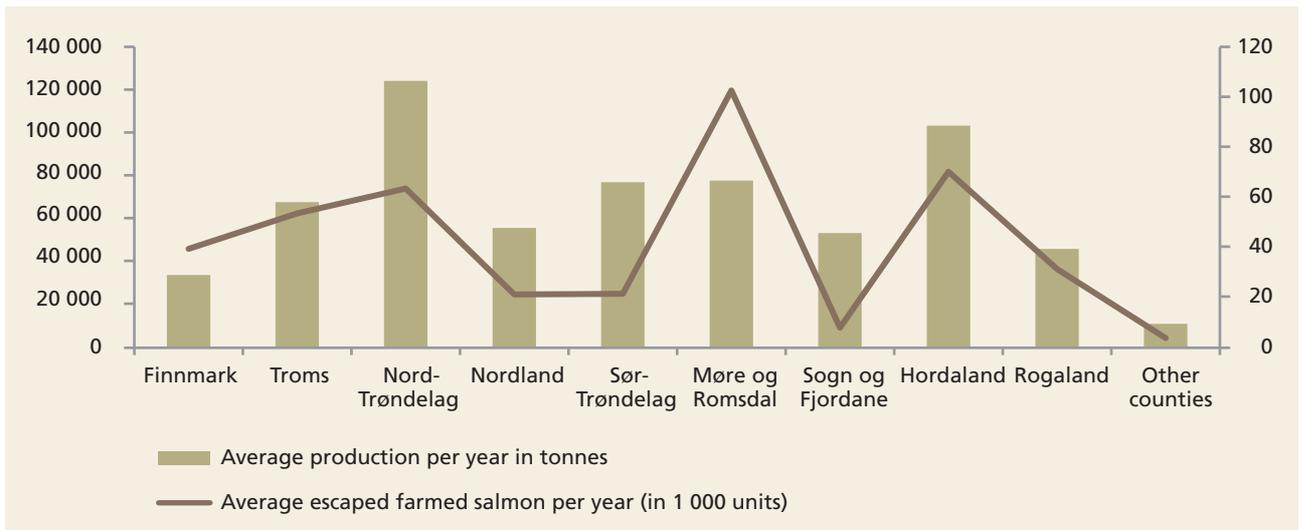
The figure shows that the number of reported escaped fish per county was highest in the counties of Møre og Romsdal, Hordaland and Nordland. Sogn og Fjordane, Sør-Trøndelag and Nord-Trøndelag have had the lowest reported escape figures. However, the underlying data from the Directorate of Fisheries show that the reported escape figures for individual counties can vary significantly from one year to the next. For example, Møre og Romsdal reported almost 300,000 escaped salmon in 2004, compared with none in 2007. The figure also shows that there are differences between the counties as regards how

80) Recommendation No 183 to the Storting (2006–2007) on Proposition No 32 to the Storting (2006–2007) *Om vern av villaksen og ferdigstilling av nasjonale laksevassdrag og laksefjorder (On the conservation of wild salmon and the designation of salmon watercourses and salmon fjords)*.

81) See for example Proposition No 1 to the Storting (2006–2007) for the Ministry of Fisheries and Coastal Affairs (p. 16) and Proposition No 1 to the Storting (2009–2010) for the Ministry of Fisheries and Coastal Affairs (p. 14).

82) The figures have not been corrected for escaped farmed fish in the catches.

Figure 3 The number of escaped farmed salmon compared with the average annual production per county for the period 2001 to 2010



Source: The Directorate of Fisheries

many fish escape in relation to the amount produced. Nordland county has relatively few escapees compared with the amount produced, while in Møre og Romsdal, there are many escapees seen in relation to the amount produced in the county. Finnmark county also stands out as a county with a lot of reported escapes when compared with production.

Figures from the Directorate of Fisheries show that the number of cases of reported escapes is relatively low, which means that a high number of fish escape per incident on average. The number of reported cases of escaped salmonids has varied between three and fifty-four in the period 2005 to 2011. The corresponding figures for cod are 10–27 cases (no cases in mid-2011).

Little is known about the extent of escapes from smolt farms and from early in the phase where smolt are released into the sea, partly because it is difficult to catch smolt and because they migrate quickly towards the open sea.⁸³

In the sustainability strategy, the Ministry of Fisheries and Coastal Affairs refers to the fact that there is great uncertainty attached to the escape figures, and that it must be assumed that a significant number of unregistered escapes must be added to the reported figures. The Directorate of Fisheries also points to the uncertainty attached to the escape figures. It states in an inter-

83) The Norwegian Institute of Marine Research (2011) *Genetiske effekter av rømt oppdrettsfisk i ville bestander: utforming av indikatorer (Genetic impact of escaped farmed fish on wild stocks: developing indicators)*.

view that attempts have been made to estimate the escape figures more accurately, but that there are no adequate methods for estimating the correct number of escaped farmed salmon. The Directorate of Fisheries has assigned the Norwegian Institute of Marine Research the task of examining the possibility of estimating more reliable escape figures.⁸⁴

4.1.2 Reasons for escape

The Directorate of Fisheries passes on information about reported escapes of farmed fish to the Aquaculture Escape Commission, which is an official commission appointed by the Ministry of Fisheries and Coastal Affairs in 2006. The Commission works systematically to obtain information and initiate investigations in order to shed light on the course of events and the reasons for escapes. The purpose of the Commission's work is to increase knowledge about escapes and to identify expedient measures to prevent escapes. According to the Aquaculture Escape Commission, 65 per cent of the escape cases in 2010 were linked to grow-out farms in the sea, 16 per cent to transport, 14 per cent to slaughter facilities and five per cent to smolt farms.

Data from the Aquaculture Escape Commission and interviews with the Directorate of Fisheries and the directorate's regional offices show that a high percentage of the escapes in recent years are due to human errors and errors in the installation and operation of the facilities. In more than half the escapes, measured both in terms of the number of escapes and the number of escaped

84) Interview with the Directorate of Fisheries.

fish, it is presumed that the escapes were due to operating errors or to design errors.⁸⁵ According to the Directorate of Fisheries, the high escape figures in the mid-2000s were due to facilities breaking down because of technical failures. In recent years, no escapes have been reported as a result of facilities breaking down.

4.1.3 Means of preventing escapes

According to the Directorate of Fisheries, several measures have been implemented to minimise the number of fish that escape from aquaculture facilities. One important measure is the NYTEK regulations⁸⁶, which entered into force in January 2004. The regulations set out requirements for the technical standard of floating fish farms and the main components of such fish farms. These main components must be certified in accordance with Norwegian Standard 9415: 'Floating fish farming installations – design, dimensioning, construction, installation and operational requirements'. In the opinion of the Ministry of Fisheries and Coastal Affairs, the Directorate of Fisheries and most of the directorate's regional offices, the introduction of NYTEK has improved the technical facilities at fish farms and contributed to reducing the number of escaped farmed fish in recent years. The Directorate of Fisheries also refers to the fact that, as pointed out above, technical breakdowns have not been registered as the cause of escapes since the introduction of NYTEK.⁸⁷

The Aquaculture Escape Commission was established in connection with the vision of zero escapes. The Ministry of Fisheries and Coastal Affairs states that the Commission is an important measure in relation to preventing and hindering escapes.

Other parts of the regulations relating to aquaculture contain a number of requirements aimed at contributing to preventing escapes, including requirements for internal control, requirements for the mesh sizes of cage nets, double securing of drains in smolt farms and marking provisions aimed at reducing the probability of vessels colliding with aquaculture facilities. Sanctions Regulations were introduced in 2007 in order to tighten sanctions for breaches of the aquaculture regulations that have an impact on the environment,

including escapes.⁸⁸ The regulations mean that fish farmers' self-reported escapes can be met with violation fines.

The Ministry of Fisheries and Coastal Affairs and the Directorate of Fisheries state that the extent to which the Sanction Regulations have contributed to reducing escapes is not known, and that nor is it known whether they can have contributed to fewer farmers reporting escapes. The ministry also states that it is aware that escapes take place without their being reported.⁸⁹

However, both the Ministry of Fisheries and Coastal Affairs and the Directorate of Fisheries state that it is not the escape figures in themselves that are most interesting, but what impact escaped fish have on wild fish, including genetic introgression and the spreading of diseases. This will be presented below.

4.1.4 The proportion of farmed fish among wild fish

The Ministry of the Environment has overall administrative responsibility for wild salmonids, work on which has been delegated to the Directorate for Nature Management. The Directorate of Fisheries is responsible for monitoring the escape situation and the impact of escaped farmed fish. The Directorate for Nature Management was previously responsible for both these areas, and it still contributes to this work and supplements the Directorate of Fisheries' monitoring work.

Monitoring of rivers and watercourses

The proportion of escaped farmed salmon in catches from rivers and the sea has been systematically surveyed since 1989.⁹⁰ The surveys are based on identifying escaped farmed salmon on the basis of their appearance and scale properties. Measurements are carried out in different types of locations and at different times of the year. The Norwegian Institute for Nature Research (NINA) states in an interview that, as of 2011, approximately 75 watercourses are monitored in the summer and approximately 40 in the autumn.

The monitoring in summer primarily takes place through anglers' reports of catches and the submission of scale samples over a three-month

85) Figures taken from the Aquaculture Escape Commission's annual report.

86) Regulations of 11 December 2003 No 1490: Technical requirements for fish farming installations.

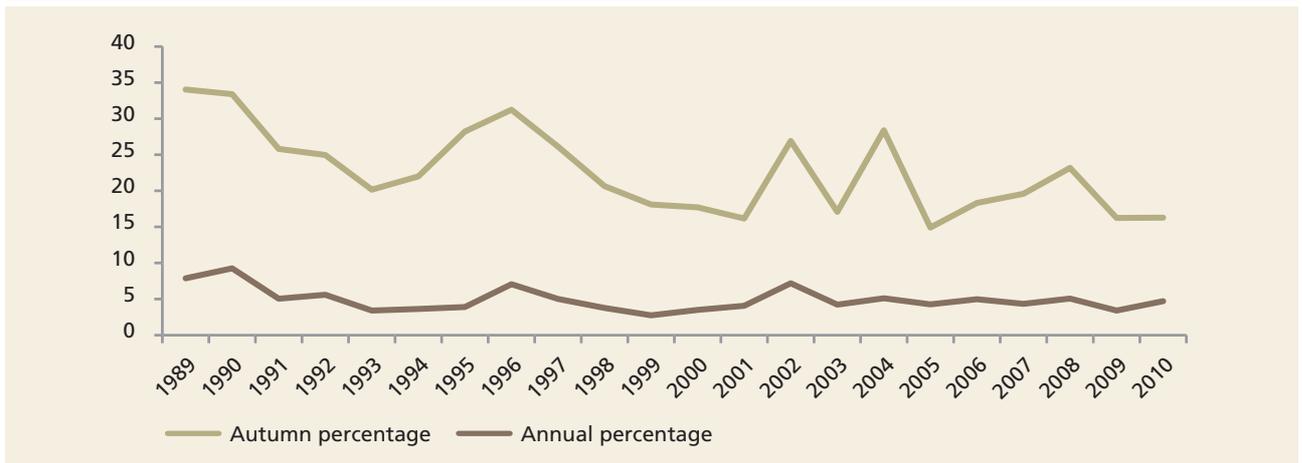
87) New NYTEK Regulations were issued in August 2011, cf. Section 5.3. on supervision.

88) Proposition No 1 to the Storting (2007–2008) for the Ministry of Fisheries and Coastal Affairs.

89) Other use of supervisory activities and sanctions in the work of limiting the number of escaped fish will be dealt with in chapter 5.3 – Supervision of the aquaculture industry.

90) Report from the Norwegian Scientific Advisory Committee for Atlantic Salmon Management No 3 (2011), *The status of Norwegian salmon stocks*.

Figure 4 The proportion of farmed fish among wild fish. Average annual percentage and average in the autumn. Based on monitoring



Source: The Norwegian Institute for Nature Research

period. The summer monitoring is conducted on behalf of the Directorate for Nature Management. In principle, autumn fishing is not allowed, but experience has shown that farmed fish arrive in rivers later than wild fish, and in the Norwegian Institute for Nature Research' opinion, autumn fishing thereby gives a more correct picture of the amount of farmed fish among spawning salmon stocks. Autumn fishing is organised fishing that takes place using various fishing equipment over a period varying from a few days to some weeks.⁹¹ Autumn monitoring is conducted on behalf of the Directorate of Fisheries, which orders data from approximately 20 to 30 rivers. Monitoring of the other rivers in the autumn is conducted on assignment for the Directorate for Nature Management, among others.

The Norwegian Institute for Nature Research states that little is known about possible differences between escaped farmed fish and wild fish as regards how easy they are to catch and when they move up the rivers. This means that there is some uncertainty attached to the figures for the proportion of farmed fish among wild fish. Wild fish stocks also vary from year to year and this therefore affects the calculation of the proportion

91) The Norwegian Institute for Nature Research states that summer monitoring for the years 1989 to 2009 is based on an analysis of scales from a total of 207,183 individuals divided between 989 spot checks of salmon, while the autumn monitoring for the same period is based on an analysis of scales from 47,589 individuals divided between 749 spot checks. Since the autumn monitoring is based on less material, while summer monitoring may have taken place too early, the Norwegian Institute for Nature Research has prepared a new index that takes both sample sets into account. This index is called the annual percentage. It presents an average of the percentages of escaped farmed fish in the summer samples and autumn samples from the same river, and it is weighted in relation to the catch from the different rivers when the average for several rivers is calculated.

of farmed fish in different years. Although there is some uncertainty attached to the figures, the Norwegian Institute for Nature Research states that the figures give a good picture of the proportion of farmed fish among wild fish.

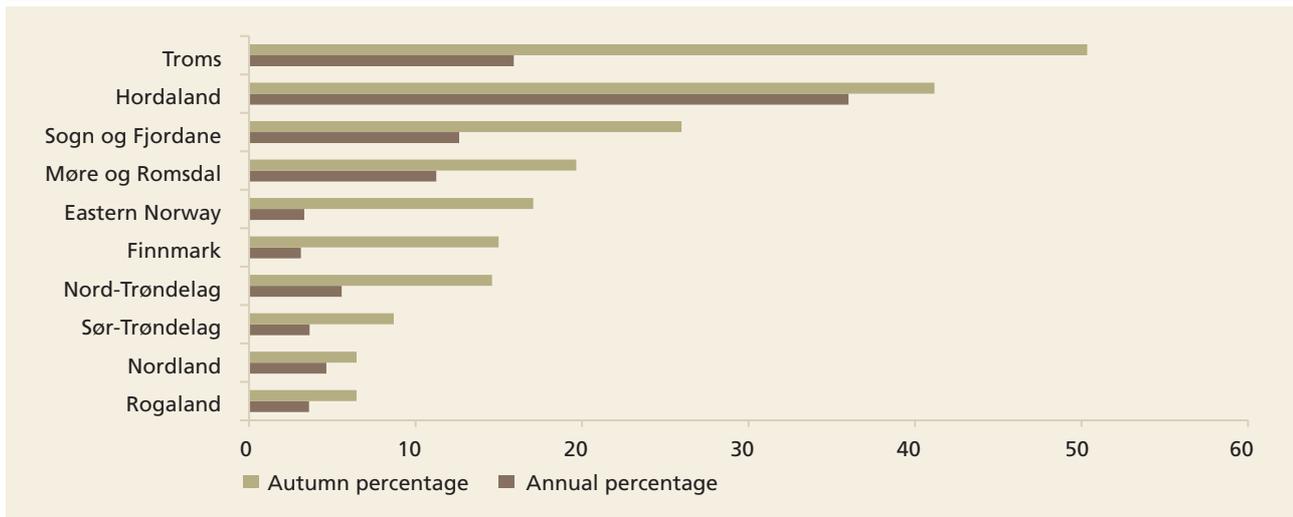
Interviews with the authorities show that they generally trust that most of the monitoring programmes provide reliable and valid data. However, the Ministry of Fisheries and Coastal Affairs points out that there is uncertainty about the data based on the catch statistics for salmon, because it is not always certain that the person catching the fish is able to ascertain whether it is a farmed fish. The ministry also refers to the fact that too few rivers are surveyed to arrive at regional estimates, and that the proportion of escaped fish in the rivers varies.⁹²

The proportion of farmed fish among wild fish for Norway as a whole in the period 1989 to 2010 is presented in Figure 4.

Figure 4 shows that the annual proportion of escaped farmed salmon among wild fish was more or less stable at between three and nine per cent per year during the period 1990 to 2010. The proportion of farmed fish measured by taking samples from trial fishing and broodstock fishing just before spawning in the autumn – the so-called autumn percentage – has been between 15 and 23 per cent in recent years (2005–2010). In

92) *Report from the Norwegian Institute of Marine Research No 7-2011. Evaluering av datagrunnlaget 2006–2009 for estimering av andel rømt oppdrettslaks i gytebestanden i norske elver (Evaluation of the data basis for 2006–2009 for the estimation of the proportion of escaped farmed fish among the spawning stock in Norwegian rivers)* (p. 33), the Norwegian Institute of Marine Research.

Figure 5 Average proportion of farmed salmon among wild fish in rivers for the year as a whole and in the autumn for relevant counties during the period 2000 to 2010



Source: The Norwegian Institute for Nature Research

the 1990s, there were years in which the proportion of farmed fish was over 30 per cent. Report No 3 (2011) from the Norwegian Scientific Advisory Committee for Atlantic Salmon Management⁹³, states that the unweighted average proportion of farmed salmon in autumn fishing was between 11 and 18 per cent in the years 1999 to 2010, while it was over 20 per cent in all years from 1989 up to and including 1998. This percentage is somewhat lower than the figures from the Norwegian Institute for Nature Research. Among other things, this is because of differences in the calculation methods and because corrections have been made to the data material that forms the basis for the reports of the Norwegian Institute for Nature Research and the Norwegian Scientific Advisory Committee for Atlantic Salmon Management, respectively.

The proportion of farmed salmon in rivers varies strongly between counties. This is shown in Figure 5.

The figure shows that the counties of Troms, Hordaland and Sogn og Fjordane had the highest average proportions of farmed salmon, both for the year as a whole and in the autumn, during the period 2000 to 2010. In the autumn, the proportion in Troms county is highest, at more than 50 per cent. Hordaland county has the highest annual proportion at 36 per cent. The lowest pro-

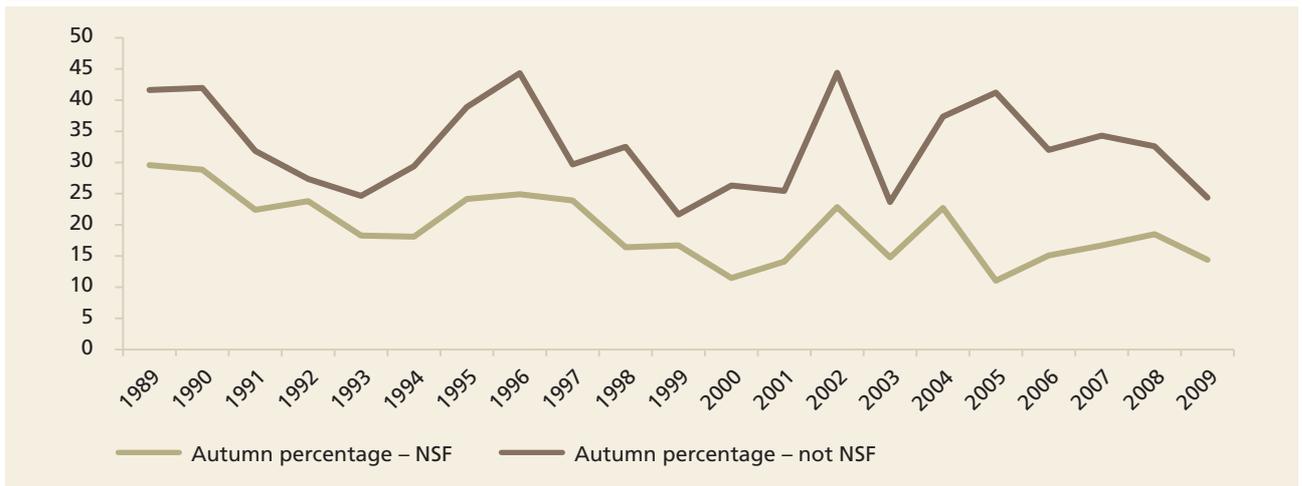
portions are found in the counties of Sør-Trøndelag, Nordland and Rogaland, with a proportion of 3.5–4.5 per cent for the year as a whole and 6.5–8.5 per cent in the autumn. These are average variations per county, but the proportion of escaped fish can vary in individual rivers in the counties and from one year to the next. There may also be variations in the identified proportion of escaped farmed salmon in the rivers in different surveys. In a survey carried out by the Directorate of Fisheries, it was found that the proportion of escaped farmed fish was lower in the counties of Finnmark, Nordland and Troms, while the proportion was higher in Møre og Romsdal compared with the figures from the Norwegian Institute for Nature Research.⁹⁴

If Figure 3 is compared with Figure 5, there is no clear covariation between the escape figures for each county and the proportion of farmed fish among wild fish in the same counties. For example, a relatively high number of fish escaped in Nordland county, but the identified proportion for the county is relatively low. Sogn og Fjordane has had relatively few escapes, but it still has a relatively high intrusion level. There have been many fish escapes in Hordaland county, however, and the intrusion level is among the highest in the country. According to the Norwegian Scientific Advisory Committee for Atlantic Salmon Management, the lack of covariation may be because escaped farmed fish appear to have different migration patterns, depending on when in their life cycles they escape.

93) The Norwegian Scientific Advisory Committee for Atlantic Salmon Management is an independent committee appointed by the Directorate for Nature Management. The Committee prepares an annual report in a separate report series, which describes the status and development of wild salmon stocks.

94) The Norwegian Institute of Marine Research, report No 7, 2011.

Figure 6 The proportion of farmed fish in areas under special protection through the scheme for national salmon fjords (NSF), and in areas not covered by such protection⁹⁷



Source: The Norwegian Institute for Nature Research

Monitoring in the sea

The proportion of escaped farmed salmon in catches from sea-water fisheries has also been measured since 1989. Seven sites in outer coastal areas and four sites in fjord areas have been surveyed in all these years. On the basis of these surveys, the proportion of escaped fish among wild fish in the sea has been found to vary between two and seventy-three per cent.⁹⁵ The most recent available figures from 2008 show that the average proportion in sea catches was 25 per cent. There are great variations between different parts of the country and between fjord areas and coastal areas, however. In general, the sites in the fjord areas have a lower proportion of escaped farmed fish than sites in outer coastal areas.

From 1997, in addition to the number of sites mentioned above, salmon from a site in the outer Hardangerfjord have also been investigated. This is an area with a high density of aquaculture facilities and weak stocks of wild salmon. In this area, the proportion of farmed salmon in catches was between 55 and 94 per cent in the period 1997 to 2008.⁹⁶

Monitoring in national salmon watercourses and salmon fjords

As previously mentioned, a scheme for national salmon fjords and salmon watercourses was established in 2003 to give wild salmon special

protection. Among other things, this means that more stringent regulations apply to the allocation of licences for farming in these areas. Figure 6 shows that the proportion of farmed fish among wild fish is lower in areas that are under such special protection than in areas that are not.

In an interview, the Ministry of the Environment states that, in its opinion, the national salmon fjords and salmon watercourses are generally a good measure for conserving and safeguarding wild salmon populations. It is assumed that the scheme must be supplemented by other measures, primarily measures targeting escapes and salmon lice, as well as the regulation of salmon fishing. However, too little is known about the effects of the establishment of these national salmon fjords and watercourses. An evaluation of the effect of the national salmon fjords and watercourses will be carried out in 2016, according to the Directorate for Nature Management.

4.1.5 The impact of escaped farmed salmon on wild fish

Genetic impact

The Norwegian Institute of Marine Research refers to the fact that many of the properties of salmon that have a bearing on their development, survival and growth vary between populations, and it is assumed that these properties adapt to local conditions over time. There is less genetic variation among farmed salmon. A number of differences have been identified in genetically based properties between farmed fish and wild fish that are of importance to their ability to adapt

95) The Norwegian Scientific Advisory Committee for Atlantic Salmon Management, Report No 3, 2011.

96) The Norwegian Scientific Advisory Committee for Atlantic Salmon Management, Report No 2, 2010.

97) Equivalent figures for national salmon watercourses follow a corresponding pattern.

and to their reproduction potential, such as growth performance, aggression, dominance and anti-predator behaviour.⁹⁸ For example, farmed fish grow better and more quickly than wild fish. The Norwegian Institute of Marine Research states that there is reason to believe that the genetic differences that are of direct or indirect importance to survival in nature will increase for each generation.⁹⁹

Molecular genetic studies show that genetic changes have taken place in wild salmon stocks that have included a high proportion of farmed salmon for several years. This has not happened in some large stocks despite a high proportion of farmed fish. It is presumed that this is due to strong stocks that are better protected against changes caused by escaped salmon.¹⁰⁰

Surveys show that there are two periods in the development of the farmed salmon in which escape is especially critical. One of these periods is in early summer, when young wild salmon naturally migrate to the ocean. Farmed fish that escape around this time can have a relatively high survival rate and migrate back to the same geographical area from which they escaped. They have more success in spawning than farmed salmon that escape later in life. The other period is when the escaped farmed salmon are approaching sexual maturity. They can then have a high survival rate up until spawning, but limited success in spawning. Even for escaped fish that are less likely to move up the river to spawn, large escapes can nonetheless lead to a large number of farmed fish in spawning stocks.¹⁰¹

It emerged in interviews with the authorities that no indicators have been operationalised or developed for what constitutes a sustainable level of genetic introgression and other effects that influence the spawning stock, but that work is ongoing both in the government administration and in research communities. The Ministry of Fisheries and Coastal Affairs has requested the Directorate of Fisheries and the Norwegian Institute of Marine Research to study and report on possible indicators for the different sustainability elements presented in the sustainability

98) *Risk assessment – environmental impacts of Norwegian aquaculture* (2010), the Norwegian Institute of Marine Research, *Fisken og havet*, special edition 3-2010.

99) *Risk assessment – environmental impacts of Norwegian aquaculture* (2010), the Norwegian Institute of Marine Research, *Fisken og havet*, special edition 3-2010.

100) The Norwegian Scientific Advisory Committee for Atlantic Salmon Management, Report No 2, 2010.

101) Norwegian Institute for Nature Research.

strategy. In the short term, this includes how much intrusion from farmed fish a wild fish population can tolerate without being threatened. The prevalence of salmon lice and the effect this has on the wild stocks will also be measured.

In May 2011, the Norwegian Institute of Marine Research and the Norwegian Institute for Nature Research submitted proposals for indicators of the genetic impact farmed fish have on wild stocks. It is pointed out here that threshold values must be developed for genetic impact from escaped farmed salmon. At present, no one knows enough to stipulate these values. However, in September 2011, the Norwegian Institute of Marine Research stated that significant genetic changes in the wild salmon population had been detected in six of the 21 surveyed rivers, while no change was detected in 15 of the rivers. Escaped farmed salmon were registered to a greater or lesser extent in the six populations in which a change was detected. The Norwegian Institute of Marine Research therefore concludes that the likelihood of genetic changes is between moderate and high in many counties, based on the proportion of escaped salmon in the rivers included in the monitoring programme.¹⁰²

Acceptable limits for the proportion of farmed fish among wild fish will depend on the time perspective applied. The Norwegian Scientific Advisory Committee for Atlantic Salmon Management proposes that the proportion of escaped farmed salmon in the spawning stocks should be less than five per cent if the wild salmon stocks are assessed over a period of ten salmon generations, and even lower if a longer time perspective is applied. It is pointed out that the straying rate among wild fish is approximately four per cent and that the proportion of farmed fish should therefore not exceed this percentage. In an interview, the Norwegian Institute for Nature Research states that zero per cent is the only limit that is certain not to harm a wild salmon stock in the long term.

As shown in Figure 4, the annual percentage of farmed fish among wild fish for the period 1989 to 2010 has been between three and nine per cent for Norway as a whole. The proportion of escaped salmon in the autumn has been approximately 12 per cent on average in recent years. The figures above, cf. Figure 5, also show that the

102) *Risk assessment – environmental impacts of Norwegian aquaculture* (2011), the Norwegian Institute of Marine Research, *Fisken og havet*, special edition 3-2011.

proportion in the autumn varied between 6.5 and 50 per cent between counties.

On the basis of the figures mentioned above, research communities have expressed concern about the amount of farmed fish among wild fish. In its Report No 3 (2011), the Norwegian Scientific Advisory Committee for Atlantic Salmon Management concludes that measures must be implemented immediately to strongly reduce the number of farmed fish and their level of spawning in nature.

In an interview, the Ministry of the Environment states that we have reached a limit for what nature, and particularly wild salmonids, can tolerate. The ministry also refers to the fact that the detected proportion of escaped salmon is too high in many rivers and watercourses.

In an interview, the Ministry of Fisheries and Coastal Affairs states that, in scientific terms, it is uncertain what proportion of farmed salmon is acceptable if fish farming is to have no lasting genetic impact on wild salmon populations, but that a proportion of 40–50 per cent is too high. The acceptable figure will vary from river to river. According to the ministry, some stocks are robust and can possibly tolerate a proportion of ten per cent or more, while other rivers can only tolerate intrusion of two per cent.

Farmed salmon and the spread of sea lice and diseases

In addition to the possible genetic impact that escaped farmed salmon can have on wild fish, farmed salmon can have a negative impact on



Salmon lice.

Photo: NTB Scanpix

wild fish as carriers of diseases and parasites such as sea lice. Salmon lice are a threat to fish as they can eat the fish's skin, slime and blood and thereby cause big open wounds. Studies show that high lice infection pressure can affect the fish in the form of high levels of stress hormones, a weakened immune system and problems with the water and salt balance. After-effects such as impaired growth, swimming ability and reproduction have been observed. Increased mortality has also been found.¹⁰³

In principle, salmon lice are natural adapted parasites that occur on salmonids, and they rarely cause serious diseases in wild fish in natural systems because natural concentrations of lice in the sea are low. According to the Ministry of Fisheries and Coastal Affairs' sustainability strategy, there is a general consensus that wild stocks of salmonids cannot tolerate high sea lice infection pressure. The Norwegian Food Safety Authority, which is responsible for monitoring and combating salmon lice and other diseases, states in an interview that the current level of sea lice is an environmental problem and represents a threat to wild fish. Over time, salmon lice have become one of the biggest challenges in relation to ensuring an environmentally sustainable aquaculture industry. According to Proposition No 1 to the Storting (2010–2011), salmon lice do not constitute a health problem for the farmed fish, but the total amount of salmon lice in fish farms can represent a threat to wild fish.

The Norwegian Institute of Marine Research points out that there is little precise knowledge about what infection intensity wild fish can tolerate. A limit or indicator has therefore not been adopted for what level of salmon lice does not have a negative impact on the wild salmon stocks. The Ministry of Fisheries and Coastal Affairs states in an interview that the Norwegian Institute of Marine Research will measure the prevalence of salmon lice and the effect they have on the wild stocks. In September 2011, the institute pointed out that, since 2010, several counties have experienced a worsening of infection pressure from salmon lice on wild salmon, and that there is still considerable infection pressure on sea trout in many counties.¹⁰⁴

103) *Risk assessment – environmental impacts of Norwegian aquaculture* (2010), the Norwegian Institute of Marine Research, *Fisken og havet*, special edition 3-2010.

104) *Risk assessment – environmental impacts of Norwegian aquaculture* (2011), the Norwegian Institute of Marine Research, *Fisken og havet*, special edition 3-2011.

The Norwegian Scientific Advisory Committee for Atlantic Salmon Management has ranked the different factors that pose a threat to the conservation of wild salmon.¹⁰⁵ The threat represented by salmon lice and escaped farmed salmon is highlighted as the only clear non-stabilised existential threat. This means that there is a high probability that it contributes to further losses, and that the current situation means that not enough has been done to limit this threat. It is assumed that salmon lice in combination with the intrusion of escaped farmed fish in the spawning stocks has made a significant contribution to several salmon stocks in the Hardangerfjord now being critically small.

The Ministry of the Environment has chief responsibility for the conservation and development of wild salmon stocks. In that connection, the Ministry of the Environment states that new methods have been developed for combating the salmon parasite *Gyrodactylus salaris*, which is one of the biggest threats to the wild salmon. Acidification is effectively counteracted by liming. In addition, more stringent environmental requirements have been introduced in connection with the regulation of watercourses that give greater consideration to wild salmon.

In the Ministry of the Environment's opinion, however, the ministry has limited legal remedies at its disposal in the work of conserving the wild salmon stocks. In addition, other ministries and agencies have areas of responsibility that, according to the Ministry of the Environment, strongly influence the Ministry of the Environment's ability to conserve and safeguard salmon stocks. In the Ministry of the Environment's opinion, the challenge in connection with this intersectoral work is that it is escaped wild salmon and salmon lice that currently constitute the biggest non-stabilised threats to wild salmon. The Ministry of Fisheries and Coastal Affairs administers the policy instruments used to limit escapes of farmed fish and to limit the spread of salmon lice.

The spread of other diseases from farmed fish to wild fish will be presented in chapter 4.2.3.

4.1.6 Wild salmon stocks

The size of the wild salmon stocks has been calculated for each year since 1983 by measuring the migration of fish from the ocean to the coast.

The Norwegian Scientific Advisory Committee for Atlantic Salmon Management points out that the drift of wild salmon has been reduced from about 1,000,000 fish in 1983 to about 480,000 fish in 2010. This reduction mainly reflects the fact that the migration of small salmon has decreased throughout the period, while, for the country as a whole, there has been no reduction in the migration of medium-sized and big salmon.

According to the Norwegian Scientific Advisory Committee for Atlantic Salmon Management, reduced migration is primarily due to a low survival rate in the sea. The reasons for this are little understood, but it is assumed that a worsening of the food supply and temperature changes in the sea may be important. To compensate for reduced migration, salmon fishing has been significantly reduced both in the watercourses and in the sea in particular. In 2010, the restrictions on fishing combined with slightly higher migration led to considerably better attainment of the spawning stock targets in 2010 compared with the period 2006 to 2009. However, for approximately 30 per cent of the 210 stocks assessed, the spawning targets were not achieved in 2010. The number of salmon spawning in Norwegian rivers has not changed significantly in the period 1983 to 2010, despite large reductions in sea fishing for salmon. Relatively few Norwegian salmon stocks were classified as over-harvested in 2010. One important exception is the stocks in the Tanavassdraget watercourse, which are strongly over-harvested. Otherwise, over-fished stocks are small stocks where the harvestable surplus is particularly small due to little migration by small salmon. It is therefore assumed that the regulations introduced to reduce the harvesting have primarily compensated for reduced migration and kept the spawning stock at a relatively stable level. The harvesting of stocks is particularly low in Western Norway, where the impact of sea lice and escaped farmed salmon has been identified as a particularly serious challenge. Several watercourses and fjords have therefore been closed to fishing in this area.

4.1.7 Cod

Farmed cod that spawn in the cages represent a challenge to the genetic distinctiveness of wild cod if fertilised eggs are released. The spawning and rearing grounds for coastal cod are in the same areas where the aquaculture facilities are located, and escapes from and spawning in cages can therefore have a negative impact on the wild

105) The Norwegian Scientific Advisory Committee for Atlantic Salmon Management, Report No 3, 2011. The status of Norwegian salmon stocks, 2011.

stocks. Although significant spreading of eggs from cages has been documented in trials, nothing is currently known about the spreading of eggs from fish farms for cod. Therefore, while the impact of escaped fish and eggs on wild cod stocks has not been documented, negative effects cannot be ruled out.¹⁰⁶ Coastal cod stocks comprise several different stocks, and this means that the coastal cod is particularly vulnerable to intrusion from farmed cod. The Ministry of Fisheries and Coastal Affairs has introduced regulations that prohibit the establishment of aquaculture facilities for cod in known cod spawning areas.

4.2 Fish health and fish welfare

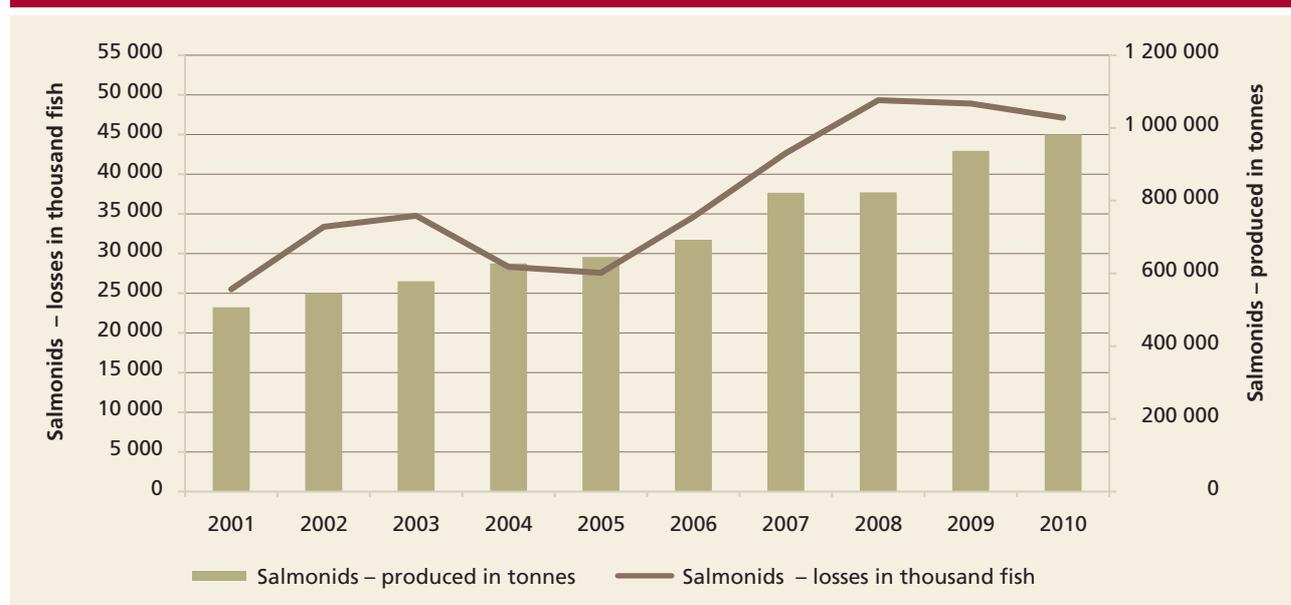
For several years now, it has been a goal to maintain a high fish health standard in the aquaculture industry in order to ensure that the production of farmed fish is economically and ethically justifiable, cf. Report No 48 to the Storting (1994–95) *Havbruk – en drivkraft i norsk kystnæring* (Aquaculture – a driving force in Norway's coastal economy). The same report also points out that the infection pressure from farmed fish on wild fish must be reduced so that it does not constitute a threat to wild stocks. According to the report, emphasis was to be placed on improving the farmed fish's health status through preventive efforts. In Proposition No 1 to the Storting (2009–2010) for the Ministry of Fisheries and

Coastal Affairs, reference is made to the sustainability strategy in which it is maintained that diseases in fish farming must not have a regulating effect on stocks of wild fish, and that as many farmed fish as possible shall grow to slaughter age with minimal use of medicines.

Proposition No 1 to the Storting (2010–2011) for the Ministry of Fisheries and Coastal Affairs states that disease is still a major loss factor for the Norwegian aquaculture industry and that the wastage percentage (losses in the sea due to mortality) is high and seems to be increasing, which is both worrying and unacceptable. The losses have consequences for the health and welfare of the fish and they also result in financial losses for the aquaculture industry.

This chapter describes developments in health and disease among farmed fish, including salmonids. The loss figures will first be reviewed. The loss figures give an impression of how much fish is lost in the aquaculture industry mainly because of disease, but also due to other causes. The types of diseases that affect farmed fish will then be reviewed. Current knowledge about the spread of diseases from farmed fish to wild fish will be presented in that connection. Finally, some calculations will be presented of what losses in production cost the aquaculture industry.

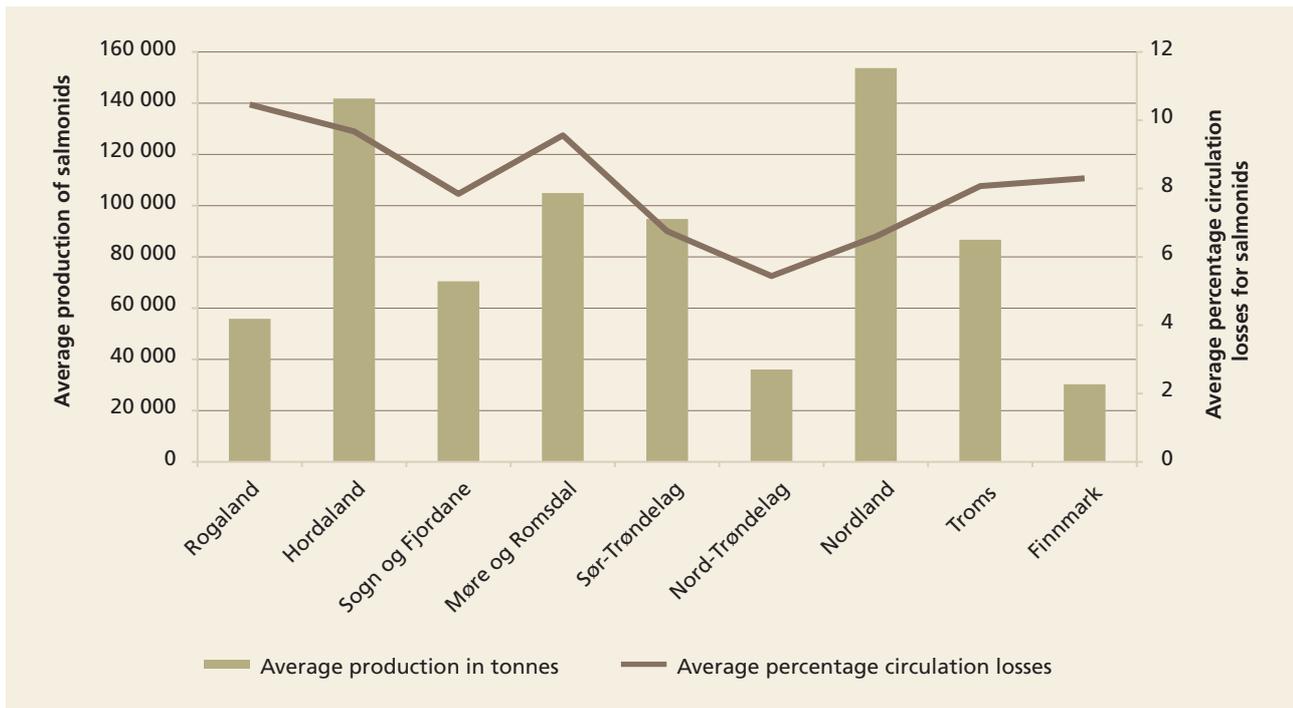
Figure 7 Production in tonnes compared with losses in thousand fish for salmonids for Norway as a whole during the period 2001 to 2010



Source: The Directorate of Fisheries and Statistics Norway

106) http://www.regjeringen.no/upload/FKD/Vedlegg/Brosjyrer/2009/Brosjyre_strategi_baerekraftig_havbruk.pdf.

Figure 8 Average percentage losses per county in salmonid production for the years 2005 to 2010



Source: The Directorate of Fisheries and Statistics Norway

4.2.1 Losses in the aquaculture industry

According to the Committee on the Use of Marine Areas by Aquaculture, production losses in salmon farming are mainly due to disease. The loss statistics are therefore one way of monitoring the development of the health of farmed fish. The loss statistics are based on information from the industry and are reported to the Directorate of Fisheries and Statistics Norway.¹⁰⁷ There is uncertainty attached to the loss figures. One reason for this is that there are not enough accurate counting machines that can count the exact number of released smolt, which means that the loss figures are not entirely accurate. According to the Directorate of Fisheries, adult fish most often die of disease, while recently released smolt die because they are not strong enough.

Development of losses in the aquaculture industry

Figure 7 shows the development of losses compared with growth in the production of salmonids for the years 2001 to 2010.

Figure 7 shows that both the production and the number of lost fish have increased strongly throughout the period 2001 to 2010. The number of lost fish was approximately 25 million in 2001 and it increased to more than 47 million in 2010. Relatively speaking, roughly the same number of

fish is lost in production for each year in the period: the loss percentage¹⁰⁸ is between approximately 8 and 10 per cent per year. As a result of increased production, the total number of lost fish was thereby higher in 2010 than in 2001.

In 2009, the Norwegian Veterinary Institute pointed out that wastage and losses in the industry are disturbingly high, and it recommended that the production volume should not be increased before this wastage is reduced to an acceptable level.¹⁰⁹ The Directorate of Fisheries also points out that the losses of farmed fish are far too high in certain areas and that little attention has been paid to losses in general.

Geographical differences in losses of farmed fish

Figure 8 presents the loss statistics for each county, and thereby sheds light on geographical differences in losses in the production of salmonids. The figure shows the average losses in salmonid production during the period 2005 to 2010 by county seen in relation to the county's average production.

The figure shows that the average production loss has been higher in Western Norway than in

107) Act of 17 June 2005 No 79: Act relating to Aquaculture, Section 24. Duty of disclosure and investigation.

108) The loss percentage is calculated by dividing the number of lost fish by the number of released fish plus the stocks on 1 January every year. This method is called the circulation loss method.

109) The Norwegian Veterinary Institute's input to the Directorate of Fisheries before the planned biomass increase in 2010. See chapter 5.1 for a detailed review of this process.

Central Norway and Northern Norway in the periode 2005 to 2010. The four counties in Western Norway all have a higher loss percentage than the five northernmost counties. While the four counties in Western Norway were responsible for 56 per cent of the total losses for the years 2005 to 2010, the corresponding figure was 43 per cent for the counties from Sør-Trøndelag northwards. In the same period, the four counties in Western Norway accounted for 45.5 per cent of the total production, while the counties from Sør-Trøndelag northwards were responsible for 53.3 per cent of production. The highest percentage losses are found in the counties of Hordaland, Rogaland and Møre og Romsdal, with average losses of between nine and ten per cent during the period in question. The lowest average losses are found in Nord-Trøndelag county, with five per cent losses, followed by the counties of Sør-Trøndelag and Nordland, with average losses of seven per cent. According to the report of the Committee on the Use of Marine Areas by Aquaculture, the somewhat higher losses in the counties of Troms and Finnmark can be related to the lack of smolt in these counties. Long-distance transportation of smolt of varying quality can contribute to high mortality after release.

The Committee on the Use of Marine Areas by Aquaculture states that, even though little is known about the causes of mortality, there is reason to believe that mortality is related to factors such as the water quality in smolt farms and the quality of the smolt, the location and operating methods at grow-out farms, environmental conditions at grow-out farms and the amount of fish in the farms. In *Risk assessment – environmental impacts of Norwegian aquaculture*, which was produced by the Norwegian Institute of Marine Research in 2010 on assignment for the Ministry of Fisheries and Coastal Affairs, the farming intensity was calculated by looking at the ratio between the amount of fish and the marine area. It was found that Hordaland county is the county with the highest farming intensity by far, followed by Rogaland and Agder.¹¹⁰ The farming intensity is lowest in the counties of Finnmark, Troms and Nordland. Hordaland has more than twice as many fish per square kilometre as Sør-Trøndelag and eight to ten times as many fish per square kilometre as Finnmark. This shows that, where the losses are greatest, i.e. the counties of Hordaland and Rogaland, the amount

of fish, or the farming intensity, is highest. It is important to emphasise that there will be big differences in losses within counties and from facility to facility.

The loss percentage

Even though losses are stated as the number of fish, different methods are used to calculate the relative, or percentage, losses. Very different loss percentages are therefore used in the aquaculture industry, depending on what calculation method is used. The most frequently used method so far is called the circulation loss method. It is used, for example, in the sustainability strategy, in the Ministry of Fisheries and Coastal Affairs' budget propositions, by the Directorate of Fisheries and it was used by Statistics Norway until spring 2011. This method results in the lowest percentage.

The Directorate of Fisheries¹¹¹ and the report of the Committee on the Use of Marine Areas by Aquaculture refer to several methods for calculating the loss percentage. All the methods show the same trend, however, so the discussion is mostly about which figure is the most realistic. Figure 9 shows a comparison of the loss percentage per county for the years 2005–2010 in the production of salmonids using the *circulation loss method* and the *average stock loss method* (see Appendix 3 for a more detailed explanation of the differences between these calculation methods).

Figure 9 shows that the trend is the same for both methods. This means that the differences between the counties in average losses in salmonid production for the years 2005 to 2010 are largely the same regardless of which calculation method is used. In its report, the Committee on the Use of Marine Areas by Aquaculture proposes that losses should be a factor that affects how much actual biomass a fish farmer can have. If the losses are low, the fish farmer can have greater biomass, and vice versa. The Norwegian Food Safety Authority supports the Committee's proposal to demand a reduction in biomass at facilities that have a loss percentage exceeding a specified limit.

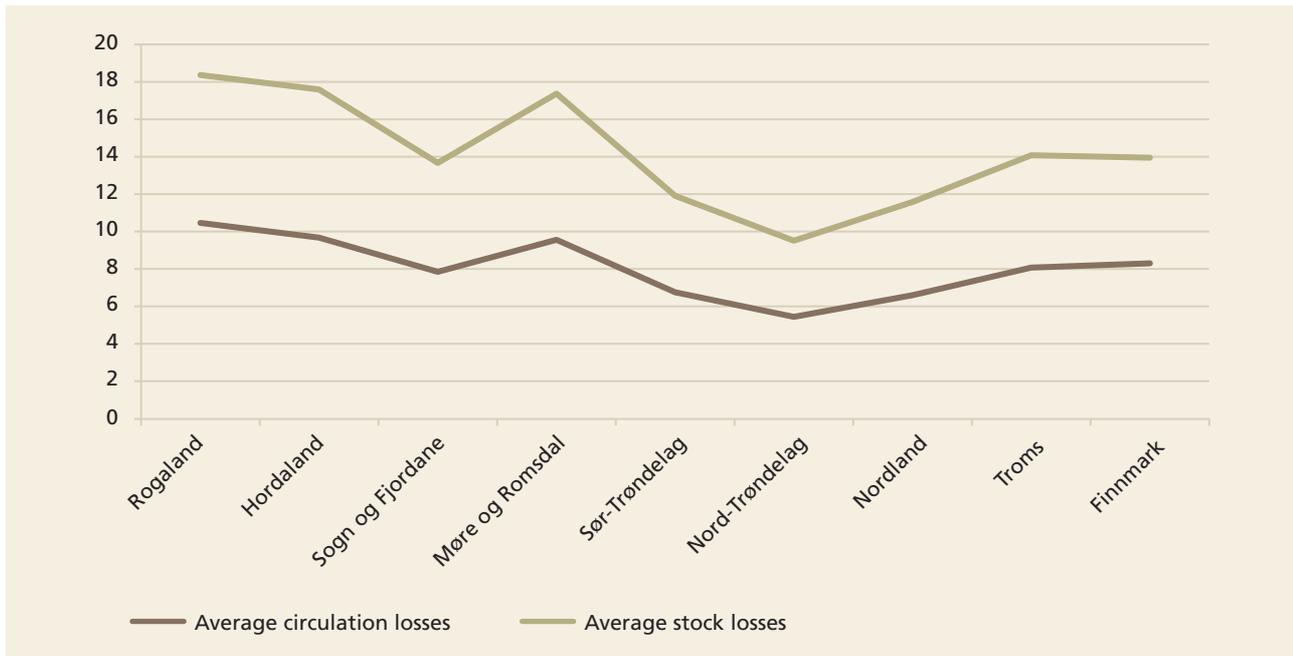
Causes of losses of farmed fish

Losses in the production of marine growers are mainly due to disease, but there are also other reasons why the fish die during production. The Directorate of Fisheries divides the causes of

110) There is some salmon farming in Vest-Agder county. For practical reasons, the statistics for the counties of Rogaland and Vest-Agder have been combined in the Directorate of Fisheries' statistics.

111) *Notat om alternative matematiske modeller for beregning av tapspersent i lakseoppdrett basert på antall fisk (Memo on alternative mathematical models for calculating the loss percentage in salmon farming based on the number of fish)* (2011), published by the Directorate of Fisheries.

Figure 9 Average circulation losses and stock losses in salmonid production for the years 2005 to 2010, as a percentage



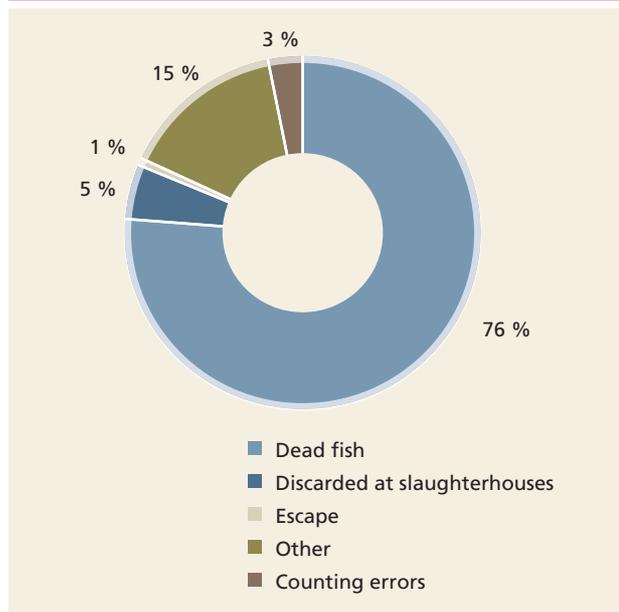
Source: The Directorate of Fisheries and Statistics Norway

losses in the production of marine growers into the following five groups:¹¹²

- *Dead fish*: The number of fish that are physically removed from the cages. The reasons for deaths of this type can be disease, sores, injuries, smoltification (that the fish adapts to life in salt water), normal mortality, algae, jellyfish etc. The figures are reported by the fish farmers.
- *Discarded from slaughterhouses*: The number of fish discarded at slaughterhouses. The fish can be discarded because of sexual maturity, defects etc. The causes can also be disease-related (the Committee on the Use of Marine Areas by Aquaculture's report of 2011). The figures are reported by slaughterhouses.
- *Escape*: The number of reported escaped fish. This figure is based on estimates from fish farmers.
- *Other losses*: The number of fish lost as a result of predators, theft and other, inexplicable reasons. This figure is based on estimates from fish farmers.
- *Counting errors*: The number of fish adjusted in relation to the number originally released.

Figure 10 shows how the different causes of losses of salmonids are distributed at the national level for the period 2007 to 2010.

Figure 10 Losses in the production of salmonids by cause for Norway as a whole, 2007–2010

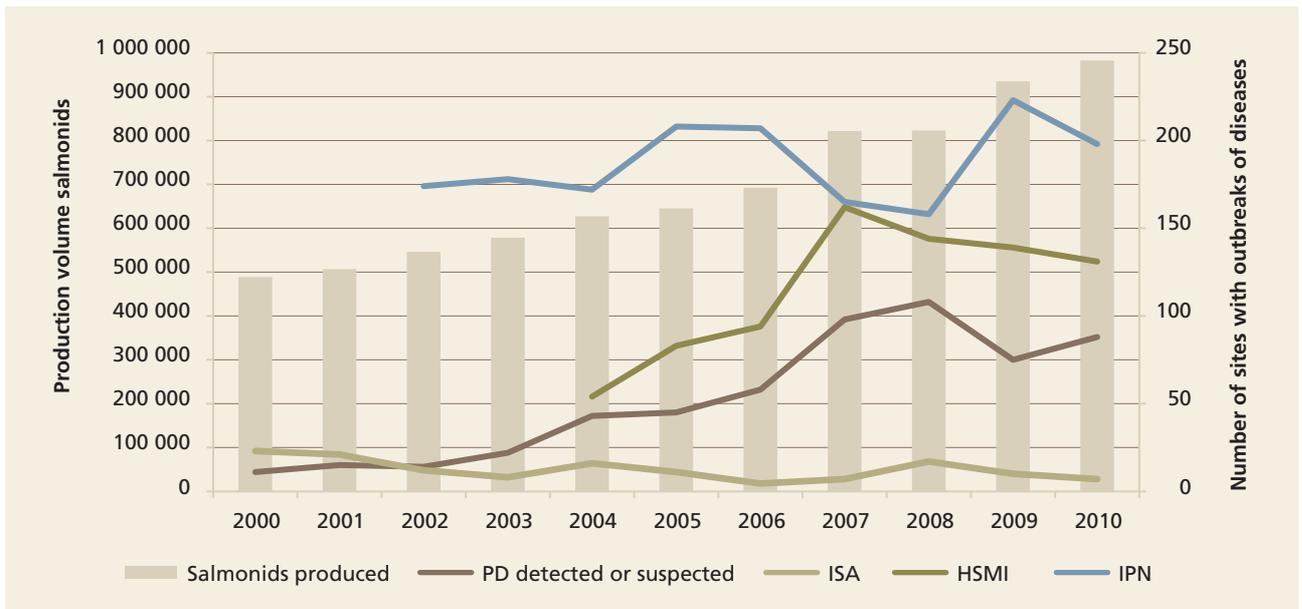


Source: The Directorate of Fisheries

Figure 10 shows that dead fish, which include deaths due to disease, represent the main cause of production losses and were responsible for 76 per cent of losses in the years 2007 to 2010. The reported escapes category accounts for one per cent of reported losses and is the category responsible for the smallest part of the reported losses. Otherwise, the figure shows that the second largest cause of losses category is *other*, which includes production losses as a result of

112) Loss statistics in the aquaculture industry. Published on 8 July 2010. <http://www.fiskeridir.no/akvakultur/aktuelt/2010/0710/statistikk-paa-tap-i-akvakulturnaeringen>.

Figure 11 The number of salmonid sites with outbreaks of diseases compared with salmonid production in tonnes for the years 2000 to 2010



PD = pancreas disease, ISA = infectious salmon anaemia, HSMI = heart and skeletal muscle inflammation, IPN = Infectious pancreatic necrosis
 Source: The Directorate of Fisheries and the Norwegian Veterinary Institute

predators (such as minks, otters, seals, birds (herons and cormorants)), theft or other, unknown causes.

4.2.2 Diseases in the aquaculture industry

As mentioned in connection with Figure 10, disease is presumed to be the most important cause of losses in the aquaculture industry.¹¹³ In the annual health report for salmonids published by the Norwegian Veterinary Institute for 2010, it is stated that a disproportionately high number of fish die during the production phase, and that a large part of these losses is due to infectious diseases and production disorders. In the Norwegian Institute of Marine Research's risk assessment, it is pointed out that fish diseases in aquaculture are a serious problem that results in large financial losses. The health situation for fish in Norwegian fish farming in 2011 is nuanced, and the disease situation is continuously changing, the Norwegian Veterinary Institute stated in an interview. The institute maintains that the disease situation has generally not improved since 2000. There has been a change in the disease situation compared with the 1990s, in that the level of bacterial diseases has dropped significantly, while the incidence of viral diseases and salmon lice has increased. The Norwegian Veterinary Institute emphasises, however, that the production of fish

is growing, which would not have been possible if the health situation had not been at an acceptable level.

The Norwegian Food Safety Authority is formally responsible for disease statistics, but the statistics are mostly prepared by the Norwegian Veterinary Institute. The fish health service¹¹⁴ collects samples at the facilities, and each facility is required to conduct a health check every second month, and if mortality increases. The Norwegian Veterinary Institute believes that this reporting regime works on the whole and is reliable.

In order to develop a better system for reporting diseases and losses, the Ministry of Fisheries and Coastal Affairs has initiated a project, MFISK, in collaboration with the Norwegian Food Safety Authority and the industry, cf. Proposition No 1 to the Storting (2009–2010). In an interview, the Ministry of Fisheries and Coastal Affairs states that the project has not been closed down, but that it has not been given high priority. According to the Committee on the Use of Marine Areas by Aquaculture, the project has not been completed due to difficulties in obtaining data from the industry.

Figure 11 shows the number of salmonid sites that had outbreaks of the most important and

113) The Norwegian Food Safety Authority's area analysis: *Norsk fiskeoppdrett – status og utfordringer, en tilstandsbeskrivelse (Norwegian fish farming – status and challenges. A status report)*, draft of April 2011.

114) All aquaculture facilities must be attached to a fish health service, either a private or a municipal service.

Table 1 Place on list and measures against the diseases shown in Figure 11, in addition to salmon lice

Disease	List	Measure/status
PD	List 3	Separate zone regulations. Goal: to prevent spreading north of Hustadvika (Møre og Romsdal); not eradicate the disease, but limit losses.
ILA	List 2	Adapted to the EU's regulations. Goal: to prevent further spreading, not to eradicate the disease.
HSMI	List 3	No programme of measures. Different administrative practices in the Norwegian Food Safety Authority's regions, only joint guidelines from April 2011. The Norwegian Food Safety Authority wishes to remove the disease from the list, as it has spread along the whole coast.
IPN	No longer listed	No measures. Removed from the list since the implemented measures have not had any documented effect. The disease has spread along the whole coast. There is no longer a duty to report this disease.
Salmon lice	List 3	There are separate regulations for salmon lice.

loss-causing fish diseases – pancreas disease, infectious salmon anaemia, heart and skeletal muscle inflammation and infectious pancreatic necrosis – during the period 2000 to 2010. The figure also shows the development of production volumes for the whole of Norway in the same period.

The figure shows that, while production has increased throughout the period, the number of outbreaks of the different diseases has developed differently throughout the period. While outbreaks of infectious salmon anaemia have been at a relatively stable level throughout the period at between ten and twenty outbreaks each year, pancreas disease has increased strongly since 2000: There were 11 outbreaks in 2000, whereas 88 outbreaks were registered in 2010. There has been a reduction in detected infectious pancreatic necrosis from 2009 to 2010, but it is still high, with 198 registered outbreaks in 2010. There was also a slight reduction in the incidence of the viral disease heart and skeletal muscle inflammation from 2007 to 2010, although it has increased overall since 2004.

Measures against diseases in the aquaculture industry¹¹⁵

In addition to the Food Act's regulations in connection with infectious animal diseases, measures against diseases among farmed fish are regulated by the Placing on the Market and Disease Regulations.¹¹⁶ These regulations contain lists of diseases that are subject to public measures.

115) This section is mainly based on information from the report of the Committee on the Use of Marine Areas by Aquaculture (2011, pp. 75–76) and the Norwegian Food Safety Authority's area analysis *Norsk fiskeoppdrett – status og utfordringer, en tilstandsbeskrivelse (Norwegian fish farming – status and challenges. A status report)*, draft of April 2011 (pp. 63–66).

116) Regulations of 17 June 2008 No 819 relating to the placing on the market of aquaculture animals and products of aquaculture animals, prevention and control of infectious diseases in aquatic animals.

Diseases on lists 1 and 2 are fully harmonised in the EEA area, cf. the EU' fish health directive, while diseases on list 3 are diseases that Norway believes it is important to regulate at the national level. There is no duty to report unlisted diseases.

Diseases on list 1 are diseases that Norway and all other EEA States are declared to be free of.

Diseases on list 2 occur in some EU countries. In the EEA area, there is a shared understanding that diseases on list 2 shall be prevented from spreading to new areas and that, as far as possible, attempts shall be made to expand the areas that as of 2011 are free of these diseases. Of the diseases on list 2, only infectious salmon anaemia occurs regularly in Norway.

The national public measures that apply to diseases on list 3 vary depending on the type of disease. The goal is that plans shall be prepared for measures against all list 3 diseases.

Table 1 presents the list status and applicable measures taken against the most important diseases for salmonids, in addition to salmon lice.

In the following, the implementation of measures against pancreas disease (PD) and salmon lice will be described. The other three diseases are discussed in Fact Box 1 (on the following page).

Pancreas disease (PD)

As of 2011, pancreas disease is described as one of the most serious health problems in the Norwegian aquaculture industry. The disease inflicts large financial losses on the aquaculture industry as a result of high mortality, reduced growth performance and slaughter quality of

Fact Box 1 The extent and combating of the fish diseases infectious salmon anaemia, infectious pancreatic necrosis and heart and skeletal muscle inflammation

Infectious salmon anaemia (ISA)

As of 2010, approximately 480 outbreaks of the viral disease ISA have been registered since it was first registered in Norway in 1984. According to the Norwegian Food Safety Authority, the disease results in big losses for infected facilities. The disease has affected entire industries in other countries that engage in salmon farming, such as Chile and the Faeroe Islands. In Norway, the strategy has primarily consisted of reducing the infection rate and spreading of the ISA virus. According to a risk assessment carried out by the Norwegian Institute of Marine Research, the goal has not been to eradicate the virus, which has been attempted in the Faeroe Islands.

Infectious pancreatic necrosis (IPN)

In an interview, the Norwegian Food Safety Authority also states that IPN causes large losses, and attempts to combat it have not proved successful. According to the Norwegian Food Safety Authority, the available methods have been insufficient, and nor can the authority prove that the measures implemented to combat this disease have had any effect. Some enterprises claim that the measures have been counterproductive. The viral disease was removed from list 3 in 2008, which means that there is no longer any duty to report it. According to the Farmed Fish Health Report 2009, this can result in an increase in under-reporting. According to the Norwegian Veterinary Institute, IPN has spread along the whole coast.

Heart and skeletal muscle inflammation (HSMI)

HSMI is a disease on list 3. The Norwegian Food Safety Authority states in an interview that, as is the case with PD, there are special challenges relating to HSMI. Although HSMI is a disease on list 3 and shall be subject to national measures, no plan to combat the disease is in place. The Norwegian Food Safety Authority maintains that, ideally, combating plans should have been prepared for all diseases on list 3 to ensure as uniform practice as possible. Preparing combating plans is a big job, and the Norwegian Food Safety Authority does not have capacity to prioritise it.

According to the Norwegian Food Safety Authority, endeavours have been made to combat HSMI, but the administrative practice has varied between different regions. For example, facilities in which HSMI has been detected in Finnmark county have been subject to more stringent regulations than facilities in other parts of the country because Finnmark had an ambition to keep the area free of the disease. The Norwegian Food Safety Authority cannot document that the measures implemented against this disease have had any effect, and it has therefore proposed that HSMI should be removed from the list.

infected fish that survive.¹¹⁷ The Norwegian Food Safety Authority states in an interview that PD is probably the viral disease that results in the biggest financial losses in the aquaculture industry and that it is one of the most loss-causing of all animal diseases. In an interview, the Directorate of Fisheries maintains that fish farmers in Western Norway reckon on losses as a result of PD and compensate by releasing extra smolt.

PD cannot be treated, but several measures have been implemented to combat the disease. The disease was included on list 3 in December 2007. On that basis, a national programme of measures was established in November 2007 through zone regulations.¹¹⁸ The regulations apply to the counties of Rogaland, Hordaland, Sogn og Fjordane and Møre og Romsdal north to Hustadvika. The

purpose of the regulations is to prevent and limit the spreading of the virus that results in PD to outside the zone and to prevent, control and limit the consequences of PD in salmonids inside the area covered by the regulations. Among other things, the regulations contain strict requirements for the moving of fish to and from the PD zone, and requirements for coordinated fallowing in biosecurity areas.

Of the counties covered by the regulations, it is especially Hordaland and Rogaland that have had outbreaks of PD. In 2010, 68 of a total of 88 outbreaks took place in these two counties. Table 2 shows the extent of PD in the area covered by the regulations for the years 2008 to 2010.

Table 2 shows that Rogaland had the biggest proportion of sites with outbreaks of PD in 2010, at 28.8 per cent. That is a big increase from 2009, when the proportion in this county was approximately 11 per cent. In Hordaland, which is the

117) Profitability survey 2008 (p. 10), published by the Directorate of Fisheries, and Proposition No 1 to the Storting (2010–2011) (p. 94).

118) Regulations of 20 November 2007 No 1315: Regulations relating to a zone to prevent infection and combat pancreas disease in aquatic animals.

Table 2 The number of sites with PD outbreaks in Western Norway during the period 2008–2010

	Number of sites 2008	Number of sites with PD outbreaks in 2008, as a percentage	Number of sites 2009	Number of sites with PD outbreaks in 2009, as a percentage	Number of sites 2010	Number of sites with PD outbreaks in 2010, as a percentage
Møre og Romsdal	110	18.2	105	6.7	107	6.5
Sogn og Fjordane	106	10.4	99	11.1	96	13.5
Hordaland	211	25.1	197	23.4	203	23.2
Rogaland	63	31.7	64	10.9	73	28.8
Total	490	21.2	465	15.3	479	18.4

Source: The Directorate of Fisheries and the Norwegian Veterinary Institute

county with the most outbreaks overall, the proportion of PD outbreaks was around 23–25 per cent during the period 2008 to 2010. Altogether, just over 18 per cent of the sites in the four counties in Western Norway had PD outbreaks in 2010, which is a slight increase from 2009, but a reduction from the peak year of 2008, when more than 100 PD outbreaks were registered in the four counties.

In an interview, the Norwegian Food Safety Authority states that the PD situation in Western Norway is worse than it was ten years ago. The border set at Hustadvika has worked well with respect to preventing infection outside of the zone, and there have been no PD problems north of Hustadvika since 2010. Inside the zone, however, the regulations have not worked as intended, and the expectations of the effect of the regulations have not been met. The Norwegian Food Safety Authority states that the goal was not to eradicate the disease through introducing the regulations, but to limit losses. This has not succeeded, according to the Norwegian Food Safety Authority. In the Norwegian Food Safety Authority's assessment, however, the situation would have been worse if the regulations had not been introduced.

In an interview, the Ministry of Fisheries and Coastal Affairs states that the PD zone regulations have worked as intended by having both prevented PD from spreading north of Hustadvika and contributed to making the problem tolerable for the fish farmers within the zone. The regulations were not designed to solve the PD problem, and the ministry emphasises that it is not possible to eradicate this problem by means of regulations.

Salmon lice

Salmon lice occur naturally on salmon in salt water. Salmon lice have been described as a

problem in the aquaculture industry since the mid-1990s. At the end of the 1990s, the number of lice per fish could be higher than was the case in 2011. In an interview, the Norwegian Food Safety Authority states that the lice level was reduced as a result of several measures and that it was at an acceptable level up until the mid-2000s. At the end of the 2000s, monitoring showed that the lice level was increasing, and in autumn 2009 the salmon lice situation escalated at the national level because the number of hosts was higher than in the 1990s. The Norwegian Food Safety Authority also reported that, in addition to the increase in the number of lice in aquaculture facilities, there was also an increase in resistance to delousing agents.

As of 2011, salmon lice are described as the most serious health problem in the Norwegian aquaculture industry. In Proposition No 1 to the Storting (2010–2011) for the Ministry of Fisheries and Coastal Affairs, it is maintained that the salmon lice situation will require special attention and follow-up both in the short and the long term. Although salmon lice can occur naturally on wild salmon, the amount of salmon lice has increased considerably in step with the growth of the aquaculture industry. Salmon lice result in reduced welfare for both farmed fish and wild fish and will lead to fish mortality if the number of lice becomes too great. Salmon lice result in financial losses for fish farmers.

According to Proposition No 1 to the Storting (2010–2011), salmon lice are not a health problem for farmed fish, but the total amount of salmon lice in aquaculture facilities can constitute a threat to wild fish (cf. the discussion in chapter 4.1).

There are also regional differences as regards the prevalence of salmon lice. There are few salmon lice in the counties of Troms and Finnmark.

According to the Norwegian Food Safety Authority, the amount of salmon lice in the rest of the country is high in places, while resistance to delousing agents is an increasing problem south of Bodø, although to a varying degree. In the southern part of Nordland county, in Nord-Trøndelag county and in the Sunnhordland district, there are problems with multi-resistance, which means that the salmon lice are resistant to several of the delousing agents. In an interview, the Norwegian Veterinary Institute maintains that the areas where the biomass is greatest also have the highest amounts of salmon lice.

Combating salmon lice

The purpose of the Sea Lice Regulations is to combat sea lice in aquaculture facilities in order to minimise the harm to fish in aquaculture facilities and wild fish. They are also intended to reduce the development of resistance in lice. The Sea Lice Regulations contain requirements for the counting and reporting of sea lice, for treatment if the specified threshold values are exceeded, and measures in the event of suspected or detected resistance to delousing agents.

In addition to the Sea Lice Regulations, regulations have been issued concerning coordinated spring delousing.¹¹⁹ The purpose of these regulations is the same as for the Sea Lice Regulations. According to the Norwegian Food Safety Authority, there are indications that coordinated spring delousing did not reach its goal of as low infection pressure as possible when the smolt migrated in spring 2011. The reason for this may be a too long delousing period, inadequate coordination of the use of certain delousing agents and that certain areas have too many farmed fish.

According to Proposition No 1 to the Storting (2010–2011), the increase in the number of salmon lice in aquaculture facilities, and to a certain extent the big delousing campaigns in the winters of 2009/2010 and 2010/2011 implemented to reduce the environmental load on migrating salmon smolt, led to a big increase in the consumption of delousing agents. The consumption of delousing agents increased from 218 kg in 2008 to 6,454 kg in 2010. In addition, 308 tonnes and 3,071 tonnes of hydrogen peroxide were used in 2009 and 2010, respectively. It is not only the quantity that increased, but also the number of agents. Because of the increase in resistance to certain delousing agents, several agents that have

not been used for several years have been reintroduced. The increase is also due to the fact that some of the agents that have been reintroduced must be used in much greater amounts, since the different agents vary greatly with respect to their efficacy.¹²⁰

The Norwegian Institute of Marine Research also refers to the extensive measures implemented by the industry to limit the lice level, but it also points out that production has increased to a level that negates much of the effect of the work of combating salmon lice in several regions. In the questionnaire survey sent to eight of the Norwegian Food Safety Authority's district offices, several of the district offices state that, overall, the sea lice regulations are not sufficient to combat lice.

The Norwegian Food Safety Authority points out that most of the lice occurring in production are lawful, in the sense that the amount is below the limits for implementing measures that follow from regulations. The Norwegian Food Safety Authority's head office states in an interview that the current regulations for sea lice have not worked in an optimal manner, and that the authority is therefore in the process of revising them as of 2011. At the same time, the Norwegian Food Safety Authority emphasises that a great deal of the regulations introduced to combat sea lice are pioneering work, and that, since the lice situation is constantly changing, drafting regulations and evaluating whether they work as intended is demanding work.

On the basis of the challenges posed by diseases, including sea lice, the Norwegian Food Safety Authority maintains in its status report of 2011 that the existing system for regulating production does not stimulate optimal operation with respect to fish health and fish welfare.

The authority's district offices call for more focus on areas and more coordination to combat diseases in the aquaculture industry, including sea lice. Some district offices point out that the spread of disease is difficult to control through regulations, but that the more hosts/fish there are in the sea, the more difficult it is to combat disease.

According to the Ministry of Fisheries and Coastal Affairs, increasing focus is being placed on the area environmental load. The special regu-

119) Regulations of 17 December 2010 No 1703: Regulations relating to coordinated treatment against salmon lice in winter and spring 2011.

120) The Norwegian Food Safety Authority's area analysis: *Norsk fiskeoppdrett – status og utfordringer, en tilstandsbeskrivelse (Norwegian fish farming – status and challenges. A status report)*, draft of April 2011 (p. 43).

lations that apply to the Hardangerfjord – issued pursuant to the Aquaculture Act and the zone regulations¹²¹ issued pursuant to the Food Act – are examples of this.

Fact Box 2 The Hardangerfjord

The Hardangerfjord is the area in Norway with the densest concentration of aquaculture facilities, with production of approximately 58,000 tonnes in 2008. This figure means that there are more than 50,000 times as many farmed fish as wild fish in the fjord basin. It was documented already in 2004 that the situation was critical for salmon and sea trout in the Hardangerfjord as a result of the salmon lice level. The Norwegian Institute of Marine Research therefore recommended that either the amount of farmed salmon in the fjord must be reduced or the amount of salmon lice on the farmed fish must be reduced. Since 2004, the amount of farmed salmon in the fjord has almost doubled. In a report from the Norwegian Institute of Marine Research, it is concluded that the measures implemented against salmon lice have probably not been effective enough because of the production increase in salmonid farming.¹²² Against this background, a freeze was introduced on the allocation of licences for new facilities or the expansion of existing sites in the Hardangerfjord from April 2008.¹²³ Despite the fact that the situation was frozen in the Hardangerfjord in 2008, figures from the Directorate of Fisheries show that the production of farmed salmon is still increasing, and that approximately 70,000 tonnes of salmonids were produced in this area in 2009. In April 2010, on the basis of documentation from the EPIGRAPH project (a research project on, among other things, the critical situation for wild salmon and sea trout stocks in the Hardangerfjord), the Directorate of Fisheries, the Norwegian Food Safety Authority, the Directorate for Nature Management and Hordaland County Council requested that proposals for immediate measures be considered in order to safeguard salmonids in the Hardangerfjord, pending more permanent solutions. The report concludes that the sustainability strategy's goal that disease in fish farming shall not have a regulating effect on stocks of wild fish has not been met in the Hardangerfjord basin, and that the trend is moving in the opposite direction, despite the extensive measures implemented against escapes and salmon lice.

121) Regulations of 14 July 2010 No 1123.

122) *Prioriterte strakstiltak for sikring av ville bestander av laksefisk i Hardangerfjordbassenget i påvente av langsiktige forvaltningsiltak (Prioritised immediate measures to safeguard wild salmonid stocks in the Hardangerfjord basin pending long-term management measures)*. Report from the Norwegian Institute of Marine Research No 10-2010.

123) *Havforskningstema 1-2009. Hardangerfjorden under lupa; Interaksjoner mellom økosystem, akvakultur, bæreevne og klimaendringer. (A closer look at the Hardangerfjord: Interactions between ecosystems, aquaculture, carrying capacity and climate change)*.

4.2.3 The spread of disease between farmed fish and wild fish

As previously mentioned, it is a goal that diseases in fish farming shall not have a regulating effect on stocks of wild fish, cf. among other things Proposition No 1 to the Storting (2009–2010) and Proposition No 1 to the Storting (2010–2011) for the Ministry of Fisheries and Coastal Affairs. In order to prevent diseases in connection with aquaculture from affecting wild fish stocks, the infection pressure from farmed fish to wild fish must be reduced (cf. among other things Proposition No 48 to the Storting (1994–95) *Havbruk – en drivkraft i norsk kystnæring (Aquaculture – a driving force in Norway's coastal economy)*).

In interviews, the Norwegian Food Safety Authority, the Norwegian Veterinary Institute, the Ministry of the Environment and the Norwegian Institute for Nature Research maintain that, in general, too little is known about the disease situation for wild fish such as salmon and cod, except for how salmon lice affect the fish. All infectious diseases originally come from wild fish, but there is inadequate knowledge about how disease in farmed fish is spread to wild fish. The Norwegian Institute of Marine Research has started a work on obtaining more knowledge about the possible spreading of diseases from farmed fish to wild fish.

4.2.4 Fish welfare and production diseases

The purpose of the Animal Welfare Act is to promote good animal welfare and respect for animals, including fish. It is pointed out that animals have an intrinsic value over and above the utility value they may have for people. Animals shall be treated well and protected against the risk of unnecessary stress and strain.

Good health is a prerequisite for good fish welfare. Although reduced mortality in fish farming is seen as a critical success factor in the work on animal welfare,¹²⁴ simply registering dead fish or the survival rate does not provide significant information about fish welfare. For example, the current levels of salmon lice do not result in mass deaths among farmed fish, but they do result in reduced welfare. In the Norwegian Institute of Marine Research's risk assessment, it is pointed out that fish welfare is not highlighted in the sustainability strategy. Pursuant to the

124) The Norwegian Food Safety Authority's area analysis: *Norsk fiskeoppdrett – status og utfordringer, en tilstandsbeskrivelse (Norwegian fish farming – status and challenges. A status report)*, draft of April 2011 (p. 45).

Ministry of Fisheries and Coastal Affairs' allocation letter to the Norwegian Institute of Marine Research for 2010, the institute shall develop operational welfare indicators for farmed fish in accordance with priorities from the Norwegian Food Safety Authority. Because there are no such indicators in place as of September 2011, there is no systematic documentation of the welfare of farmed fish.

In addition to infectious diseases and parasites, production diseases are also found in farmed fish. Examples of production diseases include deformed spines and other disfigurements, unspecific sores, bowel problems, (grey) cataract, side effects of vaccines, and wear and tear on fins. In an interview, the Norwegian Veterinary Institute states that statistics for production diseases in farmed fish are not collected systematically, and that little information is therefore available about the level and development of production-related diseases in the fish.

4.2.5 Effects on profitability

Diseases in aquaculture result in financial losses for the industry: Diseased fish either show poorer growth performance and reduced slaughter quality, or they die. Large fish that die entail particularly big losses for the fish farmer as a result of increased production costs per kilo produced fish. There are also costs relating to medication: in recent years, such costs have been related to delousing agents in particular. According to the Norwegian Food Safety Authority, salmon lice are an important reason for financial losses in the aquaculture industry. The report of the Committee on the Use of Marine Areas by Aquaculture includes some calculations based on losses in salmonid production for 2008, which amounted to 49.3 million fish. This results in the following figures:

- The value of smolt alone was NOK 400 million.
- If it is assumed that the average size of lost fish was one kilo (most of the fish die shortly after being released into the sea), the production costs for the fish that died would amount to NOK 550 million.
- The loss of income from the lost fish seen in relation to a hypothetical situation in which the fish had lived until slaughter age has been estimated to be NOK 4.9 billion.

The report maintains that the favourable market situation for salmonids in the period 2007 to 2010, as a result, among other things, of the big losses in the aquaculture industry in Chile, made

it possible for Norwegian fish farmers to record good profits despite relatively big losses.

The Directorate of Fisheries' annual profitability surveys can give an indication of whether the regional differences in the loss and disease statistics are reflected in the profitability of salmonid production in salt water. The figures largely show that the counties of Sør-Trøndelag, Nord-Trøndelag and Nordland, which have the lowest loss figures, are the counties with the best average profitability since the mid-2000s. Some companies also report that disease (particularly pancreas disease and infectious salmon anaemia) is the reason for poorer financial performance in some years. The Directorate of Fisheries also points out that the poorer financial performance in Southern Norway in 2005 and 2006 compared with the counties of Trøndelag and Nordland probably reflects the PD situation in the region.¹²⁵

4.3 Pollution and discharges

Pursuant to the Pollution Control Act, it is prohibited to implement measures that can result in a risk of pollution, unless permission has been granted by the pollution control authority. It has been a requirement for several years that pollution from aquaculture shall not exceed the recipient's tolerance limit. In Report No 48 to the Storting (1994–95) *Havbruk – en drivkraft i norsk kystnæring* (Aquaculture – a driving force in Norway's coastal economy), it is pointed out that priority has been given to the work of limiting discharges of pharmaceuticals, chemicals and organic pollution, and of ensuring proper handling of waste and by-products. It is also stated that the effect on the recipient of organic substances and nutrient salts shall be below stipulated values. As of 2011, no such values have been stipulated.

In Proposition No 1 to the Storting (2010–2011) for the Ministry of Fisheries and Coastal Affairs, it is stated that knowledge about tolerance limits in fjord areas and the development of indicators for discharges from aquaculture facilities will be prioritised. Reference is made to the fact that knowledge is needed about the environmental impacts of discharges of organic material, nutrient salts, chemicals and pharmaceuticals from fish farming on the surrounding environment. Pursuant

¹²⁵ *Fiskeridirektoratets anbefalinger vedrørende områder som vurderes som mindre aktuelle for økning av oppdrettsvirksomhet. Tildelingsrunde 2009 (The Directorate of Fisheries' recommendations for areas that are considered not to be advisable for an increase in aquaculture activities. Allocation round 2009)* (p. 20).

Table 3 Different types of discharges from aquaculture

Discharges from aquaculture		
These discharge types will affect the seabed and the water in different ways		
1 Organic material a) Waste feed and faeces that fall to the seabed, i.e. feed that is not eaten and fish excrement that sinks to the ocean floor. b) Floating particles from waste feed and faeces.	2 Nutrient salts a) Dissolved substances (phosphorus and nitrogen) that follow the water bodies and can lead to increased algae growth.	3 Chemicals and metals a) Chemicals in the form of pharmaceuticals. b) Copper used to impregnate the nets.

to the sustainability strategy, the Government's goal is that all fish farming sites shall maintain an acceptable environmental standard and not discharge nutrient salts and organic material in excess of what the recipient can tolerate. Table 3 shows how discharges from fish farms to the surrounding environment can roughly be broken down:

In connection with aquaculture, the county governors grant discharge permits in individual cases, cf. chapter 5.2. In the processing of applications for discharge permits, the county governors shall assess whether pollution from the facility will exceed the recipient's tolerance limit. The discharge permits are indirectly regulated through the maximum allowed biomass, which means that a fish farmer can have discharges that are in proportion to the amount of fish in the facility. Discharges are thus not regulated by the amount of feed, discharges of organic material or nutrient salts. In principle, an aquaculture facility that has good control of feeding can discharge less organic material than an aquaculture facility with an inferior feeding regime, even if both facilities have the same limitation on biomass. There are no requirements for the collection or treatment of discharges from aquaculture. Nor is a permit required to discharge chemicals from pharmaceuticals at facilities. In discharge permits issued pursuant to the Pollution Control Act, the practice has been to only stipulate general conditions for the handling of chemicals and pharmaceuticals – mainly related to the handling of waste – and to not include specific requirements relating to discharges. The possible negative environmental impact from pharmaceuticals is discussed and regulated to as low a level as practically possible through treatment recommendations (recommended dosages and methods of use) for the individual pharmaceuticals.

In the following, the extent of discharges from the aquaculture industry will be described broken down by organic discharges, discharges of nutrient salts and discharges of chemicals and copper, respectively.

4.3.1 Discharges of organic material

The seabed under and surrounding fish farms is affected by waste feed, i.e. the feed that goes uneaten, and faeces, i.e. fish excrement. A distinction is often made between heavier particles that fall to the seabed and floating particles that are spread around the facility to a somewhat greater extent. The degradation of organic material requires oxygen. Lack of oxygen arises when discharged organic material uses more oxygen for degradation than the amount of oxygen that is supplied by the bottom current. This can result in the development of toxic gases that kill benthic animals and affect the welfare of the fish in the cage. Organic material can also contribute to over-fertilisation and lead to sedimentation, which can be harmful to vulnerable species and biotopes.

Monitoring of discharges of organic material

The monitoring of organic discharges from the aquaculture industry takes place through a mandatory environmental monitoring system – a so-called MOM B survey¹²⁶ – before start-up and as a regular procedure in the operating phase at each aquaculture facility.¹²⁷ The legal authority to require environmental surveys follows from the Section 35 of the Aquaculture Operation Regulations. The impact of the aquaculture facility shall not be so great as to prevent benthic animals from living in the sediments. The main purpose of introducing the MOM system was to

126) "Miljøovervåking av bunnpåvirkning fra marine akvakulturanlegg" (Environmental monitoring of seabed impact from marine aquaculture facilities) – Norwegian standard 9410.

127) The results of the environmental surveys shall be included in the aquaculture application and also be submitted to the authorities in the operating phase via Altinn.

develop a management system to calculate maximum production and thereby discharges from fish farms based on the carrying capacity of the site. The bottom current that spreads the particles from the facility and that brings oxygen necessary for the degradation processes is the most important factor in relation to a facility's carrying capacity.

The MOM system distinguishes between four environmental states: Environmental state 1 means that there is little impact on the environment, while state 4 means that the environmental load is excessive. In state 4, the impact is so great that the benthic fauna has disappeared. The environmental state registered in the survey determines how often the survey must be carried out during the operating phase.¹²⁸

Based on 332 MOM B surveys for the whole of Norway during the period 2008 to 2010, it can be concluded that the environmental state under and near the facilities is generally good in all counties. Over 90 per cent of the facilities are in environmental state 1 or 2, which means little or some impact, while only two facilities are in environmental state 4, which means an excessive environmental load. According to the Norwegian Institute of Marine Research's risk assessment, there is no indication at the county level that organic material from fish farming has an excessive impact on the seabed. The Norwegian Climate and Pollution Agency states in an interview that the MOM B surveys from the fish farmers do not constitute a sufficient basis for drawing conclusions about the environmental status at county level. The agency generally refers to regions within county borders where pollution from fish farming is a problem. It states that assessments should therefore be made of individual fjord systems and that conclusions should not be drawn about national conditions as the fjords can be very different.

According to the Norwegian Institute of Marine Research, as the 2000s progressed, knowledge about the local effects of organic discharges, such as the risk of local over-fertilisation in areas with poor water replacement, resulted in facilities being established further out nearer the coast where the current and water replacement conditions are favourable, and not far up fjords, as was more common in the 1980s and 1990s.

128) In environmental state 1, new samples must be collected every second year; in environmental state 2, new samples must be collected every year; in environmental state 3, a survey must be carried out every six months; and in environmental state 4, an extended MOM B survey must be carried out.

Some of the assumptions on which the MOM system was based when it was developed have now changed. Eight of the county governor offices maintain that MOM B surveys have several limitations and that they therefore do not always give a correct picture of the state of the environment at a site. There are several reasons, for example that the MOM B system was originally developed to evaluate small fish farms on flat soft seabeds, while today's fish farms are more often situated on hard seabeds. In addition, the seabed can slope, so that the discharges fall outside the area where samples are collected. Several of the county governor offices have therefore called for the MOM B system to be changed. In an interview, the Ministry of Fisheries and Coastal Affairs also maintains that the MOM system, as it was used in 2011, does not give an accurate picture of the state of the environment at and around individual sites.

In addition to the mandatory MOM B survey, an MOM C survey has been developed, which maps the condition of a larger area of the seabed around the facility than the MOM B survey. MOM C surveys are not mandatory for all fish farms, but they can be required by the county governors if this is deemed necessary, for example in connection with applications to expand the biomass at large facilities. There are no systematic overviews of the results of MOM C surveys. The responses to the questionnaire survey distributed to the county governor offices also show that practice differs from office to office with respect to the extent to which MOM C surveys or corresponding environmental surveys are requested. However, the trend is that MOM C surveys are requested more often than previously. The Norwegian Climate and Pollution Agency sent a proposal to the Ministry of the Environment in 2009 concerning amendments to the regulations relating to aquaculture enterprises. Among other things, an increase in the use of MOM C surveys is proposed. As of September 2011, this proposal is still under consideration by the Ministry of the Environment, and a deadline has not been set for when a proposal will be distributed for consultation.

In 'Felles instruks til Fiskeridirektoratets regionkontor og Fylkesmannen' (Joint instructions for the regional offices of the Directorate of Fisheries and the county governors) prepared by the Norwegian Climate and Pollution Agency and the Directorate of Fisheries, there are some limitations on the right to request extended environ-

mental surveys. In the opinion of the Norwegian Climate and Pollution Agency and several of the county governor offices, these joint instructions limit their use of the Pollution Control Act and they want the instructions to be updated and changed to lower the threshold for requesting further surveys.

According to the report of the Committee on the Use of Marine Areas by Aquaculture, the lack of knowledge and the degree of uncertainty is greatest as regards the regional effects of organic discharges. Because the facilities are becoming bigger and are situated in clusters separated by larger zones, cumulative regional effects may arise that require a different type of monitoring than is practised through the MOM system. In its risk assessment, the Norwegian Institute of Marine Research states that, as of 2011, there is no good method for monitoring organic material on deep hard seabeds.

4.3.2 Discharges of nutrient salts

Nitrogen and phosphorus are the nutrient salts discharged from fish farms, and they can have an impact on the environment. Discharges of nutrient salts can lead to an increase in algae growth and to over-fertilisation, hereinafter referred to as eutrophication,¹²⁹ of the water bodies. Increased algae growth leads to increased degradation of the algae biomass, which, together with reduced light penetration in the water, can result in a lack of oxygen and changes to the ecosystem. Increased algae growth will be limited to the layers of water where light can penetrate, but dead material will sink and be degraded further down, so that the impact in the form of a reduced oxygen level etc. will take place in deeper-lying layers and on the seabed.

Monitoring of discharges of nutrient salts

Discharges of nutrient salts are monitored through a central government programme for the monitoring of pollution. The Norwegian Climate and Pollution Agency is responsible for implementation of the programme, which is intended to meet the authorities' need for information about pollution conditions, register the effect of measures and form the basis for assessing new measures. There is no overall national monitoring of the amount of nutrients discharged from fish farms and of any regional and national effects of such discharges.

129)) Eutrophication of the pelagic zone is often defined as a 50 per cent increase in the phytoplankton biomass compared with values in the sea or historical references (OSPAR 2005).

The Riverine Inputs and Direct Discharges Programme (Elvetilførselsprogrammet)

The figures for total discharges mainly come from the *Riverine Inputs and Direct Discharges Programme*, which has metering stations in 46 selected locations in Norwegian watercourses. The programme is intended to provide an annual quantitative assessment of all input from watercourses, surface run-off and direct discharges of selected pollution components to coastal and ocean areas covered by the Oslo and Paris convention (OSPAR).¹³⁰ On the basis of these figures, theoretical calculations are made of how much the total discharges for the whole country will amount to, through the programme *Endringer i menneskeskapte utslipp av næringssalter til kystområdene (Changes in anthropogenic discharges of nutrient salts to the coastal areas)* (TEOTIL). Production figures from the industry are used to calculate the proportion of the total discharges that come from fish farming.

Figures 12 and 13 (on the following page) show the development of the total discharges of nitrogen and phosphorus, respectively, and the proportion of discharges from the aquaculture industry in the period 2000 to 2009.¹³¹

The figures show that discharges from aquaculture have more than doubled in the period 2000 to 2009. Discharges of phosphorus and nitrogen from sewage, industry and agriculture have also increased slightly in the same period, except for nitrogen discharges from industry, which have decreased. Nitrogen discharges from aquaculture accounted for more than 50 per cent of inputs in 2009. In relation to phosphorus, discharges from aquaculture accounted for 83 per cent of inputs in 2009. The corresponding figures for nitrogen and phosphorus in 2000 were 34 per cent and 69 per cent, respectively.

For regional differences in discharges of nutrient salts, see Appendix 4.

Uncertainty about the effects of discharges of nutrient salts from aquaculture¹³²

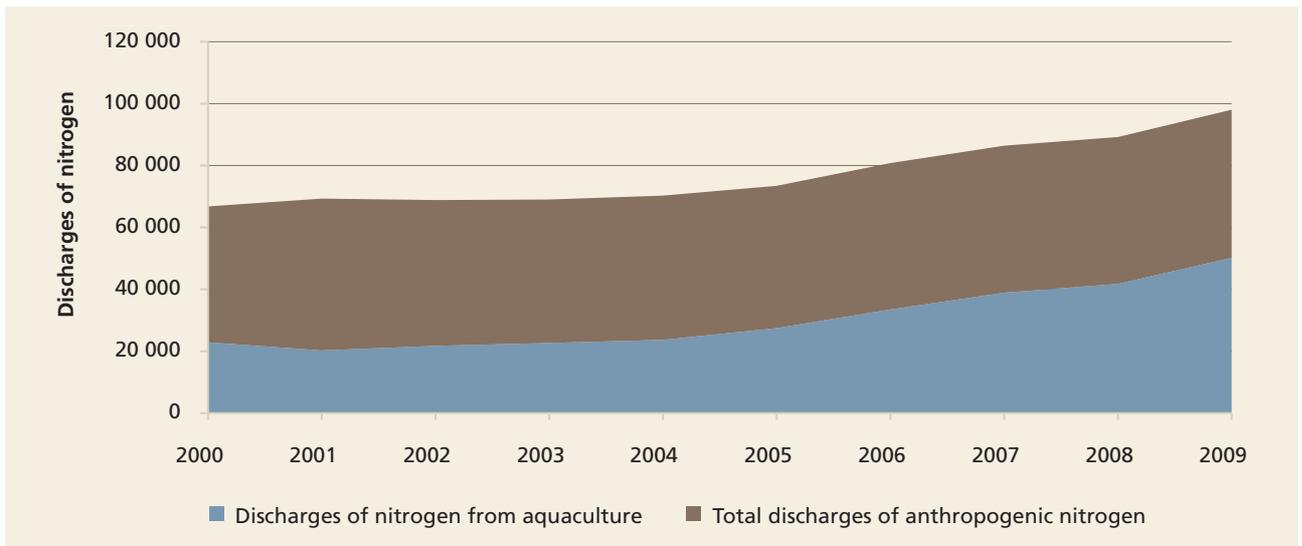
In interviews, the Ministry of Fisheries and Coastal Affairs and the Ministry of the Environment state that particularly little is known about the cumulative effects and impact of discharges of

130) The Convention for the Protection of the Marine Environment of the North-East Atlantic. Signed in 1992.

131) The figures for 2010 were not available as of May 2011.

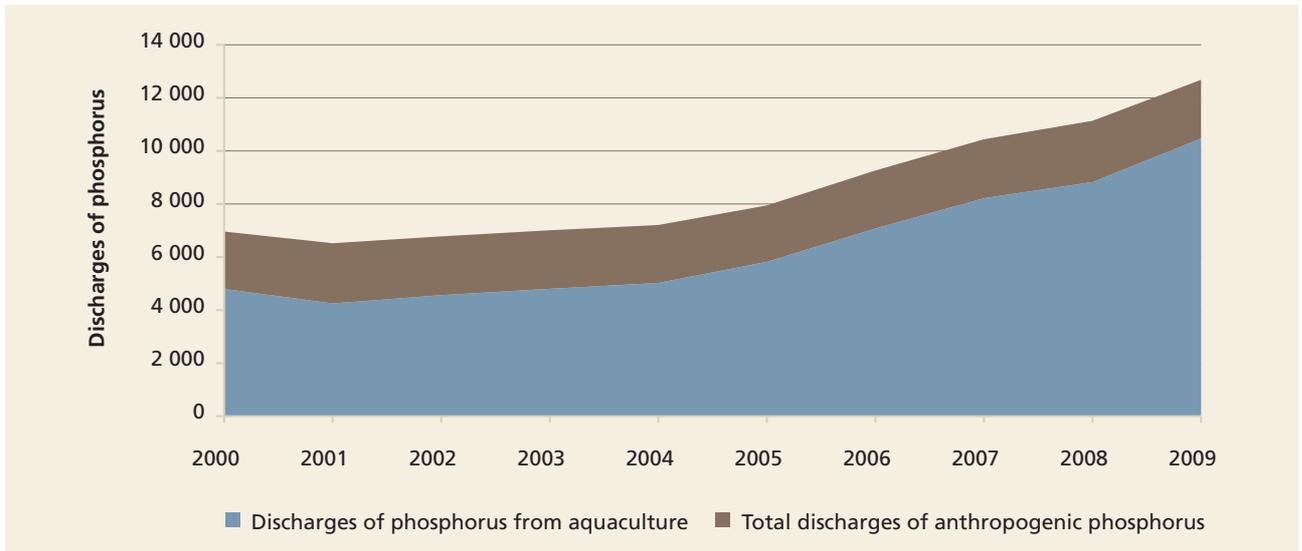
132) Appendix 4 provides an overview of differences between the counties in relation to discharges of nutrient salts.

Figure 12 Discharges of nitrogen to Norway's coastal areas during the period 2000 to 2009, in tonnes



Source: TEOTIL and the Directorate of Fisheries

Figure 13 Discharges of phosphorus to Norway's coastal areas during the period 2000 to 2009, in tonnes



Source: TEOTIL and the Directorate of Fisheries

nutrient salts from fish farming in an area perspective. This lack of knowledge has contributed to the differences in views found in the government administration and among expert communities about what (regional) consequences discharges of nutrient salts from fish farming have for water quality and the environment.

While the Norwegian Climate and Pollution Agency and the Norwegian Institute for Water Research (NIVA) emphasise that discharges from fish farming are the biggest anthropogenic source of nutrient salts discharges, cf. Figures 12 and 13, and link them to the retreat of sugar kelp (*Saccharina latissima*) in Western Norway, the

Norwegian Institute of Marine Research points out that discharges from fish farming only account for a very small percentage of the total input of nutrient salts to the coast. The Norwegian Climate and Pollution Agency expresses concern that increased discharges from fish farming, in combination with the rising sea temperature, may lead to over-fertilisation problems. In the worst case, such a situation could lead to fewer marine animals and plants and a lifeless seabed. The Norwegian Climate and Pollution Agency states in an interview that, even though discharges from fish farming account for a minor part of the cumulative impact, the extra impact from fish farming can have a negative effect on a recipient

that is already being affected by other sources. The extra impact can be critical at both the local and regional level. In the Norwegian Institute of Marine Research's risk assessment, it is stated that, based on current knowledge about the size of the discharges seen in relation to water replacement and naturally transported nutrients, the risk of regional over-fertilisation of the pelagic zones is low in all counties.

In a questionnaire and interview survey of all the county governor offices along the coast from Rogaland to Finnmark, it was asked whether the county governors deemed discharges to place limits on further growth of the aquaculture industry. Five of the county governor offices maintain that discharges of nutrient salts are not in themselves a limiting factor on further growth of the aquaculture industry, but they also stress that there is insufficient research and monitoring in this area. Some of the county governor offices state that they do not have the underlying material required to answer the question.

Expert committee on eutrophication

Because of disagreement about the eutrophication situation along the coast, the Ministry of Fisheries and Coastal Affairs and the Ministry of the Environment appointed an expert committee to look into the nutrient salts situation in the Hardangerfjord and Boknafjord. The committee has arrived at a view regarding the level and importance of discharges.¹³³ The group consisted of experts from the University of Oslo, the University of Bergen, the Norwegian University of Science and Technology, the Norwegian Institute of Marine Research and the Norwegian Institute for Water Research. The report was completed in December 2011.

4.3.3 Discharges of pharmaceuticals and other chemicals

In addition to discharges of organic material and nutrient salts that are a natural consequence of the operation of fish farms, copper used to impregnate nets and chemical substances from various pharmaceuticals are also discharged. The sustainability strategy states that discharges of such substances have unwanted environmental impacts and that their use must be reduced. In that connection, the Ministry of the Environment

refers to the BAT principle¹³⁴ which states that, in connection with pollution problems, the technology that produces the best results shall be used. The ministry also refers to the work initiated by the Norwegian Climate and Pollution Agency on finding new technical solutions in order to reduce discharges.

Discharges of pharmaceuticals

The government administration has a good overview of the use of pharmaceuticals. All pharmaceuticals prescribed for fish and animals must be reported to the Norwegian Food Safety Authority. The Norwegian Institute of Public Health also keeps statistics of the sale of pharmaceuticals for farmed fish. There has been a substantial reduction in the use of antibacterial agents in the aquaculture industry since effective vaccines against bacterial diseases were developed in the early 1990s. According to the Norwegian Climate and Pollution Agency, delousing agents are the biggest discharge problem in the aquaculture industry as of 2011.

The delousing agents diflubenzuron and teflubenzuron have been used in the fish farming industry since 2009. These agents are added to the feed, and when the salmon lice are exposed to the agents, their scale growth is inhibited and the lice die. The problem is that crustaceans can also be exposed to these agents via waste feed and faeces. In 2011, the Norwegian Climate and Pollution Agency published a report¹³⁵ showing that the detected concentrations of these delousing agents are so high that they can threaten crustaceans. Since there are no Norwegian threshold values for these agents, British threshold values have been used instead. In relation to these levels, the values for water and the seabed exceed the levels at which the shell formation of crustaceans can be damaged. The Ministry of the Environment states that it sees it as a serious problem that environmentally harmful substances are being spread to the environment, and that the Norwegian Climate and Pollution Agency has been in contact with other relevant authorities to discuss possible measures related to the delousing agents. According to the Ministry of Fisheries and Coastal Affairs, the Ministry of Agriculture and Food and the Ministry of the Environment, the environmental protection authorities will consider

133) PowerPoint presentation by the Ministry of Fisheries and Coastal Affairs of 17 March 2011 *Miljømessig fotavtrykk fra havbruksnæringen* (The environmental footprint of the aquaculture industry).

134) The BAT principle is enshrined in the Pollution Control Act Section 2 No 3, which states that all types of industry, including aquaculture, shall be subject to requirements.

135) *Environmental Screening of Veterinary Medicines Used in Aquaculture – diflubenzuron and teflubenzuron* TA-2773/2011.

whether the use of the above-mentioned pharmaceutical should be regulated in discharge permits.¹³⁶

Discharges of other chemicals

Copper is used as an anti-fouling agent for fish farm nets. Chapter 25 of the Pollution Regulations deals with pollution from the washing and impregnating of nets. The purpose of the provisions is to prevent discharges of environmentally harmful chemicals and to reduce pollution from facilities that clean, wash or impregnate nets. According to the Norwegian Institute of Marine Research's risk assessment, national discharges of copper increased by approximately 36 per cent during the period 1995 to 2005, mainly as a result of the increase in the use of cupriferous net impregnation agents. The institute states that, because copper is not prioritised by the environmental protection authorities, natural leakage from impregnated nets is only sporadically monitored. More knowledge is therefore needed about the level and effects of such leakages to the environment. The Norwegian Climate and Pollution Agency states that the figures for copper discharges have probably not been reduced in the period 2008 to 2011. The only available figure for discharges of copper is from 2008, approximately 700 tonnes.

In an interview, the Norwegian Climate and Pollution Agency states that there are no good alternatives to cupriferous impregnation agents. Copper has been removed from the Norwegian Climate and Pollution Agency's list of prioritised environmental toxins. According to the Norwegian Climate and Pollution Agency, copper is also less toxic in the sea than in fresh water. If copper is not used, the Norwegian Climate and Pollution Agency states that this could lead to sedimentation despite extensive washing.

4.3.4 New monitoring – the Water Regulations

The EU's Water Framework Directive, which was adopted by the EU on 22 December 2000, regulates the use of water – both fresh water and salt water, in lakes and along the coast. The Water Regulations, which entered into force on 1 January 2007, implement the EU's Water Framework Directive in Norwegian law. The Water Regulations describe how the management of water resources is to be carried out. They stipulate environmental targets that are intended to ensure a good chemical and biological water state

within one nautical mile of the baseline. The goal is that all water bodies shall be in a good environmental state by 2021. Regional plans and programmes of measures shall be prepared in order to achieve the environmental targets, but a regime for monitoring the development and status of the different environmental parameters is required in order to assess the condition of the water. According to the Committee on the Use of Marine Areas by Aquaculture, such monitoring will provide information about the overall environmental load along the coast, as well as better answers about the impact of discharges from aquaculture.

The Ministry of the Environment is responsible for national coordination of the implementation of the Water Framework Directive in Norway. In an interview, the Ministry of the Environment states that, in connection with the characterisation of the environmental condition of coastal water bodies pursuant to the Water Regulations, until 2010 it was only the degree of pollution that was measured. During the planning period (2010–2015) for water management plans that will apply from 2016 to 2021, biological impacts will also be included as factors in the assessment of the environmental condition of coastal waters, including significant impacts from lice, escaped fish and alien species.

4.4 Use of marine areas

One important sub-goal for ensuring sustainable growth and development of the aquaculture industry is that sufficient and satisfactory areas shall be available.¹³⁷ According to the Government's *Strategy for an Environmentally Sustainable Norwegian Aquaculture Industry*, the use of marine areas shall form the basis for maximum production within a limited geographical area and without unacceptable impacts on the environment. This requires a good marine area structure and that the individual sites are suitable for aquaculture. The site has a bearing on the spreading of infection, pollution, biological diversity and on the growth, welfare and health of farmed fish. The site structure also has a bearing on how fish farming affects wild fish.

136) Letter of 21 October 2011 from the Ministry of Fisheries and Coastal Affairs, the Ministry of the Environment and the Ministry of Agriculture and Food.

137) Cf. for example Report No 48 to the Storting (1994–95) *Havbruk – en drivkraft i norsk kystnærings (Aquaculture – a driving force in Norway's coastal economy)*, Report No 19 to the Storting (2004–2005) *Marin næringsutvikling – den blå åker (Marine business development – the Blue Field)* and Proposition No 1 to the Storting (2008–2009) for the Ministry of Fisheries and Coastal Affairs.

According to the Ministry of Fisheries and Coastal Affairs, the current marine area structure is the result of growth in the industry, which has resulted in more sites being allocated without an overall plan for development being in place.

As stated in chapter 4.2 on fish health and fish welfare, the current site structure is a contributory cause of the disease problems in Western Norway, where the density of aquaculture facilities is highest. The ministry states that a change in the structure that can help to address current and future challenges, such as lack of space, pollution and the spread of disease, can facilitate future growth in the aquaculture industry.

In addition to areas for aquaculture, areas in the coastal zone are important to a number of other sectors, not least fisheries and shipping, recreation and various conservation and protection interests. There are more and more conflicts of interest in connection with the use of the coastal zone.

This chapter describes the use of key policy instruments relating to the use of marine areas for aquaculture.

4.4.1 Work on an overall strategy for a site structure

Report No 19 to the Storting (2004–2005) *Marin næringsutvikling – den blå åker (Marine business development – the Blue Field)* states that it is a goal to ensure that the aquaculture industry has access to sufficient suitable areas, and that further growth of the aquaculture industry is achieved with as few conflicts as possible with other interests in the coastal zone. The report announced that, in order to achieve these goals, a strategy would be developed for how the aquaculture industry's use of available areas can be rationalised to ensure growth and take account of economic, fish health, fish welfare and environmental considerations. In the Ministry of Fisheries and Coastal Affairs' budget propositions for the years 2007, 2008 and 2009, the ministry states that such a strategy must be developed.

As of September 2011, the Ministry of Fisheries and Coastal Affairs has not developed an overall strategy for efficient use of marine areas by aquaculture. The ministry appointed however the Committee on the Use of Marine Areas by Aquaculture in 2009. The Committee's remit was, among other things, to 'study and propose new measures to secure sufficient access to areas in the coastal zone for the aquaculture industry and

a new overall area structure that contributes to ensuring that the aquaculture industry uses its areas efficiently and with as little environmental impact as possible'.

The Committee submitted its recommendation to the ministry in February 2011, and the recommendation was distributed for consultation with a deadline for submissions of 10 August 2011.

According to the Committee, the main challenges facing the aquaculture are salmon lice, escapes and production losses. The Committee believes that a sustainable development of the industry is completely dependent on solving these problems. A new overriding marine area structure must contribute to solving these challenges, but it cannot solve them alone. The Committee presented the following three fundamental elements as proposals for the management of aquaculture:

- The coast should be divided into separate production areas with pertaining release zones.
- Mitigating measures in a production area should be governed by the use of indicators and rules of action.
- The industry in the individual production areas should be given more direct responsibility for dealing with common challenges.

In an interview, the Ministry of Fisheries and Coastal Affairs states that follow-up of the Committee on the Use of Marine Areas by Aquaculture will be an important and central task in the ministry's further development of the management of aquaculture in the time ahead.

4.4.2 Municipal and regional planning of marine areas

For several years now, zoning of the coastal zone through the use of municipal zoning plans has been mentioned as an important policy instrument for ensuring environmentally friendly area use in aquaculture. Municipal zoning plans shall also contribute to coordinating conflicting interests in the coastal zone, such as aquaculture, fisheries, shipping, recreational use and conservation interests.¹³⁸ Regional zoning plans (previously county master plans and county sub-plans) are also an important policy instrument for clarifying matters that straddle municipal boundaries.

Pursuant to the Planning and Building Act, the municipalities are responsible for planning area

¹³⁸ See for example, Report No 19 to the Storting (2004–2005) *Marin næringsutvikling – Den blå åker (Marine business development – the Blue Field)*.

Table 4 Status of municipal area planning of the coastal zone* as of 31 December 2010

County	Plan / No plan		Status for eksisterende planer			
	Number of municipalities with a plan	Number of municipalities without a plan	Plan period until at least 2011	Plan outdated, but is being updated	Plan outdated and is not being updated	Unknown rolling-out status
Finmark	16	1	10	3	4	
Troms	23	1	12	10	1	
Nordland	41	1	27	4	9	1
Trøndelag	33	0	19	0	0	12
Møre og Romsdal	29	6	14	0	0	15
Sogn og Fjordane and Hordaland	54	2	46	0	0	8
Rogaland	23	0	22	1	0	
Total	219	11	150	18	14	36

Source: The Directorate of Fisheries

* The coastal municipalities from the Agder district to the Swedish border are not included in the overview. In this area, most municipalities have a plan for marine area regulation. Most are being rolled out.

use. This responsibility means that the municipalities shall safeguard national and important regional interests in their planning. The county authorities are responsible for regional planning. In the following, marine area planning in the coastal municipalities will be described.

Figures from the Directorate of Fisheries show that almost all of the coastal municipalities have prepared a plan for the coastal zone. Table 4 shows the breakdown of such plans by county at the end of 2010.

The table shows that most municipalities along the coast have prepared a plan for the use of the municipality's marine areas. Of the 230 coastal municipalities from Finnmark to Rogaland, 219 had prepared a marine area plan for the coastal zone at the end of 2010, while 11 municipalities had not. According to the Directorate of Fisheries, most of the municipalities that do not have a plan have small marine areas in the innermost reaches of fjords. Møre og Romsdal is the county with the most municipalities without marine area plans.

The table shows that 150 municipalities had a plan that was valid as of 2011 or later. However, more than 60 of these plans have not been rolled out during the last four years. Some plans have not been updated for 20 years. The table also shows that 18 municipalities have outdated plans, but that these plans are being rolled out. Furthermore, 14 plans are outdated and there are no plans to update them. Of the 36 plans with

unknown status, several plans are outdated, but no information is available as to whether the plans will be or are in the process of being updated.

The content of the municipal and regional plans

The county governor offices play a key role in the municipal planning processes through communicating the national policy in discipline areas such as area use and environmental protection. The county governors shall thereby contribute to regional and national considerations being taken into account.

On this basis, nine county governor offices along the coast from Finnmark to Rogaland have answered several questions about the content of the municipal plans relating to the coastal zone. Most responded that the quality of the municipalities' coastal zone plans is either unsatisfactory or that the plans are of variable quality. Three offices state that the municipal plans are of a satisfactory quality. The county governors also state that no or few expedient guides have been prepared on which the municipalities can base their work on coastal zone plans. Around half the county governors state that municipalities that have rolling plans contribute to increased quality. However, three offices state that the quality of the plans has hardly changed during the last three years.

Lack of clarification in relation to area use is an important reason why the county governors

believe that the municipal plans are of variable quality. This means that the municipalities earmark marine areas for nature, transport, fisheries, recreational and aquaculture use without distinguishing between these activities. This could implicate that the use of these areas is not clarified until an individual aquaculture application is processed. Nor do the plans contribute to clarifying different user interests when areas are allocated for use for several purposes.

In the Planning and Building Act, it is stated that municipalities should cooperate when this is expedient. Eight out of nine county governor offices state that the municipalities in the county have few or no plans that cut across municipal boundaries or that are prepared from a regional perspective. This applies regardless of whether the county authority has prepared a county sub-plan for the coast. The overall environmental load from the aquaculture industry in a larger area can be highlighted by adopting a regional perspective.

There are exceptions, however. In the district of Helgeland, 18 municipalities have cooperated on a joint area plan for fish farming. Similarly, 11 municipalities in Sør-Trøndelag county have decided to prepare an intermunicipal coastal zone plan that is scheduled for completion in 2012. In this planning work it is stated that cooperation across municipal boundaries is a precondition for ensuring good, sustainable and predictable management of the coastal zone.

A majority of the nine county governors believe that the municipal plans for the coastal zone do not function as an expedient management tool for ensuring sustainable management of aquaculture. Some believe that they are to a certain extent expedient in cases where the municipalities have clarified areas of use for the marine areas to a sufficient extent. One county governor thinks the plans are a good tool in the work of approving sites for fish farming.

Around half the county governors also state that the challenges facing aquaculture, such as sea lice, disease and genetic introgression, can be seen in conjunction with the municipalities' area planning over time.

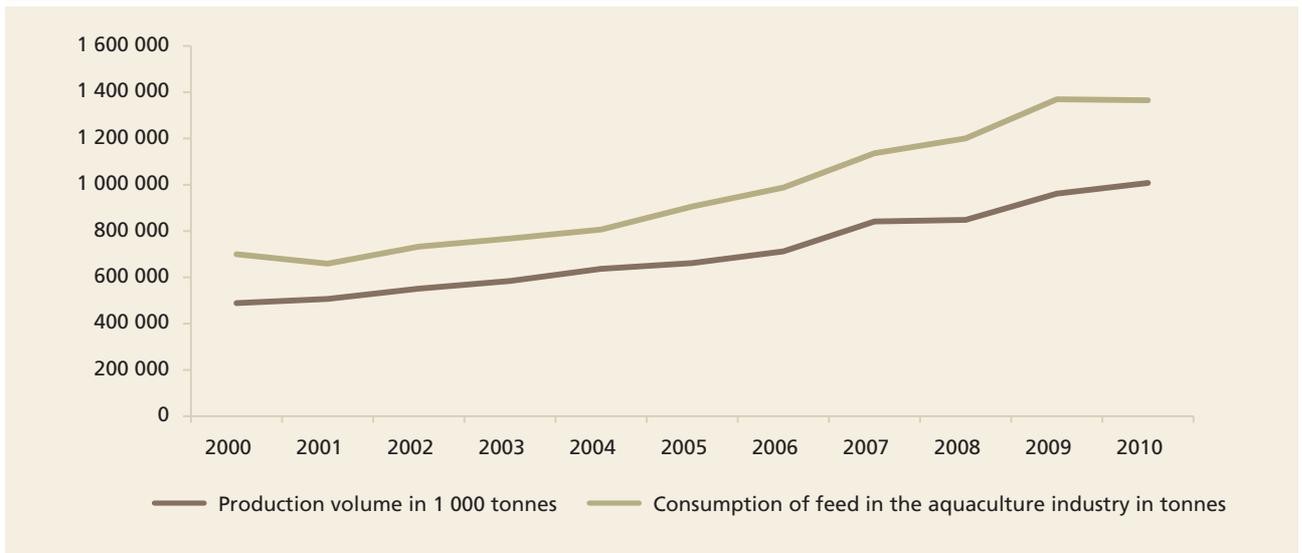
In an interview, the Ministry of the Environment states that, in its opinion, the coastal zone plans and the county sub-plans are a good management tool and that the quality of the coastal zone plans is good. One challenge, however, is that the

studies carried out in connection with the preparation of coastal zone plans are not necessary sufficient to satisfy, or do not necessarily take sufficient account of, the requirements for assessments that are required in connection with the processing of an aquaculture application. Even if a municipality earmarks a coastal area for aquaculture, this does not necessarily mean that a concrete application for an aquaculture site should be granted.

The ministry also states that it is important that the municipalities use the plans as tools when weighing use and protection considerations. Evaluations of sites have always been carried out during the processing of individual applications, but, in the ministry's opinion, it is most expedient for all parties that as much as possible is clarified in the plans, so that possible conflicts of interest can be clarified at an early stage. According to the Ministry of the Environment, it is difficult to see how the individual municipalities' coastal zone plans should function in a larger geographical area. When several municipalities open for aquaculture, it is important to keep sight of the big picture and ensure that the overall consequences are considered when several neighbouring municipalities want new and/or more aquaculture facilities. The county governors and the county authorities have an important responsibility in relation to ensuring a regional perspective. Some counties have adopted county sub-plans for the coastal zone that set out regional guidelines for area use. However, the ministry states that it varies how far these plans include guidelines for the use of marine areas. In the Ministry of the Environment's opinion, the municipal plans are too rarely seen in conjunction with each other. The ministry therefore also believes that the big picture is not sufficiently taken into account in area planning.

In an interview, the Ministry of the Environment states that the municipal plans can prove to be a strong policy instrument in relation to ensuring sustainability and protecting the environment. The Planning and Building Act, the Nature Diversity Act and the Water Regulations all contain requirements and provide opportunities for the municipalities that can make plans important in the municipal environmental management context.

Figure 14 The connection between the production of aquaculture products and feed consumption during the period 2000 to 2010. In thousands tonnes and tonnes, respectively



Source: The Directorate of Fisheries' key figure reports for aquaculture and Statistics Norway

4.5 The consumption of feed resources in aquaculture

Report No 19 to the Storting (2004–2005) *Marin næringsutvikling – Den blå åker (Marine business development – the Blue Field)*, it is pointed out that the sustainability element in the aquaculture industry can only be ensured if the fish stocks used to produce feed for farmed fish are managed in an acceptable manner. Pursuant to the Governments' sustainability strategy, it is a goal that the aquaculture industry's feed requirements shall be met without over-fishing living marine resources.

This chapter provides a short overview of the harvesting of the most important fish stocks used in the production of fish feed. Firstly, the stocks that Norway shares, in whole or in part, with other coastal states in Europe will be presented. The management of the Peruvian anchoveta, which is a very important species in fish feed production both in Norway and globally, will also be reviewed.

4.5.1 The consumption of fish feed

As previously shown, the production of farmed fish has increased considerably over several years (cf. Figure 1), and, as a result, the consumption of feed by the aquaculture industry has also increased significantly, cf. Figure 14.

The figure shows that the consumption of feed in fish farming has increased from approximately 700,000 tonnes in 2000 to approximately 1.37 million tonnes in 2010 – an increase of around

95 per cent. By comparison, aquaculture production has increased by approximately 106 per cent. Feed consumption has thus become somewhat more efficient during the period. The fish feed mainly consists of fishmeal, fish oil and vegetal ingredients. The marine ingredients, fishmeal and fish oil, comprise approximately 40 per cent of the fish feed. The use of vegetal ingredients has increased and comprises approximately 60 per cent of feed ingredients as of 2011.

Most of the fish feed (more than 95 per cent) used in Norwegian fish farming is produced in Norway. Around 50 per cent of the input factor fishmeal is produced in Norway, while the rest is imported, especially from Peru, Iceland and Denmark. Norway produces about 25 per cent of the fish oil used in feed production, and the rest is for the most part imported from Denmark, Peru and Iceland.

Most of the fishmeal and fish oil is produced from fish that are little used for human consumption – so-called industrial fish. Some of it also comes from fish used for human consumption, such as herring and from by-products/trimmings from other fish for human consumption.

Industrial fish is a generic term for species that are small and have many bones, that grow quickly and that have a relatively short life expectancy. The fish are relatively fatty, and the whole fish is used to produce fishmeal and fish oil. Table 5 shows what fish species are used in the fish feed used by the Norwegian aquaculture industry and

Table 5 Fish species used in fish feed for farmed fish. Figures for 2008, as a percentage

Fish species	Fiskemel	Fiskeolje	Sentrale fiskerinasjoner
Anchoveta	23	23	Peru
Blue whiting	27	8	Norway and other European coastal states
Capelin	1	1	Norway and Russia
Herring	17	23	Norway and other European coastal states
Sandeel	14	7	Norway and other European coastal states
Herring (trimmings)	4	12	
Sprat	4	9	Norway and other European coastal states
Other species such as the Norway pout	10	17	Norway and other European coastal states

Sources: The Norwegian Seafood Federation, the sustainability strategy and the National Institute of Nutrition and Seafood Research

the most important fisheries nations in this context.

Among other things, the table shows that of the industrial fish species harvested by Norway and other countries in Europe, blue whiting and sandeel have been especially important species in the production of fishmeal and fish oil in Norway. Herring, which can also be used for human consumption, is also widely used in feed production. The table also shows that the South American anchoveta, from Peru in particular, is an important industrial fish species. However, it can vary over time which fish species are used in the production of fishmeal and fish oil.

If the use of feed resources in aquaculture is to be sustainable, the management of the fish resources used in the fish feed must also be sustainable. Sustainable exploitation of fish resources to facilitate long-term value creation in the fisheries industry is also a key goal of the national fisheries management.¹³⁹

In the following, a short description will be provided of the management of industrial fish resources, with the emphasis on harvesting in Norway and in the countries with which Norway shares fish stocks. A brief overview will also be



Blue whiting. Photo: Jan de Lange, the Norwegian Institute of Marine Research

139) See, among other things, Proposition No 1 to the Storting (2006–2007), (2007–2008), (2008–2009), and Proposition No 1 to the Storting (2009–2010) for the Ministry of Fisheries and Coastal Affairs.

given of the management and harvesting of industrial fish in Peru.

4.5.2 Management of industrial fisheries in Norway

Two important principles for ensuring sustainable management of fish resources are that the fish stocks are regulated and that compliance with these regulations is monitored.¹⁴⁰

Regulation and quotas

The regulation of fishing by Norwegian vessels mainly takes place by regulating who is permitted to engage in fishing (access regulation), how much the participants can fish (regulation of catches) and through provisions relating to how the fishing is to take place, including the types of gear to be used, reporting obligations and areas closed and open to fishing. The Directorate of Fisheries, the Coast Guard and the fish sales organisations supervise compliance with the different regulations.

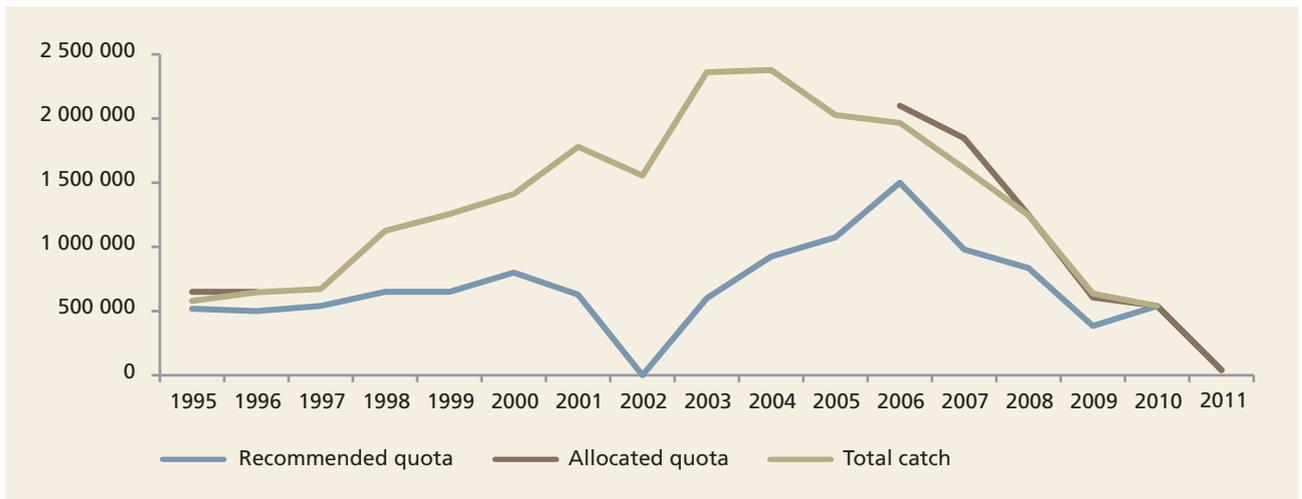
The OAG has previously shown that the Norwegian fisheries authorities have developed extensive and detailed regulations to regulate the right to fish and how fishing is carried out. The supervision of compliance with these regulations is also extensive.¹⁴¹

In the present investigation, emphasis is therefore placed on catch regulations, including the harvesting of important fish species used in the Norwegian fish feed in Norway, as this was not included in the investigations mentioned above.

140) See, among other things, Proposition No 1 to the Storting (2009–2010) for the Ministry of Fisheries and Coastal Affairs.

141) See Document 3:2 (2007–2008) *The Office of the Auditor General's investigation into the management and control of fish resources in the Barents Sea and Norwegian Sea* and Document No 3:8 (2010–2011) *The Office of the Auditor General's follow-up of the parallel audit with the Accounts Chamber of the Russian Federation of the management of the fish resources in the Barents Sea and the Norwegian Sea*.

Figure 15 Recommended and allocated quotas and total catches of blue whiting for the years 1995 to 2011 for the species' range in the North-East Atlantic. Figures in tonnes



Source: ICES, The Norwegian Institute of Marine Research and Report No 18 to the Storting (2009–2010) *Om dei fiskeriavtalane Noreg har inngått med andre land for 2010 og fisket etter avtalane i 2008 og 2009* (The fisheries agreements that Norway has entered into with other countries for 2010 and fishing under the agreements in 2008 and 2009)

The main method of regulating catches in order to ensure that species are not over-harvested is the stipulation of total quotas (so-called TACs). On the basis of the member states' research and monitoring of the fish stocks in the North-East Atlantic, the International Council for the Exploration of the Sea (ICES) gives advice on how much of each individual fish stock can be harvested. The Norwegian Institute of Marine Research participates in this work. Based on the assessments, ICES and the Norwegian Institute of Marine Research usually also submit proposals for total quotas of the different fish stocks for their range. As most of the relevant stocks have ranges that include several national economic zones and international waters, the stipulation of total quotas and the allocation of the total quotas are subject to international negotiations. Norway has annual negotiations with the EU, Russia, Iceland and Greenland for the different species. The degree of cooperation on the management of the different species varies.

The final total quotas in Norwegian zones are stipulated by the Ministry of Fisheries and Coastal Affairs. In the following, a brief overview will be provided of the harvesting of some important species. In an interview, the Ministry of Fisheries and Coastal Affairs states that there have been problems with over-fishing of certain industrial fish species in the North Sea. Lack of an agreement between the coastal states and disagreement about the allocation of quotas are important explanations for this, according to the Ministry of Fisheries and Coastal Affairs.

Blue whiting

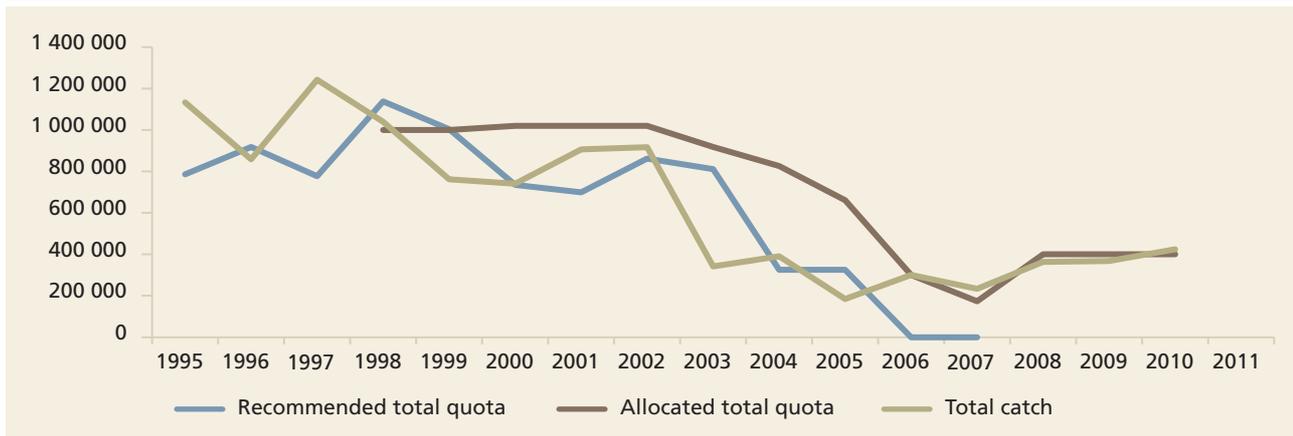
As shown in Table 5, blue whiting is a species that accounts for a substantial proportion of the fish feed. Figure 15 shows the development in the harvesting of blue whiting compared with recommended and stipulated total quotas for this stock during the period 1995 to 2011. The figure shows that the stock has been over-harvested for several years in relation to the recommended catch levels.

During the period 1997 to 2005, there was no agreement between the coastal states Norway, the EU, the Faeroe Islands and Iceland, and this resulted in almost unlimited fishing. During this period, the total catch of blue whiting was significantly higher than the recommended total quotas.

In 2006, a coastal state agreement was signed between Norway, the EU, the Faeroe Islands and Iceland. According to the Ministry of Fisheries and Coastal Affairs, it is based on ICES' stock estimates and advice. A total quota is stipulated for the whole stock's range, including the economic zones. This quota is allocated between the parties with a separate allocation for third countries in international waters through the North East Atlantic Fisheries Commission (NEAFC). In November 2008, the parties also agreed on a management plan to ensure that the stock is managed and harvested in a sustainable manner and in accordance with the precautionary principle.

Figure 15 shows that, since the agreement was signed, the total quota has been higher than the recommended quota for the period 2006 to 2009, and that, for 2010 and 2011, the allocated quota and the recommended quota have been identical.

Figure 16 Quota recommendations, allocated total quotas and catch statistics for sandeel during the period 1985 to 2010 for the species' entire range



Source: TEOTIL and the Directorate of Fisheries

The figure shows that the total quotas have been reduced over the last few years. According to the Ministry of Fisheries and Coastal Affairs, this is due to a weak stock situation for blue whiting and to weak recruitment.

Figures from Statistics Norway show that Norway has dominated the blue whiting fisheries, with an average share of 35 per cent in the period 2000 to 2010. In practice, this means that, before an agreement was signed, Norway alone fished approximately 95 per cent of the recommended total quota during the period 2000 to 2005. It also means that Norway overfished its national quotas and that in certain years in the 2000s, there was unlimited fishing in the Norwegian zones. In an interview, the Ministry of Fisheries and Coastal Affairs states that, when no quota has been stipulated, fishing for a species is not deemed to be illegal fishing.

According to the Norwegian Institute of Marine Research, ICES evaluated the management regime agreed on by the parties in 2009 and concluded that the regime was in compliance with the precautionary approach. The recommended and stipulated quota for 2011 is 40,100 tonnes.

Sandeel

ICES has for several years given advice on sandeel fisheries for the whole species' range. However, no advice was given during the period 1987 to 1994, while, from 1995 to 2003, the advice was that the catch level was sustainable. The recommended total quota was reduced from 2004, cf. Figure 16. According to the Norwegian Institute of Marine Research, the sandeel spawning stock was significantly reduced around

2000, and it was below the critical level during the period 2001 to 2008. The reason was weak recruitment and strong fishing pressure. According to the Ministry of Fisheries and Coastal Affairs, the stock situation was poor and the situation for sandeel was very difficult in the mid-2000s.¹⁴²

Figure 16 shows that the allocated total quotas and catches were considerably higher than the recommended quota of zero in the period 2006 to 2007. For 2008 to 2010, fishing was only recommended to an extent that would allow the spawning stock to rise above the critical level.

In ICES' stock estimates, sandeel is deemed to be one stock, while there are actually several stocks. According to the Norwegian Institute of Marine Research, the situation for the sandeel stock in the Norwegian zone (NEZ) has therefore been considerably worse than assumed. On this basis, direct fishing of sandeel was prohibited in the Norwegian zone between 2008 and 2010. For 2011, on the recommendation of the Norwegian Institute of Marine Research, a quota of 60,000 tonnes of sandeel was allocated in the Norwegian zone.

Norway and Denmark have been the two most active sandeel fishing countries. Of the total catch, Norway's share was approximately 12 per cent on average during the period 2000 to 2010.

¹⁴² See, among other things, Report No 32 to the Storting (2006–2007) *Om dei fiskeriavtalane Noreg har inngått med andre land for 2007 og fisket etter avtalane i 2005 og 2006* (The fisheries agreements that Norway has entered into with other countries for 2007 and fishing under the agreements in 2005 and 2006).

Mackerel

As of 2011, there is no coastal state agreement for mackerel fisheries. According to the Ministry of Fisheries and Coastal Affairs, the absence of such an agreement could lead to a reduction in stocks in the long term. ICES refers to the fact that the coastal states Norway, the EU and the Faeroe Islands agreed on a harvesting rule in 2008. In ICES' assessment, this management plan is compatible with the principles of precautionary management. The recommended quota for 2011 and 2012 pursuant to this management plan was approximately 600,000 tonnes. Due to the lack of an international agreement, the sum total of the local quotas for 2011 amounts to 959,000 tonnes.

The management of Norway pout, capelin and sprat is described in Appendix 5.

4.5.3 Trimmings from fish for human consumption

Trimmings and by-products from fish for human consumption can also be used in the production of fishmeal and fish oil. As shown in Table 5, trimmings from herring were used in fish feed production. According to the Ministry of Fisheries and Coastal Affairs, large parts of the rest raw materials from herring are used, but as regards cod, the proportion of rest raw materials in 2010 was approximately 35 per cent.¹⁴³ In an interview, the Ministry of Fisheries and Coastal Affairs states that it is possible to increase the use of rest raw materials from catches of fish for human consumption. The ministry is working on implementing a proposal that all trimmings from catches shall be landed except for offal. A requirement will be introduced that fish shall not be beheaded before being landed. It is not proposed that factory trawlers that produce fillets on board will be subject to the same requirements for delivery, but, according to the Ministry of Fisheries and Coastal Affairs, many vessels already save these rest raw materials.

143) Figures based on information from RUBIN. This foundation, which was established in 1992, works to promote increased and more profitable utilisation of by-products from the fisheries and fish farming industries in Norway. RUBIN was established by the Ministry of Fisheries and Coastal Affairs, among others, and it is managed by representatives of the fisheries and aquaculture industry.

4.5.4 Peruvian anchoveta in Norwegian fish feed¹⁴⁴

As shown in Table 5, the Peruvian anchoveta is an important fish species in the production of Norwegian fish feed. Details about the management of Peruvian anchoveta are provided in Appendix 5. In the appendix, it is pointed out that the anchoveta stock has varied, but that researchers have recommended quotas that allow for large catches of this stock.

Up until 2006, total quotas were not used as a limiting management mechanism in anchoveta fisheries. Up until then, the fisheries were regulated through restrictions in areas where fisheries were permitted and, in order to protect spawning fish and young fish, by stipulating periods when fisheries were permitted. In 2008, a law was introduced in Peru that requires the setting of a maximum permitted quota per vessel.¹⁴⁵ According to information from the Peruvian IMARPE (Instituto del Mar del Peru – a marine research institute in Peru), total quotas have been proposed since 2006, and the fisheries authorities have allocated total quotas for all the years in accordance with the recommendations from the researchers (cf. Appendix 5).

According to the Food and Agriculture Organization of the United Nations (FAO), overcapacity in the Peruvian fish fleet is a challenge. FAO believes that this overcapacity increases the probability of greater fishing pressure on this stock, but that the introduction of quotas for individual vessels will strengthen the management of the anchoveta stock. According to FAO, the central government fishing authorities in Peru are aware that a quota system requires more monitoring of the fisheries than has been the case until now. Among other things, there is a need for satellite surveillance, resource control and sufficient resources to uncover breaches of the regulations and to ensure adequate use of sanctions when breaches of the regulations are uncovered.

144) Sources from the Food and Agriculture Organization of the United Nations (FAO): National Fisheries Sector Overview, Peru, May 2010; Fish as inputs for aquaculture, Practices, sustainability and implications, 2009; The state of World Fisheries and Aquaculture, 2010. In addition, the following article is used as an extra source: 'Evolution and state of the art of fishing capacity management in Peru: The case of the anchoveta fishery', *Pan-American Journal of Aquatic Sciences*, 2009, 4 (2) 146–153.

145) Legislative decree 1084 on Maximum Catch Limits per Vessel. Peru.

4.5.5 The Ministry of Fisheries and Coastal Affairs' international work on fish used for feed

In an interview, the Ministry of Fisheries and Coastal Affairs states that the sustainability strategy is relatively general in how it addresses the issue of feed, and that the ministry believes that the most important means of ensuring sustainable feed is to work internationally to promote sustainable management of the fisheries. The ministry points out that Norway cannot overrule other countries' fisheries management and refrain from purchasing feed from certain countries. In general, Norway works through international forums to strengthen global fisheries management, including the combating of illegal, unreported and unregulated fishing (so-called IUU fishing) and the introduction of global port state control. Norway has been working for a long time to reduce discards of fish, and new guidelines for discards have been issued by FAO after input from Norway.

The Ministry of Fisheries and Coastal Affairs states in an interview that the EU has adopted a separate regulation that requires IUU certificates for imported fish, but this scheme does not apply to fishmeal or fish oil. According to the ministry, it may be necessary to introduce a traceability requirement to better ensure that the fish used in fish feed come from sustainable stocks.

The ministry also states that, despite the fact that the need for feed for the aquaculture industry has increased, the global production of fishmeal and fish oil has been relatively stable during the period 1980 to 2011, according to FAO. One of the main reasons why the aquaculture industry has grown more than the global production of fishmeal and fish oil is better utilisation of the feed and increased use of alternative raw materials for feed.

4.6 Specification of goals in the sustainability strategy and the authorities' management

As shown in chapters 4.1 to 4.5, the goals relating to ensuring a sustainable and environmentally sound aquaculture industry are only to a limited extent operationalized in concrete verifiable goals and indicators.

In an interview, the Directorate of Fisheries states that, since environmental sustainability has only partly been specified, the goals in the Government's Strategy for an Environmentally Sustainable Norwegian Aquaculture Industry are impossible

to verify, in the directorate's opinion. Management and control would be easier if the goals had been more specific.

In an interview, the Norwegian Food Safety Authority points out that it is not clear what the term 'sustainable' means. In the Norwegian Food Safety Authority's opinion, the disagreement between the environmental authorities and the fisheries authorities has led to lack of clarity in the basis for its work. It is difficult to define whether the fish farming industry is sustainable as regards fish health and fish welfare, since the concept has not been operationalised to any great extent.

In an interview, the Directorate for Nature Management states that, in principle, the current legislation is largely sufficient to ensure that the fish farming industry is adapted to the environment. At the same time, the main problem is that the production is too high both in total and in most regions, and thereby a threat to wild fish. Without indicators and threshold values for what is sustainable, it is also difficult, in the Directorate for Nature Management's opinion, to assess goal attainment in this area.

The Ministry of the Environment states in an interview that the Ministry of the Environment and the Ministry of Fisheries and Coastal Affairs cooperated on the preparation of the sustainability strategy. The Ministry of the Environment believes that the strategy is expedient and that it is based on goals and specifications that have governed the management of aquaculture for several years. The environmental authorities and the fisheries authorities cooperate on developing indicators that can be measured against the sustainability strategy.

In an interview, the Ministry of Fisheries and Coastal Affairs refers to the fact that inadequate operationalisation of concepts and indicators is a challenge for the ministry in its endeavours to manage in accordance with the goal of an environmentally sound and sustainable aquaculture industry. However, the ministry also states that, although the concepts have not been operationalised, this is not an obstacle to its management in this context. The ministry also refers to the work currently being done by the government administration in collaboration with the research environments on developing indicators linked to the goals for the aquaculture industry. These are indicators for an acceptable risk level – i.e. the environmental impact society is willing to accept.

5 The facts: The use of policy instruments to ensure a sustainable and environmentally sound aquaculture industry

Some of the policy instruments used in the management of aquaculture were presented in chapter 4. In the following, other important policy instruments used by the government administration to ensure an environmentally sound and sustainable growth and development of the aquaculture industry will be reviewed.

Firstly, the Ministry of Fisheries and Coastal Affairs' efforts to ensure sustainable growth and development of the aquaculture industry through the work on stipulating a maximum limit on the production of farmed fish will be reviewed. Chapter 5.2 will describe how the different sector authorities work to ensure environmentally sound development of the industry through the processing of aquaculture applications. Chapter 5.3 discusses how the different sector authorities use inspections to ensure compliance with the regulations regulating the aquaculture industry.

5.1 Regulation and stipulation of maximum allowed production in aquaculture

At the national level, the Ministry of Fisheries and Coastal Affairs stipulates the total allowed production of farmed salmon by regulating the total number of licences to engage in salmon farming and stipulating the maximum allowed biomass for these licences.¹⁴⁶ The ministry also decides when the licences will be allocated and how they are distributed geographically. As regards marine production of species other than salmonids for human consumption, the Ministry of Fisheries and Coastal Affairs has not stipulated an upper limit on the number of licences or the maximum total production.

Licences to engage in aquaculture are granted on the basis of individual applications. In order to take account of different considerations, several central government sector authorities and the county authority and the municipality in which a facility is located are involved in the processing of applications (cf. chapter 5.2, which describes the government administration's processing of aquaculture applications).

This chapter will describe the general development of the production regulation system for salmonid farming and the stipulation of maximum allowed production at the national level. How the Ministry of Fisheries and Coastal Affairs studied the basis for increasing the number of salmon farming licences in 2009 will be an important point, as will the work done in connection with the planned increase in the maximum allowed biomass in 2010 and the increase in maximum allowed biomass in 2011.

The Instructions for Official Studies and Reports state that all important considerations, including environmental considerations, shall be taken into account as part of the work on official reports, regulations, reforms and measures, and on propositions and reports to the Storting. A case can have significant consequences for the environment if it comes into conflict with environmental policy goals.¹⁴⁷

5.1.1 The historical development of production regulation systems in aquaculture – salmonids

The licence requirement for engaging in aquaculture was introduced in 1973 through a provisional act. All applicants were awarded licences to start and engage in the farming of salmonids as applications were received. Through a new Fish Farming Act passed in 1981, the number of licences to engage in salmonid farming was limited and licences only granted in allocation rounds. The individual licence was limited in accordance with the maximum permitted production volume. The maximum permitted production volume was gradually increased during the 1980s through several licensing rounds.

The Government initiated a new allocation round in 2002, when 40 licences were awarded. This allocation round also saw the introduction of the payment of compensation to the state for licences. According to the Ministry of Fisheries and Coastal Affairs, the increase in the number of licences in 2002 was a political initiative based on a wish to increase the state's revenues. Pursuant to the Fish Farming Act, the environment was an assessment criterion, but, according to the

146) Applies to marine farming of salmonids for consumption.

147) http://www.regjeringen.no/upload/kilde/mod/bro/2005/0003/ddd/pdfv/259373-veileder_i_utredningsarbeid.pdf.



Cages in Loppa.

Photo: Per Eide Studio © Norwegian Seafood Council

Ministry of Fisheries and Coastal Affairs, the allocation in 2002 was mainly governed by state revenue considerations.

In 2003, 50 additional licences were allocated, a decision which, according to the ministry, was also made on the basis of state revenue considerations. According to the ministry, the environmental issue was not considered on its merits in the allocation in 2003.

In 2005, the ministry introduced maximum allowed biomass as a production-regulating system, and the system of limitations on cage size and fish density was abandoned – in combination with the discontinuation of a feed quota scheme. The changes to the regulation system were intended to form the basis for increasing the total salmonid production by approximately 30 per cent, which they did.

In 2009, 65 new salmonid farming licences were allocated, and in 2010, it was proposed to increase the permitted biomass in the existing licences. In the following, the processes relating to these expansions will be described.

5.1.2 The allocation of 65 new licences to engage in salmonid farming in 2009

Study of areas where an increase is not advisable

In 2007, the Government announced that new licences would be allocated for the farming of

salmon and trout in 2009, cf. among other things the Government's *Strategy for a Competitive Norwegian Aquaculture Industry*. The ministry was to decide the framework for the geographical distribution of the new licences and it wanted to obtain expert advice in that connection. In December 2007, the Ministry of Fisheries and Coastal Affairs therefore requested the Directorate of Fisheries to prepare a fact-based risk assessment of geographical areas that were not advisable for an increase in the number of fish farms. In the overall assessments, the directorate was required to take fish health and sustainability into consideration, among other things. The ministry requested the Norwegian Institute of Marine Research and the Norwegian Food Safety Authority to help the directorate in this work.¹⁴⁸

In an interview, the Directorate of Fisheries states that giving advice on how to expand was challenging, given that it was generally against allocating more licences to engage in salmonid farming. The directorate nevertheless gave advice in accordance with the ministry's request.

The Directorate of Fisheries obtained input from the Norwegian Institute of Marine Research, the Norwegian Food Safety Authority and the Norwegian Coastal Administration, as well as from the directorate's own regional offices. The requests from the Directorate of Fisheries

¹⁴⁸) Letter of 20 December 2007 from the Ministry of Fisheries and Coastal Affairs.

elaborated on the ministry's request. The Norwegian Food Safety Authority was asked to provide input on fish health, fish welfare and food safety. The Norwegian Institute of Marine Research was asked to provide expert advice on natural conditions for the salmonid production and the impact on the environment.¹⁴⁹

Questions relating to wild salmon, biological diversity, pollution and marine areas fall under the area of responsibility of the Ministry of the Environment. Together with various subordinate agencies, the Ministry of the Environment has administrative responsibility for these areas. The Ministry of Fisheries and Coastal Affairs did not request assessments from the environmental authorities regarding these areas. The Norwegian Institute of Marine Research was to assess issues relating to recipient conditions, pollution and wild fish. The regional offices of the Directorate of Fisheries were asked to assess the escape situation for farmed fish, including its extent and the tolerance limit for wild salmon, as well as issues relating to marine area use.

In an interview, the Ministry of Fisheries and Coastal Affairs states that, after the allocation of new licences in 2009, the ministry came to an agreement with the Ministry of the Environment that, in the next allocation round, both the ministries' subordinate agencies would to a greater extent carry out joint environmental studies in order to give greater consideration to sustainability and wild salmon.

The expert input

The Directorate of Fisheries provides a summary for the Ministry of Fisheries and Coastal Affairs of all the input received and the directorate's own assessments in the report 'Fiskeridirektoratets anbefalinger vedrørende områder som vurderes som mindre aktuelle for økning av oppdrettsvirksomhet' (The Directorate of Fisheries' recommendations for areas that are considered not to be advisable for an increase in aquaculture activities).¹⁵⁰

In the report, the Directorate of Fisheries states that, on the basis of factors that have a bearing on the sustainability of the aquaculture industry, including fish health, the counties of Rogaland, Hordaland, Sogn og Fjordane and Møre og Romsdal north to Hustadvika are considered not

to be advisable for an increase in aquaculture activities. The reason was the situation relating to pancreas disease in these areas and the strategies implemented to combat the disease, as well as processes relating to changing the site structure in Western Norway. The Directorate of Fisheries also refers to reduced profitability in the industry in the same region.

The Directorate of Fisheries also refers to the fact that there is a high density of fish farms in the counties of Hordaland and Sogn og Fjordane and that it would therefore be very difficult, if not impossible, to find new sites while at the same time meeting the Norwegian Food Safety Authority's distance requirements. Among other things, the distance requirements are intended to prevent the spread of disease.

The Directorate of Fisheries concludes that there is room both for an expansion of existing sites and for new sites in the counties of Trøndelag, Troms and Finnmark. In Nordland County, the conclusion was that there was room for an expansion of existing licences, but that the potential for establishing new sites was marginal.

The Directorate of Fisheries also states that the Norwegian Food Safety Authority and the Norwegian Institute of Marine Research point to salmon lice as a limiting factor in relation to capacity growth in salmon production. Because of salmon lice, caution should be shown when establishing new facilities, especially in Hardanger, but also in other areas with high fish farming intensity. Both the Directorate of Fisheries and the Norwegian Food Safety Authority recommend that increased resistance to important delousing agents should be taken into account, especially in Nord-Trøndelag and the southern part of Nordland.

In relation to areas that also touch on the environmental authorities' area of responsibility, the Directorate of Fisheries points out that, according to the Norwegian Institute for Nature Research, a recommended limit of five per cent has been indicated for the proportion of farmed fish among wild fish in the spawning stock in the rivers. In areas with high fish farming intensity in the counties of Rogaland, Hordaland, Sogn og Fjordane and Møre og Romsdal, as well as parts of Troms, the proportion was 15–40 per cent in many cases, and in some rivers it was even higher. From Trøndelag northwards, the proportion was generally lower and usually less than 15 per cent. The Directorate of Fisheries presumed

149) Letters to the Norwegian Food Safety Authority and the Norwegian Institute of Marine Research, respectively, both of 12 February 2008.

150) The Directorate of Fisheries, report of 28 April 2007.

that this would be taken into account in the ordinary processing of individual applications.

On the basis of the report from the Directorate of Fisheries, the Ministry of Fisheries and Coastal Affairs asked the directorate for further assessments of some aspects of the directorate's recommendation.¹⁵¹ In its letter, the ministry refers to the directorate's recommendation to show caution when allocating new licences in Western Norway. The ministry believed that the directorate had given considerable weight to the Norwegian Food Safety Authority's input in its recommendation for this area, and it also pointed to the PD regulations (relating to pancreas disease) and the ongoing reorganisation of the aquaculture industry in Western Norway. The ministry also referred to the recommendations concerning Nordland county and the fact that the directorate seemed to have placed considerable emphasis on the region's assessment. The ministry also believed that the directorate had not quantified the growth potential to any great extent, nor discussed where areas were available for new sites. The ministry requested further evaluations of these areas.

In the Directorate of Fisheries' reply¹⁵² to the ministry, the directorate upheld its conclusions concerning Western Norway. As regards Nordland, the directorate refers to the potential for establishing new sites in some municipalities in the county.

5.1.3 The Ministry of Fisheries and Coastal Affairs' use of the expert input

The Ministry of Fisheries and Coastal Affairs states that, on the basis of the combined input from the Directorate of Fisheries and the other subordinate bodies, the ministry drafted two or three government memos containing, among other things, proposals for an increase in the number of new licences. In an interview, the Ministry of Fisheries and Coastal Affairs states that it was not informed about the fact that the Directorate of Fisheries was generally negative to the granting of more licenses to engage in salmonid farming. The ministry points out that the directorate was not asked to make such an evaluation either because it had already been decided that the number of licenses for salmonid farming was to be increased.

In an interview, the Ministry of the Environment points out that it was not involved before the decision was made to increase the number of licences to engage in salmonid farming, but that the ministry was involved in the Government's work on deciding the final geographical distribution of the new licences. The Ministry of the Environment also points out that, in recent years, it has advised against a further production increase in fish farming as long as the environmental challenges are not under control.

In an interview, the Ministry of Fisheries and Coastal Affairs points out that, after a thorough overall assessment by the Government, it was decided that 65 new salmon licences would be advertised, five of which would be for organic fish farming. According to the Ministry of Fisheries and Coastal Affairs, the decision to go for 65 licences was based on goals for business development, regional considerations and environmental considerations. In the interview, the ministry pointed out that it was assessed where the most important wild salmon populations were located and where salmon lice and escapes would have the most serious impact. The licences for organic aquaculture could be allocated regardless of county or region.

On the basis of the prevailing environmental situation and disease situation, the Ministry of Fisheries and Coastal Affairs stated that relatively few licences should be allocated in Western Norway, and that the licences should be used to stimulate changes in sites to help to combat pancreas disease (PD). According to the Ministry of Fisheries and Coastal Affairs, the distribution by county was the result of political negotiations. The distribution was as follows:

- Seven licences in Finnmark
- Eight licences in Troms
- Fifteen licences in Nordland
- Seven licences in Nord-Trøndelag
- Eight licenses in Sør-Trøndelag
- Five licences in Møre og Romsdal
- Five licences in Sogn og Fjordane
- Five licenses in Hordaland

However, after the Ministry of Fisheries and Coastal Affairs had proposed the increase and the distribution by county mentioned above, the Norwegian Food Safety Authority stated that, in its general opinion, granting more licences in Western Norway would not make a positive contribution to the fight against PD, and it questioned

151) Letter of 19 June 2008 from the Ministry of Fisheries and Coastal Affairs to the Directorate of Fisheries.

152) Letter of 30 June 2008 from the Directorate of Fisheries to the Ministry of Fisheries and Coastal Affairs.

how the government administration would deal with this in the operating phase.¹⁵³

When asked about the extent to which the new licences have contributed to facilitating the combating of PD in Western Norway, the Ministry of Fisheries and Coastal Affairs stated that it was not a performance goal nor a condition that the licences in Western Norway should be used to facilitate the combating of PD, but that it was an additional criterion that was to be included in an overall evaluation of the applications. The Ministry of Fisheries and Coastal Affairs has therefore not measured the extent to which the licences allocated in Western Norway have contributed to facilitating the combating of PD. The ministry states that if this were to be measured, it would be difficult to draw any clear conclusions about the causal connection between allocations and changes in the prevalence of PD in the area in question. The idea behind the criterion was that the owners of facilities that ought to be moved due to their inexpedient location would be given an incentive to move if a new licence was awarded, and that this could be beneficial.

5.1.4 Proposal to increase the maximum allowed biomass

In the Government's *Strategy for a Competitive Norwegian Aquaculture Industry*, in addition to the announcement of a new licensing round for salmon licences in 2009 (which resulted in 65 new licences for salmonid farming), it was stated that the plan was to have annual licensing rounds that were adapted to growth in the market. In an interview, the Ministry of Fisheries and Coastal Affairs states that the ministry wished to increase the production volume of salmonids in 2010 by increasing the maximum allowed biomass at existing facilities.

On this basis, the Ministry of Fisheries and Coastal Affairs sent the following three-part request to the Directorate of Fisheries in June 2009:¹⁵⁴

- 1 an overall rough assessment at the national level of the potential for an environmentally sustainable increase in capacity (deadline for responding 20 July 2009)
- 2 an overview of geographical areas that are considered to be more or less advisable for an

153) The Norwegian Food Safety Authority's consultation submission on the proposal for Allocation Regulations, 16 February 2009.

154) Letter of 4 June 2009 from the Ministry of Fisheries and Coastal Affairs to the Directorate of Fisheries.

increase in capacity (deadline for responding 1 October 2009, later changed to 3 September)

- 3 notification of a future request. The ministry refers to the fact that the fisheries authorities and the environmental authorities are to cooperate on preparing location criteria in order to give greater consideration to environmental sustainability.

The ministry referred to the statements from the allocation round in 2009, and otherwise requested that the work be based on expert input and assessments from the Norwegian Food Safety Authority, the Norwegian Institute of Marine Research, the Norwegian Veterinary Institute, the Directorate for Nature Management and the Norwegian Climate and Pollution Agency.

The Directorate of Fisheries and the other bodies' assessments at the national level of the potential for an environmentally friendly and sustainable increase in capacity

When asked whether there was room for an increase in capacity, the Directorate of Fisheries concluded, on the basis of input from the relevant agencies and bodies, that a general increase in capacity in 2010 would increase the uncertainty and risk of the goals in the sustainability strategy not being achieved. The directorate's primary recommendation was to defer a further increase in capacity in 2010. The directorate pointed out that it is necessary to define how the sustainability goals are to be operationalised and monitored, so that the industry and the authorities can have a better basis for ensuring that future growth takes place within environmentally sustainable limits. The directorate also referred to the measures described in the sustainability strategy and stated that these measures should be implemented and that positive results should be registered before increased production is permitted. See Fact Box 3 for a description of the main features of the input from the various bodies.

Assessments of areas in which an increase in capacity was considered more or less advisable

In an interview, the Ministry of Fisheries and Coastal Affairs states that, based on the input from the six bodies, the Government found it justifiable to increase the maximum allowed biomass in existing facilities by five per cent.¹⁵⁵

155) In practice, this meant an increase of four per cent of the total allowed biomass, because approximately 20 per cent of the facilities were not considered advisable for an increase in capacity.

Fact Box 3 The main features of different bodies' expert advice about the potential for an environmentally sustainable increase in capacity

The Norwegian Veterinary Institute and the Directorate for Nature Management recommended that there should not be any increase in the capacity in 2010. The Norwegian Veterinary Institute referred to the health situation of farmed fish and to the fact that the threat to the wild fish stocks has developed in a direction that indicates that measures of a fundamental nature should be implemented to ensure sustainable development of the Norwegian fish farming industry. The Norwegian Veterinary Institute therefore believed that an overall prevention strategy and strategy for combating the most important diseases must be in place before the industry is allowed to grow further.

The Directorate for Nature Management pointed out that escaped farmed salmon and subsequent cross-breeding with wild stocks is one of the biggest threats to the existence of wild salmon. The directorate also pointed out that the infection of salmon lice among wild fish must be reduced to a sustainable level, and that the sterilisation of farmed salmon must be implemented before new salmon farming licences can be granted.

The Norwegian Food Safety Authority, the Norwegian Institute of Marine Research and the Norwegian Climate and Pollution Agency recommended an increase in capacity only on certain conditions:

The Norwegian Food Safety Authority referred to the fact that the problems of salmon lice and fish health are a big challenge for the fish farming industry, and that these factors should have a decisive influence on how much biomass is allowed in salmon farming. The Norwegian Food Safety Authority pointed out that it is necessary to make extensive changes in the operating structure if an increase in capacity is to be environmentally sustainable, and perhaps also if the current production level is to be maintained within sustainable limits. The Norwegian Food Safety Authority believed that an increase in production without implementing concrete measures in the areas mentioned could have negative and unforeseen consequences for fish health. The Norwegian Food Safety Authority therefore believed that the possibility for expansion is greatest in areas where the industry can present operating plans that are based on sound operating structures on good sites. In areas that already have fish health problems or where the operating structure makes it probable that an expansion will result in fish health problems, expansions are less advisable, in the Norwegian Food Safety Authority's assessment.

The Norwegian Institute of Marine Research pointed out, among other things, that the assumed tolerance limit for escaped farmed salmon has already been exceeded in many watercourses. The institute also referred to the fact that increased fish farming activities require emphasis on the spread of disease and measures against diseases. It was recommended not to increase capacity in areas where the amount of lice on wild fish was too high. It was pointed out, however, that knowledge is lacking in several areas. The institute believed that sufficient knowledge would be a prerequisite for further growth in the aquaculture industry.

In its response, the Norwegian Climate and Pollution Agency referred to its own proposal to amend the Pollution Regulations, which deal with the regulation of aquaculture facilities in connection with the establishment and expansion of facilities. The agency believed it was important that new licences for salmonids be granted in areas where the state of the environment is good. The agency also advised against expansions resulting in very large facilities, as this can lead to a deterioration in the state of the environment because of over-fertilisation.

The ministry therefore confirmed to the bodies that part two of the request should be carried out. The ministry also pointed out that, in the agencies and institutes' overall assessments, particular emphasis had been placed on disease (particularly salmon lice), the risk of genetic interaction as a result of escapes, and pollution. Because of the challenges relating to disease, there would be no increase in biomass for licences located in national salmon fjords or in the Hardangerfjord.

The ministry asked the Directorate of Fisheries to consider whether there were other geographical

areas where an increase in capacity in the existing licences was not considered to be justifiable on environmental sustainability grounds. The assessments of the individual bodies were to be based on the risk per topic in the sustainability strategy and per region.¹⁵⁶

At the overall level, the Directorate of Fisheries had taken a negative view of the planned increase in capacity, but, as requested, it prepared a report as the ministry had ordered, including input from

156) Letter of 24 August 2009 from the Ministry of Fisheries and Coastal Affairs to the Directorate of Fisheries.

the Norwegian Food Safety Authority, the Norwegian Institute of Marine Research, the Norwegian Veterinary Institute, the Directorate for Nature Management, the Norwegian Climate and Pollution Agency and the Directorate of Fisheries' regional offices.¹⁵⁷

In its report to the Ministry of Fisheries and Coastal Affairs, the Directorate of Fisheries concluded that the bodies had submitted divergent input, among other things because of a lack of information and cooperation in the process. The directorate concluded that, despite these differences, the overall risk picture clearly indicated that, for large parts of the coast, an increase in capacity would entail a high risk of not achieving the goals in the sustainability strategy relating to genetic introgression and disease, including sea lice.

One or more bodies referred to the fact that there is a high proportion of farmed fish among wild fish and that the tolerance limit has been exceeded in most areas. In the areas with a lower proportion of farmed fish, an escape could quickly change the situation. All in all, there is a high risk of failure to achieve the goal that aquaculture shall not contribute to lasting changes in the genetic properties of the wild fish stocks.

As regards the goal relating to disease, one or more of the bodies referred to the general disease situation, including sea lice, along the coast and the lack of infrastructure that can prevent the spread of diseases. Several bodies also pointed out that little is known about the spread of diseases from farmed fish to wild fish. The bodies therefore found that there was a high risk of failure to achieve the goal that disease, including sea lice, shall not have a regulating effect on stocks of wild fish and that as many farmed fish as possible shall grow to slaughter age with minimal use of medicine.

The Directorate of Fisheries points out that, with one exception (Helgeland), there are one or more such assessments of risk in connection with an increase in capacity in existing licences for all areas along the coast. (See Appendix 6 for an overview of the bodies' risk assessments.)

In its report, the Directorate of Fisheries concluded that an increase in capacity should not be permitted in specified areas, mainly in Western

Norway (Indre Ryfylke, Sunnhordland, Midhordland, Romsdal and Sunnmøre) and in Nord-Trøndelag county. The Directorate of Fisheries states that, although it was generally negative to growth and there was a high risk of insufficient goal attainment along the whole coast, the situation in large parts of Western Norway was definitely most critical, and that it was therefore necessary to choose some geographical areas based on the request from the ministry.

The Ministry of Fisheries and Coastal Affairs' use of the expert input

Seen in light of the subordinate agencies' input, the Ministry of Fisheries and Coastal Affairs concluded that an increase in biomass was environmentally justifiable. The growth was to be achieved by increasing the maximum allowed biomass for existing licences by five per cent, in return for compensation. Exceptions were to be made for certain coastal and fjord areas where growth was not considered to be justifiable with respect to environmental sustainability. This applied to the national salmon fjords, Indre Ryfylke, Sunnhordland and Midhordland, parts of Nord-Trøndelag and parts of Sør-Troms.¹⁵⁸

In an interview, the Ministry of Fisheries and Coastal Affairs states that, following an overall evaluation, the Government came down in favour of increasing the biomass. This was announced in Proposition No 1 to the Storting (2009–2010) despite several expert agencies being sceptical. The ministry refers to the fact that the Government cannot be bound by advice and assessments from subordinate agencies. The expert agencies' assessments were part of the underlying documents when the Government considered the matter.

The planned increase in the maximum allowed biomass is stopped due to an increase in salmon lice

At the same time as the Ministry of Fisheries and Coastal Affairs announced the planned biomass increase in the budget proposition, the ministry distributed regulations relating to a capacity increase in salmon and trout farming in 2010 for public consultation. Several agencies and bodies submitted statements on the consultation memo. According to the Ministry of Fisheries and Coastal Affairs, the response from the Norwegian Food Safety Authority was decisive in relation to the ministry's decision to postpone the biomass increase.

157) The Norwegian Food Safety Authority also obtained input from its own regional offices.

158) Proposition No 1 to the Storting (2009–2010) for the Ministry of Fisheries and Coastal Affairs.

In its response, the Norwegian Food Safety Authority referred to the fact that there had been a substantial increase in the number of lice per fish in autumn 2009, and that the salmon lice situation was considered to be serious and worrying, for both the farmed fish and the wild fish. In addition to the increase in the number of lice, the lice had become more resistant to delousing agents. The Norwegian Food Safety Authority stated that there was a great risk that the resistance problems had spread geographically, and that they could continue to spread, so that large parts of the coast would be more or less affected by this problem.

The Norwegian Food Safety Authority therefore believed that the industry would have to reduce the biomass through slaughtering, fallowing and delayed release, in addition to treatment. In light of this, the Norwegian Food Safety Authority believed that general permission to increase the amount of fish pursuant to other legislation could appear confusing and unfortunate, since it would increase the number of hosts for the salmon lice and thereby increase the general infection pressure on wild fish.

Increase in maximum allowed biomass in the counties of Troms and Finnmark.

In August 2010, the Ministry of Fisheries and Coastal Affairs requested the Norwegian Food Safety Authority to assess the salmon situation along the entire coast, and the possibility of increasing the biomass. In the Norwegian Food Safety Authority's opinion, an increase south of Troms was not advisable. Based on the Norwegian Food Safety Authority's assessment of the situation, the ministry prepared for an increase in biomass in the counties of Troms and Finnmark in 2011. In Proposition No 1 to the Storting Appendix 2 (2010–2011), the Government presented a proposal for an amendment to the national budget for 2011 through an increase in capacity in salmonid farming in Finnmark and Troms. Among other things, the ministry refers to the fact that a number of measures have been implemented against salmon lice. However, the levels of lice at the national level were about the same as when the ministry postponed the national biomass increase. There were hardly any lice in Finnmark and Troms, however. On the basis of the Norwegian Food Safety Authority's assessment of the lice situation, there was, in the Government's opinion, a basis for implementing the previously adopted increase in capacity in the counties of Troms and Finnmark.

The proposal was adopted by the Storting on 11 November 2010, cf. Recommendation No 2 to the Storting (2010–2011) and legislative decision 66.

5.2 Processing of aquaculture cases

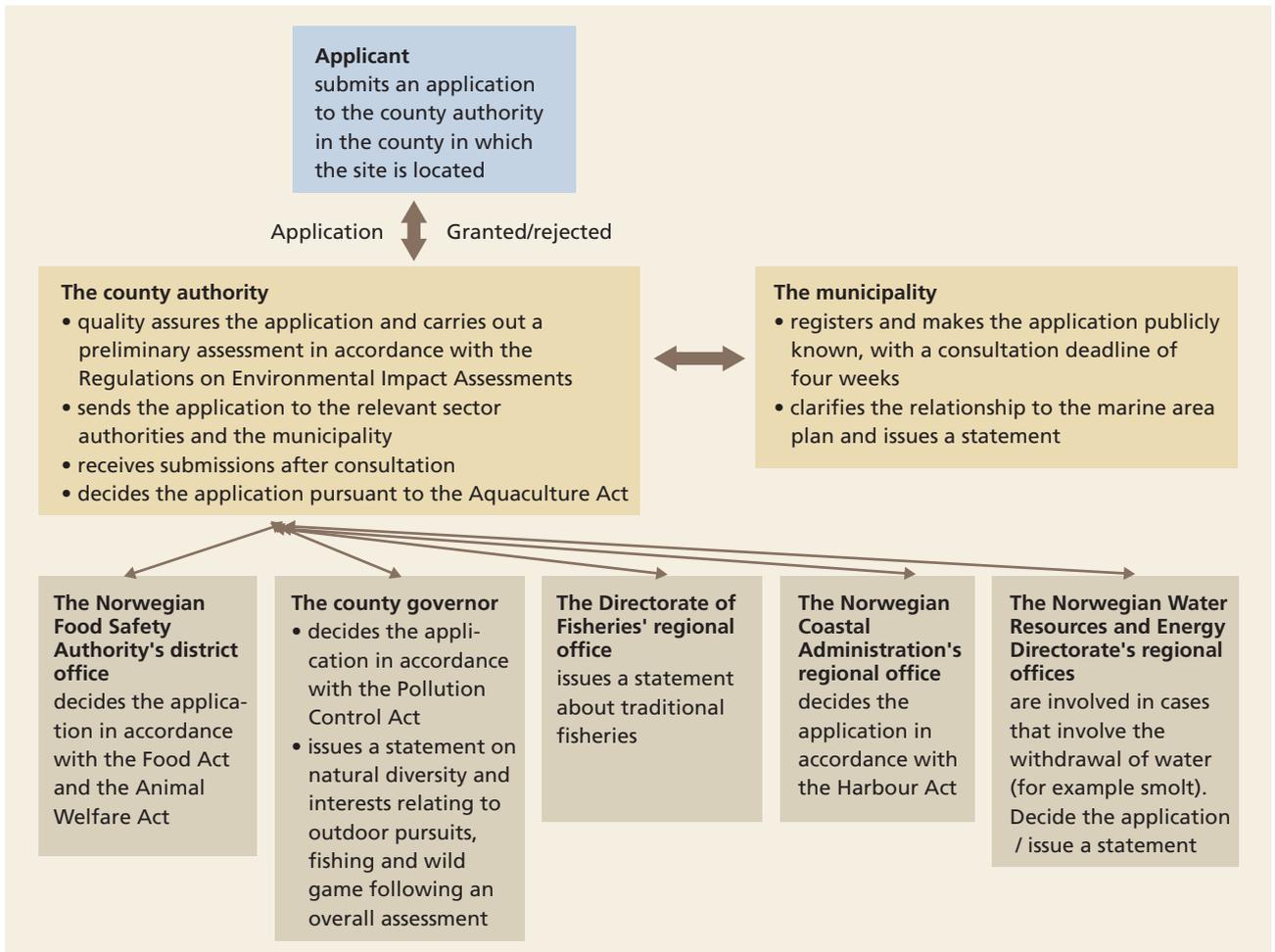
Pursuant to the Aquaculture Act, it is not permitted to engage in aquaculture activities in Norway without a licence. A licence to engage in aquaculture is granted on the basis of an individual application. The Act requires that a licence to engage in aquaculture shall only be granted if it is environmentally justifiable. The processing of aquaculture cases shall therefore contribute to ensuring that the environment and optimal use of the coastal zone are taken into consideration.

5.2.1 The case processing

Several central government sector authorities are involved in the processing of the applications in addition to the county authority and the municipality in which the site applied for is located. The processing of individual applications to engage in salmonid farming takes place in two rounds and involves two decisions. First, it is considered which applicants will be allocated a licence, and then the site is approved. For the establishment and, if relevant, moving and expansion of facilities for species other than salmonids, there is only one application round.

The county authority in which the site applied for is located receives and processes applications for licences to engage in aquaculture. Applications can concern new licences, new sites or changes to existing licences or sites. An application will have a number of appendices, including a contingency plan, current measurements, maps, internal control systems and environmental surveys. The county authority quality assures the application and pertaining appendices, registers the application and carries out an assessment on the basis of the Aquaculture Act and the applicant's assessment of whether an environmental impact assessment is necessary. The case is then forwarded to the municipality in question, which registers and makes the case publicly known, so that affected parties can state an opinion. Pursuant to the Planning and Building Act, the municipality shall advise against or recommend the granting of the application on the basis of the adopted plans (the marine area part of municipal plans) and may

Figure 17 Case processing procedures for aquaculture cases



Source: The Directorate of Fisheries

decide to grant dispensation from such plan.¹⁵⁹

The case is also sent to the relevant sector authorities, which process it on the basis of the relevant regulations and/or issue statements as follows:

- The Norwegian Food Safety Authority processes applications and makes decisions on the basis of the Food Act and the Animal Welfare Act.
- The county governors make decisions on the basis of the Pollution Control Act and issue statements based on considerations relating to nature conservation, outdoor pursuits, fishing and wild game interests, vulnerable nature and biological diversity.¹⁶⁰
- The Directorate of Fisheries can issue a statement on traditional fisheries interests.
- The Norwegian Water Resources and Energy Directorate processes cases and makes decisions on the basis of the Water Resources Act.¹⁶¹ In

the aquaculture context, this applies to licences for the use of fresh water resources for the production of smolt.¹⁶²

- The Norwegian Coastal Administration's regional office decides applications on the basis of the Harbour Act.¹⁶³ Among other things, this Act regulates the use of marine areas used to establish and operate fairways, and to safeguard accessibility along the coast.

When all the decisions of the sector authorities have been made, the county authority, which is the allocation authority, shall make a decision on the basis of the Aquaculture Act following an overall assessment.¹⁶⁴ In addition to the requirements of the Aquaculture Act, the Salmon Allocation Regulations¹⁶⁵ and the Allocation

159) The Directorate of Fisheries: *Konsekvensutredninger og miljøundersøkelser ved etablering av akvakultur (Environmental impact assessments and environmental surveys in connection with the establishment of aquaculture)*, internal report from the working group AKUMA.

160) *Brukerhåndbok akvakulturforvaltning (User manual for the management of aquaculture)*, The Directorate of Fisheries, 2010.

161) Act of 24 November 2000 No 82. The Act relating to River Systems and Groundwater (the Water Resources Act).

162) *Effektiv og bærekraftig arealbruk i havbruksnæringen – areal til begjær, 2011 (Efficient and sustainable use of marine areas in the aquaculture industry – desirable marine areas)*.

163) Act of 17 April 2009 No 19. The Act relating to Harbours and Fairways (the Harbour Act).

164) See, among other things, the Aquaculture Act Section 8 and Proposition No 61 to the Odelsting (2004–2005) *Om lov om akvakultur (akvakulturloven) (On the Act relating to Aquaculture (the Aquaculture Act))* (p. 62).

165) Regulations of 22 December 2004 No 1798.

Regulations for all other species¹⁶⁶ contain more detailed provisions concerning what shall form the basis for allocating new and amended aquaculture licences.

If one of the central government sector authorities has rejected the application on the basis of its regulations, the county authority must reject the application pursuant to the Aquaculture Act.¹⁶⁷ The county authority can nevertheless, on an independent basis and following negative recommendations from the county governors and the Directorate of Fisheries, reject an application even if all sector authorities grant permission pursuant to their regulations.

The processing of aquaculture cases involves several elements that affect the environment and that are intended to contribute to ensuring that the industry is environmentally sound. They are the Norwegian Food Safety Authority's assessment of the risk of infection and animal health considerations (cf. chapter 4.2) and the county governors' assessment in relation to discharges and pollution (cf. chapter 4.3). As mentioned, the county governors can advise against granting applications on the basis of environmental considerations such as biological diversity and wild salmon (cf. chapter 4.1).

In the following, the Norwegian Food Safety Authority's and the county governor offices' case processing of aquaculture applications is described.

5.2.2 The Norwegian Food Safety Authority's processing of aquaculture cases

When the Norwegian Food Safety Authority is to assess the risk of infection and animal health, the overriding goal is that disease in aquaculture shall not have a regulating effect on stocks of wild fish, and that as many farmed fish as possible shall grow to slaughter age with minimal use of medicines.

The Norwegian Food Safety Authority's district offices process and make decisions in aquaculture cases. The regional offices are the appeal body. The Norwegian Food Safety Authority has independent legal authority to decide applications through the Establishment Regulations, the legal authority for which is the Food Act and the Animal Welfare Act.¹⁶⁸

166) Regulations of 22 December 2004 No 1799.

167) See Section 6 letter d) of the Aquaculture Act.

168) Regulations of 17 June 2008 No 823 relating to Establishing and Expanding Aquaculture Establishments, Pet Shops, etc. (the Establishment Regulations).

The number of cases processed by the Norwegian Food Safety Authority each year varies between offices. At the offices that were asked, the annual number of processed cases varied from three to 50 during the period 2007 to 2010. The number of rejections varied between four and 20 per cent during the same period. Almost all rejections are appealed by the applicant. The outcome of the appeals varies somewhat between regions. In some regions, the decisions are seldom changed, while in other regions, the decisions are overturned in about half the cases.

Assessment points in case processing

A key element of the Norwegian Food Safety Authority's processing of aquaculture applications consists of assessing whether the site is suitable for fish farming based on the Norwegian Food Safety Authority's responsibility for ensuring good fish health and fish welfare. An application must therefore contain information about this aspect, such as data relating to water quality, currents, the amount of water and natural conditions that are significant to welfare. The Norwegian Food Safety Authority shall also assess whether the aquaculture facility can satisfy the species' requirements for a good living environment.¹⁶⁹

When considering the suitability of a site, the Norwegian Food Safety Authority shall take account of and base its assessment on the site's location and whether the fish farmer has satisfactory contingency plans and an internal control system.

The Norwegian Food Safety Authority's head office states that it can be difficult to assess several of the above-mentioned points when processing aquaculture cases. In the following, the Norwegian Food Safety Authority's consideration of a site's suitability in three key areas is presented: 1) the facility's location and risk of infection, 2) contingency plans and internal control, and 3) currents.

Risk of infection

The location of facilities in relation to other activities and the surrounding environment is important in relation to preventing infection. In this context, particular emphasis shall be placed on the distance to watercourses, other aquaculture-related activities and groups of aquaculture facilities. Pursuant to the Norwegian Food Safety Authority's guide, situating fish farms in known migration routes for wild fish is not advised.

169) See Section 7 of the Establishment Regulations.

The Norwegian Food Safety Authority's guide states that applications that meet the requirements for minimum distances shall generally be granted a licence pursuant to the Establishment Regulations, provided that the other conditions are met. The guide recommends obtaining opinions from the fisheries and environmental authorities in cases where considerations relating to wild populations can form the basis for rejecting an application for establishment pursuant to Section 5 of the Regulations.

A majority of the Norwegian Food Safety Authority's affected district offices point out that there are no clear guidelines for assessing migration routes of wild salmon, and that such assessments are therefore often based on discretionary judgement. A majority of the district offices also point out that little is known about the migration routes of wild salmon, and that it is therefore difficult to take this into consideration in case processing.

Contingency plans and internal control

An assessment of submitted contingency plans is carried out in the processing of all applications for the establishment of an aquaculture facility. In the contingency plan, the fish farmer must present an overall plan describing how the requirements for safeguarding fish health and fish welfare will be met, such as plans for the removal, handling and treatment of diseased and dead animals, biosecure transport from the facility to the slaughterhouse, and, if relevant, destruction.

According to the Norwegian Food Safety Authority's head office and some district offices, contingency plans are difficult to assess when processing an application. It is considered difficult to assess what constitutes adequate preparedness, especially for new facilities. The contingency plan shall be adapted to the individual facility, and it can therefore be difficult for the applicant to prepare detailed plans for the facility before it is in operation.¹⁷⁰

Internal control systems shall also be based on a risk assessment of the operation and are thus developed in step with the operation of the facility. Some of the Norwegian Food Safety Authority's district offices state that it is demanding to assess whether the internal control systems presented in the applications are adequate. The Norwegian Food Safety Authority's head office points out that

the plans for internal control are often extensive and prepared by consultants, but it regards it as relatively easy to assess the plans during case processing. The head office emphasises, however, that the challenge is to ensure that these plans are complied with in practice. Internal control can therefore best be followed-up through inspections.

Currents and the suitability of the site

The assessment of currents is an important part of the assessment of the suitability of a site, because the currents affect the oxygen level in the water and are crucial to fish health and fish welfare. According to the Norwegian Food Safety Authority, currents are a complicated area, and it is difficult to judge what is good enough.

A requirement that current measurements be carried out is included in the guide on how to complete application forms for licences for aquaculture in floating or land-based facilities. Requirements are also included for the location of current meters and the duration of the measurements. Several district offices state that the underlying data the offices receive in applications are generally good. A majority of them also state that it is assessed whether measurements and where they are taken are in accordance with the requirements. Normally, a large part of the documentation is prepared by hired consultants on behalf of the applicant. The offices state that they to a certain extent or a lesser extent have the competence or equipment required to verify measurements of this type. Some offices also point out that the results of current measurements may depend on what type of meter is used. This is emphasised by comparisons carried out by, for example, the consultancy company Havbrukstjenesten, which has carried out measurements of the same place using the two most frequently used current meters. The measurements produced different results. For example, a measurement at a depth of five metres showed 11.3 per cent with zero current (three hours) on one meter, and 1.3 per cent with zero current (ten minutes) on the other meter.

The Norwegian Food Safety Authority's use of discretionary judgement in case processing

As described above, the Norwegian Food Safety Authority states that assessing several of the points in the case processing is a challenging task. The suitability of a site is particularly dependent on the prevailing currents, and the Norwegian Food Safety Authority states that this is a complicated area in which it is difficult to assess what is good enough.

170) This is an excerpt from the facts of the case and the assessments of the original case officer. It should not be regarded as the correct answer to how the application should be processed.

The Norwegian Food Safety Authority's head office states that the guide to the Establishment Regulations puts too much emphasis on distance and too little on currents. This means that it is necessary to exercise discretionary judgement in the case processing of aquaculture cases. It is a goal for the government administration to ensure equal treatment of identical cases. A vignette survey was carried out in order to shed light on how the Norwegian Food Safety Authority assesses elements of importance to the sustainability goal for fish health and fish welfare,¹⁷¹ and to investigate the extent to which discretionary judgement is uniformly exercised. In the survey, the same three aquaculture applications were sent to 19 offices (16 district offices and three regional offices) for case processing. The three vignettes are based on authentic cases that have been processed by other district offices. The cases have been anonymised. The offices were sent all documentation from the original case that was relevant to assessing whether the current conditions and the oxygen level at the sites were sufficient to ensure good fish health and fish welfare. The offices were requested to assume that the applicant meets the requirements for other elements in the Norwegian Food Safety Authority's case processing, such as contingency plans and internal control.¹⁷² Under each vignette, certain facts from the original application are reproduced, cf. Fact Box 4–6. Some of the assessment points that were used and the decision from the office that originally processed the office are also reproduced here. However, this information was not available to the offices that processed the vignettes.

The difference between not making a decision and rejecting an application on the basis of a lack of documentation can in reality be small. In real cases, the case officer can contact the applicant to request further information, which was not possible in the vignette survey. This can have resulted in case officers with identical views

choosing to either not make a decision or to reject the application on the basis of lack of documentation. However, some offices state that they consistently reject incomplete applications to motivate fish farmers to submit complete applications.

Vignette 1: Assessment of currents

Fact Box 4 Vignette 1 Assessment of currents. Excerpt from facts and assessment points in original case¹⁷²

New site for salmonid farming. Biomass applied for: 3,120 tonnes

Assessment points:

- Currents: It was regarded as uncertain whether the currents at the site are sufficiently strong and whether they result in sufficient water replacement to ensure optimal conditions for a large amount of fish. It is stated that for 11 per cent of the time there is almost zero current, and that periods of almost five hours with virtually zero current have been measured. When producing close to the maximum allowed biomass and at high temperatures, this can be critical in relation to fish health and fish welfare.
- Other factors: The environmental monitoring system (MOM) shows that the seabed has a moderate ability to handle organic material from fish farming activities.

Outcome of the original case:

The district office that originally processed the application had decided to grant the applicant a licence for production as stated, but on certain more detailed conditions. The office states, however, that doubt subsequently emerged about the suitability of the site, and that it would have rejected the application had it been considered again.

The distribution of the offices' assessments of Vignette 1 is presented in Table 6.

Table 6 Vignette 1 Assessment of currents. Distribution of responses, N = 19 offices

Total number of responses	Has made a decision	Has not made a decision, but requests further information	Decision to grant a licence	Decision to reject
19	15	4	9	6

171) The Establishment Regulations Section 6 letter g and Section 7 fifth paragraph.

172) There will always be factors that mean that a vignette does not reflect the actual processing, such as it not being possible to contact the applicant for clarification and questions. A more detailed description of the method is provided in chapter 2.3.

173) This is an excerpt from the facts of the case and the assessments of the original case officer. It should not be regarded as the correct answer to how the application should be processed.

The table shows that four of 19 offices chose not to make a decision in their vignette responses, but request more information. Of the 14 offices that made a decision, nine granted a licence, five of which granted a licence on the basis of reduced biomass, a temporary licence and/or extra conditions. Six rejected the application. All rejections were justified on the grounds that the current conditions at the site are deemed to be unsatisfactory. Most offices express doubt about whether the currents are adequate, and several of the offices that granted a licence also state that they are uncertain on this point.

The offices that did not make a decision point out that a current measurement was lacking (dispersal current), which the guidelines state must be enclosed with the application. This was not pointed out in the original case processing. Two of the rejections are also justified precisely because of missing current measurements. Several of the offices that made a decision, regardless of whether a licence was granted or the application was rejected, also point out the lack of current measurements, while five offices do not point this out.

Vignette 2: Verification of underlying documentation.

Fact Box 5 Vignette 2 Verification of underlying documentation. Excerpt from facts and assessment points in original case

New site for salmonid farming. Biomass applied for: 4,500 tonnes

Assessment points:

- Measurement error: It was pointed out that there was an obvious error in the current measurement at five metres, because the current only went in one direction, namely towards the shore. It is regarded as unlikely that the current only moves in one direction in the sea, because currents and the direction of the water are affected by the tides, wind and often several current systems. In addition, the current measurement at 15 metres showed varying current directions. Taken together, these factors indicate that the current meter had become stuck.
- The current would have been regarded as good if the measurements had been correct.

The outcome of the original case: The processing of the application was never completed, but the district office states that the applicant was made aware of the measurement error and that the application was rejected by the municipality in which the site applied for was located on the basis of the marine area plan.

The distribution of the offices' assessments of different points in Vignette 2 is presented in Table 7.

The table shows that three offices did not make a decision because of lack of information about the current conditions in this vignette. Sixteen of the offices made a decision, and 13 of them granted a licence. However, all the offices that granted a licence reduced the maximum allowed biomass from the 4,500 tonnes applied for to 3,120 tonnes. Several of the offices that granted a licence pointed out that they would have requested more information had this been a real case, but they concluded that the site was suitable based on the available information. Two offices point out in their vignette responses that the current appears to be unidirectional, while only one of these two offices points out the likelihood of an error in the current measurement given the information in the case. Two offices state that the current is unidirectional, but that this is as expected and is positive in relation to removing discharges from the fish farm.

Vignette 3: Assessment of site with strong current

Fact Box 6 Vignette 3 Assessment of site with strong current. Excerpt from facts and assessment points in original case

New site for salmonid farming. Biomass applied for: 3,120 tonnes

Assessment points:

- Currents: The current measurements at the surface (five metres) at the site show a very strong current at times, with a maximum current in the measurement period of 85.6 cm/s and an average of 14.4 cm/s. At a depth of 15 metres, there was a maximum current of 24.6 cm/s and an average of 3.1 cm/s. The bottom current had a maximum measurement of 10 cm/s and an average of 1.3 cm/s.

The outcome of the original case: The district office decided to grant a licence subject to conditions, but the office later stated that the case should probably have been rejected because the current was too strong.

The offices' decisions are presented in Table 8.

The table shows that all the offices decided to make a decision in this vignette. Of 19 decisions, eight grant a licence, while 11 reject the application. With the exception of one office, all the offices

Table 7 Vignette 2 Verification of data in reports from consultants. Distribution of responses, N = 19 offices

Total number of responses	Has made a decision	Has not made a decision, but requests further information	Decision to grant a licence	Decision to reject
19	16	3	13	3

Table 8 Vignette 3 Assessment of site with strong current. Distribution of responses, N = 19 offices

Total number of responses	Has made a decision	Has not made a decision, but requests further information	Decision to grant a licence	Decision to reject
19	19	0	8	11

point out that the current is strong, and most refer to what consequences this can have for fish health and fish welfare as a result, among other things, of stress, harm to the fish, increased risk of breakdown and escapes, and operational challenges in relation to, for example, delousing. Several of the offices that choose to grant a licence point out the strong current, but deem it to be acceptable. Several of these offices stipulate a requirement that smolt not be released, but larger fish that are presumed to tolerate strong currents. Other offices state that, during periods with strong currents, the fish can move deeper down in the cages, while one of the offices that reject the application points out that the fish must move up to the surface to be fed.

The use of conditions in the licences

A licence is granted in about half the vignette responses, but special conditions are stipulated over and above those normally stipulated in connection with licences. Letters containing questions sent to the district offices also show that the extent to which such special conditions are used varies between offices. Some offices state that conditions are usually not stipulated, while other offices stipulate conditions in about 60 per cent of all cases. The content of the conditions varies from requirements for oxygen measurements to reduced biomass and requirements for general documentation of the suitability of the site. In some of the conditions, it is stated that the licence will be revoked unless it can be documented that the site is suitable after a certain time. In an interview, the Norwegian Food Safety Authority states that one licence has been revoked since the Norwegian Food Safety Authority was established in 2004.

One office states that, in recent years, a licence subject to conditions has been granted for all

applications rather than the application being rejected, under pressure from the applicant.

The Norwegian Food Safety Authority's head office states that, in the preparation of the guidance material, it was a goal that no specific conditions be stipulated in licences. Operating requirements should be stipulated through the Aquaculture Operation Regulations. However, the guide does open for the possibility of stipulating special conditions in the case of facilities with a maximum allowed biomass in excess of 3,120 tonnes. Due to the general increase in the size of facilities, a practice of stipulating special conditions has developed. The Norwegian Food Safety Authority believes that it is self-evident that case officers can and should stipulate special conditions for licences in order to find out how the applicant plans to conduct operations. According to the Norwegian Food Safety Authority's head office and district offices, the Norwegian Food Safety Authority does not have common procedures for how special conditions are to be followed up by the district offices. Nor are there any common procedures for what consequences breaches of special conditions shall have. The individual case officer must follow this up, and the Norwegian Food Safety Authority's head office assumes that the district offices have procedures for this.

It can also be unclear what the consequences will be for the fish farmer if the conditions are not followed up. Some consequences are set out in legislation, and some are explicitly set out in the decision, but, in several of the vignette responses, it is not stated what will happen if the conditions are not followed up.

Guidance and case officer support

The Norwegian Food Safety Authority has produced various guides to assist in the assessment

of elements in case processing, and courses and meetings are also held, for example on fish health, for all the Food Safety Authority's offices. The processing of appeals by the regional offices also contributes to clarifying complex cases and cases involving matters of principle. In addition, several regions have established expert groups that discuss general questions, and case officer groups that discuss difficult cases. Secondments and in-house training are also among the measures taken to help case officers in their case processing work.

Guides have been produced to the Establishment Regulations and the Aquaculture Operation Regulations. The Norwegian Food Safety Authority's head office states that the guide to the Establishment Regulations from 2004 places too much emphasis on distance and too little on guidance about currents. The reason for emphasising distance is that it was desirable to define clear and simple conditions for applicants and case officers in the application process. In the processing of aquaculture cases, the practice has therefore been to emphasise distances. In the Norwegian Food Safety Authority's opinion, the distance requirements have worked well in that they mean that applicants should know that, in cases where a facility does not meet the minimum requirements for distance, it will be difficult to grant the application.

According to the Norwegian Food Safety Authority, the recommended limits are more experience-based than scientifically founded. One district office is critical of the actual guidelines for minimum distances in the sea, because it is known that some disease problems spread over far greater distances than the stipulated minimum distances.

With the current knowledge about currents and because bigger cages are being used in the industry, the Norwegian Food Safety Authority believes it is necessary to produce a new guide. However, assessing current conditions and interpreting the results of current measurements will always be a challenge.

A lot of teaching material has been produced in connection with internal courses, but none of it has formal status and it has not been collected. According to the Norwegian Food Safety Authority, this information should have been made more easily accessible to case officers at the offices.

A majority of the district offices involved state that the Norwegian Food Safety Authority does not have clear guidelines for assessing different elements in the case processing relating to the suitability of sites, whether the current is good enough, and whether the contingency plan and plan for internal control are good enough. There are clear guidelines, however, for assessing the distance to other facilities.

The Norwegian Food Safety Authority's head office maintains that the organisation needs to endeavour to become more uniform in its case processing, but adds that each site must be assessed individually. Guidance cannot be absolute therefore; there must be room for discretionary judgement.

5.2.3 The county governor offices' processing of aquaculture cases

The other central point in the case processing that has a bearing on the sustainability goals is the county governor offices' case processing pursuant to the Pollution Control Act. It is an overriding goal that all aquaculture sites in use shall be of an acceptable environmental standard and not discharge nutrient salts and organic material in excess of the tolerance limit of the recipient.

In order to be granted a licence to engage in aquaculture, the applicant must have a discharge permit pursuant to the Pollution Control Act. The Pollution Control Act is administered by the Norwegian Climate and Pollution Agency, but this power has been delegated to the county governors in the aquaculture context. The county governors deal with and makes decisions pursuant to the Pollution Control Act on the establishment, expansion and moving of aquaculture facilities. The Norwegian Climate and Pollution Agency is tasked with guiding the county governors and endeavouring to ensure equal treatment by the county governor offices. The Norwegian Climate and Pollution Agency is also the appeal body for the county governors' decisions pursuant to the Pollution Control Act. Table 9 shows the number of aquaculture cases processed by the county governor offices and the number of applications rejected, during the period 2007 to 2011 (February).

Table 9 The processing of aquaculture cases by the county governor offices in the period 2007 to 2011*

	Number of processed cases	No of rejections
Finnmark	37	0
Troms	151	0
Nordland	151	17
Nord-Trøndelag	49	0
Sør-Trøndelag	88	2
Møre og Romsdal	121	2
Sogn og Fjordane	49	2
Hordaland	120	3
Rogaland	47	16

*As of February 2011.

Source: The county governor offices



Photo: Colourbox

As shown in Table 9, the total number of aquaculture cases processed varies from 37 in Finnmark to more than 150 in Troms and Nordland during the period 2007 to 2011 (February).¹⁷⁴ Three of the counties did not reject any applications during the period, while four rejected two or three. The County Governor of Nordland rejected 17 cases during the period and states that the reasons can be poor environmental conditions at the site or incomplete applications. The County Governor of Rogaland rejected 16 cases, but several of these rejections were appealed.

Assessment points in the case processing

When the county governors are to assess whether a site is suitable for fish farming based on pollution considerations, it is primarily the site's capacity to tolerate the planned discharges that is assessed. In more closed areas, such as threshold fjords, the overall load on the recipient must also be assessed.¹⁷⁵ The applicant is responsible for documenting the suitability of the site. In order for the authorities to assess whether the recipient conditions are satisfactory, the applicant must, among other things, obtain surveys of water replacement at the site, the direction and speed of currents, and the topography and condition of the seabed. Map sections and a sketch of the facility must also be enclosed with all applications. All the county governor offices involved point out that the quality of the submitted data varies, and that they cannot always be regarded as reliable. This applies in particular to surveys of seabed

174) How the number of cases is calculated varies somewhat between the counties, and backlogs, withdrawals of applications etc. occur.

175) *Fylkesmannens behandling av oppdrettssaker (The county governors' processing of aquaculture cases)* (1999), the Norwegian Climate and Pollution Agency, Guide 99:04.

conditions. Only one county governor states that the submitted underlying data are generally good and correct.

In response to the query sent to all county governor offices that process aquaculture cases, the majority state that they check and verify the extent to which measurements and surveys are correctly carried out. A few only emphasise this to a small extent and state that they trust that the consultants have carried out the work correctly.

The recipient's carrying capacity

A majority of the county governor offices that process aquaculture cases point out that it can be challenging to assess the recipient's carrying capacity and that it is not known what effect the establishment of the facility will have on marine biological diversity.

When an environmental monitoring survey is required as an enclosure to the application to document seabed conditions, the standard requirement is an MOM B survey. In special cases, however, the county governor can require that a more extensive C survey be carried out, or a corresponding environmental survey in accordance with international standards.

Several county governors point out that the measurement of seabed conditions in an MOM B survey prior to establishment provide little information about what the recipient's capacity will be once a facility is in operation. Many point out that MOM B is not a suitable tool for sites on hard seabeds either. The Norwegian Climate and Pollution Agency states that MOM B surveys can only provide information about the pollution

situation under and near the facility. It is unsuitable as a baseline sample at a site, since a recipient is rarely affected before the fish farm is in use.

How often an expanded environmental survey is requested varies between county governor offices. Several state that this is done to a certain extent, and particularly in cases where there is uncertainty about the recipient's ability to tolerate discharges. Some state that they only request such a survey occasionally and that they believe that the guidelines for when one should be required are unclear (cf. the description in chapter 4.3 about the ongoing work on introducing new requirements for the implementation of MOM surveys, both on start-up and in the operating phase).

Currents

Several county governors feel that it is challenging to assess whether the current conditions at a site are good enough. It is pointed out in particular that the results of the measurements can vary strongly depending on when in the year they are conducted. The measuring point will also have a bearing on the result. The current must be measured at a point below the facility, while the facility can cover 500–600 metres, and the topography can result in great variations in the current below and around the facility.

It is also pointed out that the current prior to establishment may say little about the current after establishment, because the current will be affected by the facility itself. Changed currents can thereby also affect the expected dispersal of discharges and thereby the state of the environment at the site.

The county governors' use of discretionary judgement

The Pollution Control Act allows discretionary judgement to be exercised in the processing of pollution permits. A vignette survey was also carried out for the county governor offices in order to shed light on the extent to which case officers assess identical cases identically and

exercise discretionary judgement relatively similarly when assessing sites' suitability and capacity to tolerate the planned discharges. The vignettes are based on three authentic cases that have previously been processed by a county governor. The three vignettes were processed by eight county governor offices.¹⁷⁶ For each vignette, certain facts from the original application are reproduced, cf. Fact Box 7–10. Some assessments and decisions in the cases are also reproduced. This information was not available to the offices that were to process the vignette.

Vignette 4: Assessment of the site's suitability in a threshold fjord

Fact Box 7 Vignette 4 Assessment of currents and seabed conditions at new site. Excerpt from facts and assessment points in original case

New site for cod farming. Biomass applied for: 3,120 tonnes

Assessment points:

- The currents and seabed conditions were originally deemed to be satisfactory.
- The site is situated inside a threshold fjord and this made the assessment of the site's suitability difficult.

The outcome of the original case: The county governor granted a licence with a requirement that an MOM B survey be carried out in the operating phase. However, the county governor later stated that a requirement for an MOM C survey and modelling of the fjord's capacity should have been required.

The county governor offices' responses to Vignette 4 are summarised in Table 10.

Table 10 shows that, in the responses to Vignette 4, six county governors choose to make a decision. A licence is granted in all these decisions. Two county governors choose not to make a decision on the basis of inadequate documentation of the current conditions at the site.¹⁷⁷ This was not pointed out in the original processing of the case.

Table 10 Vignette 4 Assessment of currents and seabed conditions at new cod site. Distribution of responses, N = 8 county governor offices

Total number of vignette responses	Has made a decision	Has not made a decision, but requests further information	Decision to grant a licence	Decision to reject	Points out errors in the current measurements
8	6	2	6	0	5

176) The vignette method is presented in chapter 2.3.

177) As in the vignette responses from the Norwegian Food Safety Authority, while the vignette responses from several of the county governors point out a lack of documentation, they vary in terms of how much emphasis this is given.

The requirement is that the current meter shall be in place for four weeks when measuring currents, while in the vignette it was only in place for 14 days. This is pointed out in four vignette responses. Seabed measurements at the correct depth have also been omitted, which is pointed out by five offices. Three of the county governors that pointed this out chose to grant a licence.

Vignette 5: Assessment of currents and seabed conditions

Fact Box 8 Vignette 5 Assessment of currents and seabed conditions at new site

New site for salmonids. Biomass applied for: 3,120 tonnes

Assessment points:

- Currents: Seabed measurements carried out three metres above the seabed show an average speed of 1.2 cm/s. This is considered to be low.
- Seabed conditions and topography: The enclosed map show that the fjord concerned is a deep threshold fjord that probably has a limited recipient capacity. In addition, the site slopes downwards directly into a deep area, which means that most of the environmentally harmful matter is transported from the fish farm to the deep area. This can lead to a lack of oxygen in the bottom water. In addition to the topography, this led to the county governor insisting on further information if the application was to be processed.

Outcome of the original case:

A fjord environmental survey was required in order to assess the fjord's capacity, and an MOM C survey was requested to assess the situation further out in the recipient.

The county governor offices' assessment of the vignette is presented in Table 11.

The table shows that one county governor office chose not to make a decision and requested more information. Also in this vignette response, a decision was not made because of deficiencies in the current measurements. In this one county governor office's vignette response, a measurement was also requested of the oxygen saturation in the deep water where the slope flattens out.

This was not pointed out in the original processing of the case.

All the other county governors grant a licence. The fact that the fjord concerned is a threshold fjord and that this can result in lack of oxygen in the bottom water combined with a low bottom current, which was pointed out in the original decision, is not commented on in the vignette responses to any great extent. In the responses, the maps enclosed as part of the underlying documentation are interpreted differently. One respondent points out that the fjord is not a threshold fjord, while another points out that it is, but that this is not a problem because the seabed slopes down to a deep area.

Vignette 6: Assessment of underlying documentation and requirements for suppliers of such documentation

Fact Box 9 Vignette 6 Assessment of underlying documentation and consultants. Excerpt from facts and assessment points in original case

Increase of maximum allowed biomass for salmonids from 1,560 tonnes to 5,460 tonnes.

Assessment points:

- The area applied for was a candidate area for status as a marine protected area, especially in relation to a distinctive lobster stock.
- The quality of the enclosed MOM C survey was inadequate and the presentation was unclear.
- The survey of the site had shown high copper values below the farm without the consultant who had carried out the MOM C survey having explained this.
- The subcontractor for the benthic fauna survey was not certified to carry out benthic animal analyses. This is an absolute requirement pursuant to the standard NS 9410.

Outcome of the original case:

Rejected because of unclear surveys and the fact that the supplier of the benthic fauna survey was not certified to carry out such surveys.

Table 11 Vignette 5 Assessment of currents and seabed conditions at new salmon site. Distribution of responses, N = 8 county governor offices

Total number of vignette responses	Has made a decision	Has not made a decision, but requests further information	Decision to grant a licence	Decision to reject
8	7	1	7	0

Table 12 Vignette 6 Assessment of underlying documentation and consultants. Distribution of responses, N = 8 county governor offices

Total number of vignette responses	Has made a decision	Has not made a decision, but requests further information	Decision to grant a licence	Decision to reject
8	7	1	2	5

The county governor offices' responses to Vignette 6 are summarised in Table 12.

The table shows that, also in this vignette, one county governor office chose not to process the application due to too little documentation. Other county governors also point out weaknesses in the documentation and the somewhat deficient quality of the submitted data, but choose to process the case. In this vignette, five county governors reject the application and two grant a licence. One of the five offices that reject the application expresses strong doubt and states that the outcome could have been a licence, possibly on certain conditions.

The documentation enclosed with the original application was unclear, and the application had some shortcomings. Table 13 shows the extent to which the county governor offices pointed out deficiencies in the application and the enclosed documentation.

In the vignette responses, it emerges that the county governor offices vary in the extent to which they point out errors in the submitted data, but most do so in connection with one or more topics. In six of the eight vignette responses, errors and deficiencies in the current measurements are pointed out. Among other things, it is pointed out that the dispersal current is estimated and not actually measured. In addition, the majority point out that there are errors in how the measurements pursuant to the NS 9410 standard are carried out and that the wrong environmental condition class has been stated by the consultant in the application. The site has been assigned a better environmental condition class by the

consultant than the data indicated. This is pointed out in six of the vignette responses.

None of the vignette responses pointed out that one of the suppliers of the MOM C survey was not certified to carry out this type of survey. However, the Norwegian Climate and Pollution Agency states that emphasis has not been placed on whether the companies carrying out MOM C surveys are accredited or not, as the NS 9410 standard requires. Nor, according to the Norwegian Climate and Pollution Agency, has this been a central topic in the guidance given to the county governors.

Guidance and case processing support

The Norwegian Climate and Pollution Agency and the Directorate for Nature Management produced a guide for the county governors' processing of aquaculture applications in 1999. The guide discusses roles, responsibilities, authority, cooperation between authorities, case processing procedures in fish farming cases and the assessment of applications. Several county governors state in interviews that this guide needs to be updated. At the same time, several county governors point out that it is challenging to set standardised limits for currents in terms of whether they are sufficient or inadequate to prevent the undesirable accumulation of sediments on the seabed below a fish farm, since this depends on local conditions. Knowledge has increased in this area in recent years, however, which has made it easier for the offices to process the applications and assess the extent to which sites are suitable for aquaculture.

The Norwegian Climate and Pollution Agency states that it cooperates closely with the county

Table 13 Vignette 6 Assessment of underlying documentation and consultants. N = 8 county governor offices

Total number of vignette responses	Points out wrong environmental condition class	Points out errors in the current measurements	Points out errors in measurements of seabed conditions	Points out too high copper values	Points out lack of certification of the firm that carried out benthic fauna surveys
8	6	6	5	5	0

governors to ensure equal treatment. The processing of appeals also contributes to more equal treatment. There is also a good dialogue between the county governor offices.

The Norwegian Climate and Pollution Agency states that new information is made accessible via the internet, among other things through a thematic page for aquaculture, and that this is also important guidance material. However, it is a challenge to ensure that all case officers exercise discretionary judgement in as uniform a manner as possible.

The county governors' use of negative recommendations in aquaculture cases

In addition to processing aquaculture cases pursuant to the Pollution Control Act, the county governors are required to issue statements addressing nature conservation, outdoor pursuits, fishing and wild game interests, as well as vulnerable nature and biological diversity, and they can advise against aquaculture facilities being established on the basis of such considerations.¹⁷⁸

Guidelines for assessing consequences for the natural environment and recreational activities are provided in the guide for the processing of aquaculture cases from 1999. The Directorate for Nature Management has issued certain clarifications and specifications of the guidelines for the use of negative recommendations in a letter of 3 July 2009.

A review of negative recommendation cases from county governors in the period 2007 to 2010 shows that negative recommendations on the basis of wild fish considerations are respected in the final decision in most cases. Out of 24 cases in which all the sector authorities have granted a licence on the basis of their legislation, but where the county governors have issued a negative recommendation out of consideration for wild fish, the county governor's recommendation has been taken into account in six of the cases. Four applications concerned fish farms in national salmon fjords. Negative recommendations made because of salmon lice, escapes and proximity to a national salmon fjord or watercourse were followed respected by the competent authority in two cases.

In several county governors' experience, when negative recommendations concerning facilities situated in national salmon fjords or watercourses are not respected, then it is even more difficult for them to make negative recommendations in relation to areas that are situated just outside or near a salmon watercourse that has important populations, but that is not included in the protected area. Several county governors find it unclear how this should be assessed for sea trout. This is highlighted as a particular problem in areas where there has been a strong reduction in sea trout stocks.

A majority of the county governors that process aquaculture cases state that they do not find the guidelines for negative recommendations clear. Some county governors point out that the guidelines are too general and call for more specific guidelines. However, some county governor offices believe that the guidelines are sufficiently clear. The Norwegian Climate and Pollution Agency and the Directorate for Nature Management state that work is being done on preparing a new and updated guide.

5.2.4 The use of environmental impact assessments in the processing of aquaculture cases

Applications to engage in aquaculture must contain an assessment of the need to carry out an environmental impact assessment.

The establishment of fish farms shall take place in accordance with the Planning and Building Act. When establishing fish farms, the county authority¹⁷⁹ shall assess whether it is necessary to carry out an environmental impact assessment pursuant to the Regulations on Environmental Impact Assessments. Pursuant to the regulations, an environmental impact assessment shall be carried out if the establishment of a facility can have significant effects on the environment, natural resources or society. The purpose is to ensure that the environmental and societal considerations are taken into account in connection with the establishment of aquaculture facilities.¹⁸⁰ The Ministry of the Environment is responsible for the content of the regulations.

178) *Brukerhåndbok akvakulturforvaltning (User manual for the management of aquaculture)*

179) From 1 January 2010. Before this time, this responsibility rested with the Directorate of Fisheries.

180) *Konsekvensutredninger av akvakulturtiltak (Environmental impact assessments of aquaculture measures)* (2009), the Directorate of Fisheries.

Section 4 of the Regulations on Environmental Impact Assessments sets out the criteria for assessing when plans and projects have significant effects on the environment and society and are thereby covered by the requirement for an environmental impact assessment. The criteria shall be applied if, among other things, the plan or project poses a threat to endangered species and their habitats, to prioritised species or areas of importance to these species, and other areas of particular importance to natural diversity, and if the plan or project can result in significant pollution of soil, water and sediments.

Pursuant to Appendix II to the Regulations on Environmental Impact Assessments, large aquaculture facilities and smolt farms with a capacity exceeding five million smolt require an environmental impact assessment. In practice, it has therefore been estimated that facilities with more than 3,600 tonnes of biomass are large aquaculture facilities and must therefore be subject to environmental impact assessments.¹⁸¹ However, the regulations also state that it can be considered whether an environmental impact assessment should be carried out for smaller facilities if it can have significant effects on the environment and society.

According to the Directorate of Fisheries, the use of environmental impact assessments has been considered approximately 15 times during the period 2000 to 2009. Information has not been obtained from the county authorities about the extent of such assessments in 2010–2011, but information from the county governor offices shows that the use of environmental impact assessments has been considered in approximately five cases during the period in question. Environmental impact assessments in connection with aquaculture were only carried out three times in the period 2000 to 2011.

As the criteria for considering the use of environmental impact assessments largely concern the environmental authorities' area of responsibility, the relevant county governor offices and the Directorate for Nature Management and the Norwegian Climate and Pollution Agency have been asked about the use of environmental impact assessments in connection with aquaculture.

181) See the Regulations on Environmental Impact Assessments (of 1 April 2005 No 276) Section 3-2 letter i) (hatcheries) Large facilities have been defined by the Ministry of Fisheries and Coastal Affairs as facilities with more than 3,600 tonnes of biomass.

The environmental authorities' assessment of the extent to which environmental impact assessments are an expedient policy instrument in aquaculture varies somewhat. Several respondents point out that environmental impact assessments of individual facilities are not expedient because it is the overall pollution from several facilities in a fjord and the overall impact fish farming has on the wild salmon in an area that is interesting. Some generally believe that environmental impact assessments can be a useful policy instrument, and others believe that it can be a good policy instrument if it is used in a larger geographical perspective. The Directorate for Nature Management also points out that, in an environmental impact assessment, a site perspective is not sufficient when assessing the total impact on wild salmon.

The Norwegian Climate and Pollution Agency and about half the county governor offices state that special legislation, such as the Pollution Control Act, provides the legal authority for demanding necessary surveys of the recipient. The pollution authorities are therefore not dependent on the regulations governing the use of environmental impact assessments to require an assessment of the pollution situation. The experience from the few environmental impact assessments that have been carried out is that they have only provided desired information about the projects applied for to a limited extent. The Directorate of Fisheries, the former licensing authority, states in an interview that one assessment was a failure and that the other was well carried out¹⁸² in accordance with the programme, but that it still did not provide a sufficient basis for a safe assessment because the case was complicated. The Directorate for Nature Management also points out that the environmental impact assessments that have been carried out have not been successes. The Directorate of Fisheries also states in an interview that it is normally the individual site and whether the individual applicant should be granted a licence that is assessed. This is in accordance with regulations. In the directorate's opinion, it is more the sum of the environmental impact from all the individual facilities and when the cumulative impact will exceed the limit of what nature can tolerate that should be assessed. The challenges facing the fish farming industry could probably have been handled in a more expedient manner if regional impact targets had been established.

182) The third environmental impact assessment was completed after the interview with the Directorate of Fisheries.

In the opinion of the Ministry of the Environment, environmental impact assessments work as intended *when* they are used, but they are probably used and required too rarely. It is a matter of discussion when an environmental impact assessment is required, but it is difficult to set a specific limit. The Ministry of the Environment states that work has begun on amending the regulations, and that the regulations relating to environmental impact assessments will be assessed in that connection. According to the Directorate of Fisheries and Coastal Affairs, it is necessary to change the guidelines for implementing environmental impact assessments in cooperation with the Ministry of the Environment, with a view to increasing the use of such assessments.

The EFTA Surveillance Authority, ESA, has reviewed the use of environmental impact assessments in the Norwegian aquaculture industry and has, among other things, questioned the stipulation of the cut-off point of 3,600 tonnes of biomass. The basis for this cut-off point is, among other things, statements from the former Norwegian Pollution Control Authority stating that there is considerable pollution from aquaculture facilities. ESA also points out that applications should be assessed in a broader context with respect to the environment, including considering the cumulative effects of the facility applied for and existing facilities nearby.¹⁸³

5.3 Supervision of the aquaculture industry

Supervision is a fundamental and important policy instrument for ensuring that the aquaculture industry is run in accordance with the goal of an environmentally sound and sustainable aquaculture industry, cf. Proposition 1 to the Storting (2009–2010) for the Ministry of Fisheries and Coastal Affairs. Supervision is intended to ensure that the industry complies with the applicable provisions regulating the aquaculture industry, to uncover any breaches and impose appropriate sanctions on violators of the overall regulations relating to aquaculture.

The Directorate of Fisheries, the Norwegian Food Safety Authority and the county governor offices share responsibility for supervision of the aquaculture industry. Each agency supervises the industry pursuant to its respective legislation. This means that the Directorate of Fisheries shall supervise the industry on the basis of the Aquaculture Act, the Norwegian Food Safety Authority on the basis of the Food Act and the Animal Welfare Act, and the county governor offices on the basis of the Pollution Control Act. However, both the Directorate of Fisheries and the Norwegian Food Safety Authority carry out supervision on the basis of the Aquaculture Operation Regulations and the acts relating to different sectors. All the three bodies can also exercise supervision of the enterprises' internal control – see Table 14 for an overview of the division of responsibility for supervisory tasks.

Table 14 Division of responsibility in connection with the supervision of aquaculture

Responsible ministry	The Ministry of Fisheries and Coastal Affairs	The Ministry of Agriculture and Food	The Ministry of the Environment
Directorate functions	The Directorate of Fisheries The Norwegian Food Safety Authority*	The Norwegian Food Safety Authority	The Norwegian Climate and Pollution Agency
Regional organisation	7 regions (the Directorate of Fisheries)	5 regions* 37 district offices*	The county governors
Statutory basis for supervision	The Aquaculture Act	The Food Act The Animal Welfare Act	The Pollution Control Act
Regulatory basis for supervision, examples	Aquaculture Operation Regulations		
	Internal Control Regulations for aquaculture.		The Internal Control Regulations

* The Norwegian Food Safety Authority has eight regions and 54 district offices.

183) Letter of 8 January 2010 from the EFTA Surveillance Authority to the Ministry of the Environment.

Table 15 Supervisory tasks and the goals for sustainable management of aquaculture

The goals for a sustainable aquaculture industry*	Supervisory responsibility
Escaped fish and genetic interaction	The Directorate of Fisheries
Fish health and fish welfare	The Norwegian Food Safety Authority
Pollution and discharges	The Directorate of Fisheries and the county governor offices
Fish feed	The Norwegian Food Safety Authority

* The goals relating to the use of marine areas have been omitted from the table because the use of marine areas is the responsibility of the municipalities and is not a natural area for supervision.

Table 16 List of supervisory activities carried out in 2010

	Number of supervisory activities, audits and inspections	Number of uncovered breaches of the regulations* / number of supervisory activities that have uncovered breaches of the regulations**	Forms of sanctions	
			Administrative sanctions	Reports to the police
The Directorate of Fisheries	380	638 ⁺	48	5
The Norwegian Food Safety Authority	1022	701 ^{**}	125	0
The county governors	44	38 ^{**}	0	0

Sources: The Directorate of Fisheries' annual report to the Ministry of Fisheries and Coastal Affairs for 2010, the Norwegian Food Safety Authority's key figure reports and the county governor offices' inspection reports

Table 15 shows the supervisory responsibilities of the different bodies seen in relation to the main goals for an environmentally sound and sustainable aquaculture industry.

Table 16 gives an indication of the scope of the supervisory activities of the different supervisory agencies.

In the following, a description is provided of the three agencies' work on supervision and control of the aquaculture industry – for the Directorate of Fisheries, the Norwegian Food Safety Authority and the county governor offices, respectively.

5.3.1 The Directorate of Fisheries' supervisory activities

Through its supervisory work, the Directorate of Fisheries shall ensure that the aquaculture facilities are operated in a technically, biologically and environmentally sound manner.¹⁸⁴ In the allocation letter for 2011, the Ministry of Fisheries and Coastal Affairs states that the directorate shall prioritise control of compliance with regulations that are important to ensuring a sustainable and environmentally sound aquaculture industry. This involves limiting the number of escaped fish (cf. chapter 4.1), compliance with the biomass provisions (which are important to all the environmental

goals for aquaculture, cf. chapters 4.1–4.5) and follow-up of environmental monitoring and the state of the environment (cf. chapter 4.3). The directorate also checks whether the aquaculture facilities can document that systematic measures to meet the requirements of aquaculture legislation are planned, organised and implemented.¹⁸⁵

The directorate employed approx. 450 full-time equivalents in 2011, including staff in underlying offices. The number of full-time equivalents working on supervisory activities has increased strongly in 2011. The directorate uses approximately 60 members of staff, compared with 20 full-time equivalents previously, on planning and implementing supervisory work in relation to aquaculture. Other aspects of the use of resources, as well as competence and guidance are presented in Appendix 7.

The seven regional offices of the Directorate of Fisheries¹⁸⁶ are responsible for the practical implementation of the supervisory work. As of 2011, there are approximately 1,500 sites in all where fish and other seafood are farmed and that are subject to the regulations with which the directorate is to check compliance.

184) Section 5 of the Aquaculture Operation Regulations (Regulations of 17 June 2008 No 822). See also Section 67 of the Aquaculture Operation Regulations.

185) Regulations on internal control to ensure compliance with the requirements of aquaculture legislation (Internal Control Aquaculture) (Regulations of 19 March 2004 No 537).

186) The regions Finnmark, Troms, Nordland, Trøndelag, Møre og Romsdal, West (Sogn og Fjordane and Hordaland) and South (the rest of the coast to the Swedish border).

The Directorate of Fisheries has chief responsibility for following up the regional offices' control work in accordance with the requirements and goals stipulated by the Ministry of Fisheries and Coastal Affairs. It is an important requirement that the supervisory work is effective. Effective control does not necessarily involve inspecting all sites. The regional offices must therefore ensure that, as far as possible, their inspection work targets the sites where violations of the regulations can be expected to be uncovered.¹⁸⁷

The Directorate of Fisheries' risk assessments and selection of aquaculture facilities for inspection

In order to ensure that the selection of enterprises for inspection is efficient, the Directorate of Fisheries' head office carries out strategic risk assessments at the national level. The assessments emphasise the areas that are most critical at the overriding level, and they form the basis for the prioritisation of resources.

According to the Directorate of Fisheries, no joint national risk assessment is carried out in collaboration with the Norwegian Food Safety Authority. Nor is a national risk assessment carried out in collaboration with the Norwegian Climate and Pollution Agency or the county governor offices.

In addition to the national risk assessment carried out by the directorate's head office, all the seven regional offices of the Directorate of Fisheries carry out local, operational risk assessments. From 2011, the Directorate of Fisheries introduced a new common system for carrying out regional risk assessments.

The system is based on the probability and consequences of an undesirable incident. The risk of farmed fish escaping is emphasised in the analyses. The most important factors that are considered to arrive at the probability of escape are the facilities' technical condition, the degree of professionalism of its operation and its inspection history. In order to assess the consequences of an escape, factors such as the size of the facility and the site's proximity to vulnerable areas such as national salmon fjords and salmon watercourses are assessed.

The regional offices of the Directorate of Fisheries state that the new system ensures a greater objectivity and a systematic approach to the work of selecting facilities for inspection. Some of the

regional offices also state that the system can help to ensure far more uniformity in risk assessments between regions. This tool will be further developed and better adapted to the actual risk relating to individual facilities.

Follow-up of the fish farmers' reporting and compliance with requirements for environmental monitoring and compliance with the maximum allowed biomass is assessed on a continuous basis.

To investigate whether the risk analyses contribute to selecting the facilities with the highest risk, the Directorate of Fisheries has introduced a requirement that spot check inspections shall be carried out of facilities with presumed low risks. However, only a very few regions have carried out spot check inspections as intended. The Directorate of Fisheries states in an interview that the directorate has not been sufficiently clear in communicating the importance of controls of this type, and that the regions have not prioritised resources for this task.

The Directorate of Fisheries' supervisory activities in relation to aquaculture

Table 17 shows the total annual number of inspections of aquaculture facilities¹⁸⁸ carried out by all seven regional offices of the Directorate of Fisheries, and the number of breaches of the regulations uncovered in these inspections during the period 2007 to 2010.

Table 17 The Directorate of Fisheries' inspections of aquaculture – total for all regions, 2007–2010

Year	2007	2008	2009	2010
Number of inspections	221	677	261	380
Number of uncovered breaches of regulations	487	747	482	638
Average number of breaches of the regulations per inspection	2.20	1.10	1.85	1.70

Source: The Directorate of Fisheries' annual reports to the Ministry of Fisheries and Coastal Affairs for the period 2007 to 2010

The table shows that the number of inspections varied between 221 and 677 during the period 2007 to 2010 for all types of aquaculture facilities. The reason for the relatively high number of inspections in 2008 was a special inspection campaign targeting mussel farms that came in addition to the regions' other inspection activities targeting aquaculture.

187) See, among other things, Proposition No 1 to the Storting (2009–2010) for the Ministry of Fisheries and Coastal Affairs (p. 46).

188) In this context, a facility is the same as a site.

The table also shows that each inspection uncovers approximately one to two breaches of the regulations on average. According to the Directorate of Fisheries, most breaches are not of a serious nature. In the following, a more detailed description is provided of the Directorate of Fisheries' supervisory work targeting aquaculture and the types of breaches of the regulations that are uncovered.

The regions' supervisory work

To ensure that the industry complies with the aquaculture regulations and to contribute to ensuring that the industry is environmentally sound, the regions mainly carries out two types of supervisory activities – 1) internal control audits and 2) inspections.

1) In the internal control audits, the regions investigate whether the facilities have established and carry out internal control that ensures systematic implementation of measures to meet the requirements set out in the Act relating to Aquaculture with pertaining regulations, such as the Aquaculture Operation Regulations.¹⁸⁹ Fact Box 10 shows the key requirements for the aquaculture facilities' internal control systems.

The provisions of the Internal Control Regulations for aquaculture are also warranted by the Norwegian Food Safety Authority's regulations¹⁹⁰, and the Norwegian Food Safety Authority will therefore also supervise aquaculture facilities pursuant to the same regulations. The agencies can carry out joint inspections of fish farmers.

2) The inspections of aquaculture facilities are largely technical controls aimed at investigating whether the operation of floating facilities and land-based facilities is technically sound. The purpose is to limit the number of escaped fish. Compliance with other key provisions relating, for example, to biomass and environmental surveys is also followed up through inspections. The provisions with which compliance is checked during inspections are based on several regulations.¹⁹¹ The Norwegian Food Safety Authority is also tasked with carrying out supervisory

activities on the basis of some of the same regulations, but pursuant to other sections than the Directorate of Fisheries.

Fact Box 10 Key requirements for internal control of aquaculture

Internal control of aquaculture means that the enterprise shall:

- ensure that the acts and regulations that make up the legislation on aquaculture and that apply to the enterprise are available
- ensure that employees have sufficient updated knowledge and skills in relation to the enterprise's internal control
- set goals for internal control work. Written documentation is required.
- have an overview of the enterprise's organisation, including the division of responsibility, tasks and authority relating to compliance with aquaculture legislation in the enterprise. Written documentation is required.
- identify hazards and problems and use them as the basis for assessing risk, and draw up plans and measures to reduce risk. Written documentation is required.
- implement procedures to detect, remedy and prevent breaches of requirements laid down in or pursuant to aquaculture legislation. Written documentation is required.
- systematically monitor and review internal control in order to ensure that it works as intended. Written documentation is required.

Source: The Directorate of Fisheries

The supervisory activities in the individual regions

The scope of an inspection activity can be expressed as the number of inspections carried out compared with the total number of active aquaculture facilities (sites in operation), the so-called coverage rate. Table 18 shows the average annual proportion of active aquaculture facilities that were inspected by region, and the total number for all regions during the period 2007 to 2010.

Table 18 shows that approximately 16 per cent of the aquaculture facilities have been inspected on average each year in the period 2007 to 2010. The table also shows that the proportion varies between regions. The Finnmark region and South region have the highest coverage rate at more than 31 per cent, while the Nordland region and the West region have the lowest coverage rate at around 15 per cent. Both the latter regions have

189) Regulations of 19 March 2004 No 537 on internal control to ensure compliance with the requirements of the Act relating to Aquaculture) and Act of 17 June 2005 No 79 relating to Aquaculture (the Aquaculture Act).

190) Section 5 of the Food Act, cf. Delegation Decision of 19 December 2003 No 1790 and, relating to animal welfare, Section 19 second paragraph, cf. Delegation Decision of 11 June 2010 No 814.

191) For example the Aquaculture Operation Regulations, the NYTEK Regulations and the Regulations relating to the allocation of licences to operate aquaculture facilities.

Table 18 Average coverage rate for inspections of aquaculture facilities in operation, 2007–2010. Figures as a percentage

Region	Finnmark	Troms	Nordland	Trøndelag	Møre og Romsdal	West	South	Total
Coverage rate, internal control	14.6	6.6	5.4	6.5	10.5	8.0	20.9	7.3
Coverage rate, inspections	16.9	12.2	8.7	10.6	10.7	7.5	12.3	8.9
Total coverage rate*	31.5	18.8	14.1	17.1	21.2	15.5	33.2	16.2

* Inspections that were not carried out in accordance with the stipulated guidelines and inspections of blue mussel farms carried out in 2008 are not included in the total coverage rate. If this campaign were included, the total coverage rate would be 22.5 per cent.

Source: Collated statistics from the Directorate of Fisheries' annual reports to the Ministry of Fisheries and Coastal Affairs during the period 2007 to 2010

far more aquaculture facilities than the Finnmark region and South region. The figures also show that the coverage rate correlates strongly with the number of facilities in operation in the individual region – i.e., the fewer facilities there are in a region, the higher the coverage rate will be.¹⁹² The proportion of facilities that have been considered to have high or medium risk is also higher in the Finnmark region and South region than in the other regions.

In an interview, the Directorate of Fisheries states that differences in allocation of resources can explain the variation in the inspection frequency. In addition, the regional directors' prioritisation of aquaculture inspections can vary depending on tradition and how important aquaculture inspections are deemed to be compared with other tasks assigned by the Directorate of Fisheries.

The Directorate of Fisheries' head office also states that the number of inspections of aquaculture has generally been too low, and that it was challenging to keep up with developments in the aquaculture industry with only about 20 full-time equivalents available for the supervision of aquaculture up until 2011. However, the number of employees working on supervision of aquaculture increased in 2011.

The table distinguishes between supervisory activities relating to internal control and inspections. The table shows that the regions generally emphasise both supervision methods, but that some use one supervision method more than the other. Most regions state that the risk assessments form the basis for the choice of supervision method. The cooperation with the Norwegian Food Safety Authority's district offices on selecting facilities for inspection can also affect the choice

of supervision type. Some regions state that audits are more demanding in terms of resources than inspections.

Breaches of the regulations uncovered in inspections

Through their control work, the Directorate of Fisheries' regional offices shall uncover breaches of the aquaculture regulations. The Aquaculture Act and pertaining regulations warrant the coercive administrative measures that the county governor offices can impose when they uncover breaches of the regulations. For serious breaches of the regulations, the Aquaculture Regulations warrant reporting such breaches to the police and requesting prosecution and penal sanctions.

When the regional offices choose to use administrative sanctions, the regional offices will, pursuant to the provisions of the Public Administration Act, usually issue prior notice before the sanction is imposed.¹⁹³ In the prior notice, the fish farmer is normally given an opportunity to remedy the unlawful matters by a specified deadline, before a decision is reached on coercive measures.

Table 19 (on the following page) shows the percentage of inspections carried out by the regional offices that uncovered breaches of the regulations broken down by notice of decision, decisions on coercive measures and reports to the police in the period 2007–2010.

The table shows that the regions uncover breaches of violations in a large proportion of inspections. On average, breaches of the aquaculture legislation are uncovered in over 60 per cent of the inspections. The detection rate varies between regions, but is generally high.

192) The correlation between inspection frequency and the number of facilities is -0.84 for all regions.

193) Section 16 of the Public Administration Act (Act of 10 February 1967 relating to procedure in cases concerning the public administration).

Table 19 Proportion of inspections by the Directorate of Fisheries in which violations were uncovered. As a percentage.

Region	Finmark	Troms	Nordland	Trøndelag	Møre og Romsdal	West	South	Total
Proportion of inspection where prior warning is given	52.7	52.1	47.8	42.4	52.6	50.4	40.2	48.1
The proportion of inspections where it is decided to impose coercive measures	14.9	24.4	15.0	10.7	2.4	11.4	3.3	11.9
The proportion of inspections where uncovered matters are reported to the police	4.0	2.5	0.5	2.1	3.0	0.3	2.2	1.4
Total proportion of inspections that uncover breaches of the regulations*	71.6	79.0	63.3	55.2	58.0	62.1	45.7	61.4

* Prior notices and decisions can apply to the same inspection. The proportion of inspections where breaches of violations were uncovered is therefore not precise.

Source: Collated statistics from the Directorate of Fisheries' annual reports to the Ministry of Fisheries and Coastal Affairs during the period 2007 to 2010.

The regions have no clear answer as to why breaches of the regulations are frequently uncovered. However, some regions state that some of the breaches may be due to the fish farmers not putting sufficient emphasis on compliance with the many requirements that apply to the industry. Reference is also made to the fact that requirements are changed and the rules tightened over time, and that new breaches of the regulations can therefore be uncovered from one inspection visit to the next.

In an interview, the Ministry of Fisheries and Coastal Affairs states that it is important that the inspections and the use of sanctions have a deterrent effect. The ministry also points out that the Minister has informed the Storting that the legislation relating to aquaculture will be reviewed, including the content and use of sanctions.

Table 19 shows that the proportion of prior notices is high compared with the number of decisions to impose coercive measures. This means that fish farmers who have breached the regulations usually remedy breaches by the deadline stipulated by the regions before coercive measures are imposed. In this context, the regional offices of the Directorate of Fisheries point out that, although breaches of the regulations are frequently uncovered, they are usually minor violations that the fish farmer can remedy fairly quickly.

The use of coercive measures varies somewhat between the regions. In Troms, almost 25 per cent

of inspections led to the implementation of coercive measures. The corresponding figure for Møre og Romsdal was 2.4 per cent. When the regions decide to implement coercive measures, they usually involve the use of coercive fines. In addition, the regions can use violation fines and revoke licences to operate aquaculture facilities. These are more serious coercive measures that, according to the Directorate of Fisheries' statistics, are used less frequently.¹⁹⁴

When asked why the use of coercive measures varies, the regions did not have a clear answer. Some of them state that one reason could be that the fish farmers remedy the detected breaches of the regulations to a varying extent. The regions state that it is generally clear how compliance with the different provisions of the aquaculture regulations should be assessed, and that it is for the most part clear what sanctions should be imposed when breaches of the regulations are uncovered. Some regions state, however, that there are differences in practice as regards the use of reactions and sanctions between regions.

In an interview, the Directorate of Fisheries states that, in order to ensure more uniform use of reactions and sanctions, the regions are carrying out a so-called VATER project, in which some regional offices have been selected and their practice examined. This review has detected discrepancies in the use of sanctions internally in

194) Orders and coercive fines: 150 decisions in the period 2007 to 2010, six decisions to revoke licences and six decisions to impose violation fines.

Table 20 Number of breaches of the regulations uncovered in the period 2007 to 2010, by regulation

Region	Finnmark	Troms	Nordland	Trøndelag	Møre og Romsdal	West	South	Total
Aquaculture Operation Regulations	39	126	224	124	197	250	27	987
Internal Control Regulations for Aquaculture	68	64	181	145	129	195	46	828
The NYTEK Regulations	16	47	118	57	52	220	1	511
The biomass provisions	0	1	4	1	1	2	0	9
Other provisions	0	2	6	5	3	1	2	19
Total number of breaches	123	239	529	331	381	666	76	2345
Average number of breaches per inspection	1.7	2	1.3	1.1	2.3	1.7	0.8	1.5

Source: Collated statistics from the Directorate of Fisheries' annual reports to the Ministry of Fisheries and Coastal Affairs for the period 2007 to 2010.

some regions. Furthermore, the Directorate of Fisheries carries out internal controls of the work of the regional offices and of the Aquaculture Management Section at the Directorate of Fisheries.

All regions state that the fish farmers rarely appeal against decisions made after inspections. Most regions state that the Directorate of Fisheries' head office rarely reverses decisions after inspections on appeal.

Uncovered breaches by type of regulation

Table 20 shows the extent of breaches of the regulations uncovered by inspections by regulation, as well as the average number of breaches uncovered per inspection.

The table shows that most breaches of the regulations are related to provisions of the Aquaculture Operation Regulations, the Regulations on internal control to ensure compliance with the requirements of aquaculture legislation, and the NYTEK regulations, the purpose of which is to limit the number of escaped fish from floating fish farms.

According to the regional offices of the Directorate of Fisheries, the breaches of the provisions of the NYTEK Regulations are often related to deficiencies in procedures and inadequate maintenance of facilities in relation to instructions from equipment suppliers that are intended to ensure that the facility meets the technical requirements in the Norwegian standard.¹⁹⁵ The facilities may also be insufficiently marked.

195) NS 9415: Marine fish farms. *Requirements for site survey, risk analysis, design, dimensioning, production, installation and operation.*

Shortcomings in training programmes, risk analyses and contingency procedures are uncovered in relation to both the Aquaculture Operation Regulations and the Internal Control Provisions. Deficiencies in the documentation of operations and record-keeping are also uncovered. Some offices also mention weaknesses in the securing of smolt farms.

Key supervisory areas and challenges in connection with supervisory work

As previously mentioned, the Directorate of Fisheries prioritises control of escaped fish, biomass and environmental monitoring. Certain aspects of this work are presented below.

Escapes of fish

As described above, the Directorate of Fisheries has a particular responsibility for supervising that the operation of the facilities is technically and environmentally justifiable. This means that the supervision of operations shall reduce the risk of farmed fish escaping. In chapter 4.1. it was pointed out that the number of escapes of farmed fish has fallen since 2007, and that one important reason for this reduction is the introduction of technical requirements for marine fish farms through the NYTEK Regulations.

An accredited body shall be responsible for technical approval of a facility.¹⁹⁶ In relation to the Directorate of Fisheries, the fish farmer only has to document that the facility is technically approved, and that it is maintained in accordance with the technical approval. Some of the regions

196) In practice, the approval is a product certificate for new facilities and a site classification certificate for facilities established before the introduction of NYTEK in 2004.

stated that there are challenges relating to supervision based on the provisions of the NYTEK Regulations. They believe it is difficult to check the technical facilities below the water surface. It can also be difficult to check whether the fish farmers carry out all maintenance procedures as intended.

The Directorate of Fisheries states in an interview that NYTEK is a complicated field that requires good competence. Training of inspection personnel in this field is therefore required, and more training is planned in future. In addition, the Directorate of Fisheries is in a dialogue with the accredited companies to better clarify roles and ensure a more uniform approach to follow-up of NYTEK.

The Ministry of Fisheries and Coastal Affairs issued new regulations for NYTEK in August 2011. The regulations contain more stringent requirements for technical facilities at fish farms. The new requirements are intended to contribute to limiting the number of escapes, among other things by ensuring that more components at the fish farms are product-certified.

Smolt farms are not covered by NYTEK, but one region points out that, after secondary barriers were installed at the smolt farms of three companies, it was discovered that none of the primary barriers worked as intended. At two of the farms, several dead and living fish were found at the secondary barrier. It was therefore very probable that fish had escaped without this being reported before the secondary barriers were installed.

Several regions also stated that inspecting smolt farms can be challenging. Facilities of this kind can have complicated systems, and inspections will often uncover new elements that the facility needs to remedy. The Directorate of Fisheries' head office states in an interview that part of the complexity is due to the functional requirements the smolt farms have to meet.

Verification of maximum allowed biomass

As referred to above, the Ministry of Fisheries and Coastal Affairs introduced maximum allowed biomass as a production-regulation system both per licence and per site from 2005. Fish farmers shall therefore at no time exceed the maximum allowed biomass specified in the licence. The fish farmers must submit monthly reports to the Directorate of Fisheries about the current biomass per site. If a fish farmer reports that the

allowed biomass has been exceeded, the Directorate of Fisheries can impose administrative sanctions such as coercive fines and violation fines. In serious cases, reporting the matter to the police can also be considered.¹⁹⁷

According to the Directorate of Fisheries, if violations of the maximum allowed biomass do not result in sufficiently strong reactions and sanctions, it will be profitable for fish farmers to break the rules because the fish farmer will have more fish (biomass) to sell than was intended.

Several regions state that checking the biomass at facilities is demanding because there is no suitable control method for verifying the reported biomass figures. The regions shall continuously monitor that the fish farmers report biomass figures as intended, and the biomass records shall be checked in connection with inspections. The main challenge is to stipulate the exact number of fish in a cage containing several hundred thousand fish. The weight of the fish in a cage can also vary greatly, which makes it difficult to draw any conclusions about the weight on the basis of a small sample. Fish farmers can be required to count the fish, but this operation can also affect fish health and lead to an increased risk of escapes.

In an interview, the Directorate of Fisheries states that it is very difficult to solve the problem that it is not possible to verify the reported biomass figures. Biomass is the established limitation system, and it is therefore a key control task. The Directorate of Fisheries has some indications that fish farmers exceed the maximum allowed biomass, but in the absence of a control method, proof of such violations cannot be obtained. In 2011, the Directorate of Fisheries concluded a counting project in which methods were considered for monitoring a fish farmer's production cycle and the number of fish in the fish farm. The Directorate nevertheless states that a lot of work remains to be done to arrive at a good system for the control of biomass.

Supervision addressing environmental monitoring and the state of the environment

As referred to above, a new system of mandatory environmental surveys (MOM) in both the establishment and operating phases was introduced in parallel with the introduction of the

197) See, among other things, the Sanctions Regulations (Regulations of 29 March 2007 No 361 relating to sanctions for violation of the Aquaculture Act).

maximum allowed biomass system. Based on these surveys, it is decided whether the seabed can tolerate the discharges of nutrient salts (nitrogen and phosphorus) and organic material from the individual facility (cf. chapter 4.3).

In the operating phase, environmental surveys are carried out and reported at stipulated frequencies. Although it is the pollution control authority represented by the county governors that is responsible for combating pollution, the Directorate of Fisheries is responsible for ensuring that fish farmers submit reports as intended and, if relevant, for dealing with cases where the state of the environment at a facility is unacceptable.¹⁹⁸ The MOM requirement was introduced in 2005, but the county governors did not have direct access to the reports from the MOM B surveys until February 2011 via Altinn.¹⁹⁹ In cases where the state of the environment was found to be poor, the regions previously informed the county governor about the result of the environmental surveys.

The regional offices of the Directorate of Fisheries state that it is checked whether the environmental surveys have been carried out during the operating phase. The environmental surveys are not verified through the Directorate of Fisheries taking separate samples. As shown in chapter 4.3, the fisheries authorities and the environmental authorities agree that the MOM B surveys are not suited to measuring the state of the environment at a fish farm because the MOM standard is not always appropriate in relation to today's sites.

In certain circumstances, the Directorate of Fisheries can, pursuant to the Aquaculture Operation Regulations and in consultation with the county governor's environmental protection department, decide to use an alternative monitoring programme. However, none of the regions has decided to use alternative monitoring of the environmental state of a site in the period from 2005 to spring 2011.

The Directorate of Fisheries states in an interview that MOM B surveys have not been a priority in supervisory work, and that there is also an overlap with the county governor offices.

198) Sections 35 and 67 of the Aquaculture Operation Regulations.

199) A web portal for electronic dialogue between businesses and public agencies.



Photo: Thomas Bjørkan, the Norwegian Aquaculture Centre

Inspections of national salmon fjords and national salmon watercourses

The Ministry of Fisheries and Coastal Affairs has made it a requirement that the Directorate of Fisheries inspect all salmonid sites, for both marine growers and smolt, in the national salmon fjords and salmon watercourses.²⁰⁰ As a rule, it is not permitted to establish new facilities for the production of marine growers and broodstock of anadromous salmonids in areas for national salmon watercourses and salmon fjords, but it is permitted to establish cultivation facilities and gene bank facilities for anadromous salmonids.²⁰¹ According to the Directorate of Fisheries, facilities for the production of anadromous and marine fish in the sea that were already established in 14 of the 29 national salmon fjords were ordered to move out of the area by 1 August 2011. In the other national salmon fjords, facilities for the production of anadromous and marine fish in the sea, as well as new slaughterhouses and processing plants for marine fish, were to be situated at least five kilometres from the mouth of a national watercourse by 1 August 2011.

According to figures from the Directorate of Fisheries, most of the facilities in the national salmon fjords and salmon watercourses have been checked as intended. All the facilities were checked in 2007 and 2008, while 83 per cent and 93 per cent were checked in 2009 and 2010, respectively. The regions that did not check all the facilities as intended point out that they could be

200) See, among other things, Proposition No 1 to the Storting (2007–2008) for the Ministry of Fisheries and Coastal Affairs (p. 108), and Proposition No 1 to the Storting (2009–2010) for the Ministry of Fisheries and Coastal Affairs (p. 11).

201) Regulations of 22 June 2009 No 961 relating to specific requirements for aquaculture-related activities in or near national salmon watercourses or national salmon fjords, Sections 3 and 6. The regulations implement the Storting's plenary decision, cf. Recommendation No 183 to the Storting (2006–2007).

small test facilities with limited production or land-based facilities.

5.3.2 The Norwegian Food Safety Authority's supervisory activities

Through its supervisory activities, the Norwegian Food Safety Authority shall help to achieve the overall goals for aquaculture, such as ensuring that the industry is environmentally sound and sustainable. The Norwegian Food Safety Authority has particular responsibility for ensuring compliance with the regulations relating to fish health and fish welfare (cf. Section 4.2). The Norwegian Food Safety Authority also checks whether the aquaculture facilities can document that systematic measures are planned, organised and implemented in order to meet the requirements of the Food Act and the Animal Welfare Act.²⁰²

Of the Norwegian Food Safety Authority's eight regional offices and 54 district offices, five regional offices and 37 district offices along the coast from Southern Norway to Finnmark are responsible for the practical implementation of supervisory work. Other aspects relating to the use of resources, competence and guidance are presented in Appendix 7.

The Norwegian Food Safety Authority's head office and regional offices are responsible for following up the district offices' inspection work pursuant to the requirements and goals stipulated by the Ministry of Agriculture and Food in consultation with the Ministry of Fisheries and Coastal Affairs. It is a requirement that inspections are carried out with sufficient frequency and that expedient inspection methods are used. The district offices shall also adapt the extent of inspections to the probability and consequences of any breaches of the regulations.

The Norwegian Food Safety Authority's risk assessments and selection of aquaculture facilities for inspection

The Norwegian Food Safety Authority's supervisory activities in relation to aquaculture are largely governed by the EU's fish health directive, which requires that all grow-out farms shall have a minimum of one supervisory visit (inspection) each year, and that all smolt farms shall be inspected twice a year.

202) Regulations on internal control to ensure compliance with the requirements of aquaculture legislation (Internal Control Aquaculture) (Regulations of 19 March 2004 No 537).

In addition to the mandatory inspections, the district offices can carry out additional inspections of selected facilities. At the overall level and regional level, the Norwegian Food Safety Authority assesses which areas should be prioritised, for instance biomass, fish mortality and sea lice. The Norwegian Food Safety Authority has made little systematic use of risk analyses in its follow-up of the aquaculture industry through inspections. In an interview, the Norwegian Food Safety Authority states that the agency is working on an area analysis of fish health, which also contains a strategic risk assessment for inspections in aquaculture.

In addition to the overall guidelines for which areas should be prioritised, the district offices use their knowledge about the facilities and the information fish farmers are required to report to select facilities for inspections over and above the mandatory visits. The district offices carry out extra inspections if they suspect incorrect reporting, disease, increased mortality and certain incidences of sea lice. The district offices will also follow up facilities that have had synchronised delousing, to assess the effect of this measure. In addition, the fish health service must notify the Norwegian Food Safety Authority if any irregularities are uncovered. The district offices will then assess what follow-up measures to take in relation to the fish farmer.

The district offices confirm that they cooperate with the Directorate of Fisheries' regional offices in the selection of facilities for inspection, particularly in the selection of facilities whose internal control is to be audited. Only a very few offices cooperate with the county governor offices when selecting facilities for inspection.

The scope of the Norwegian Food Safety Authority's supervisory activities in relation to aquaculture

Table 21 shows the total number of annual supervisory activities (inspections and audits) carried out by the Norwegian Food Safety Authority at aquaculture facilities, and the number of breaches of the regulations uncovered by these controls for the period 2008 to 2010.²⁰³

203) The Norwegian Food Safety Authority phased in the supervision tool MATS in 2008. The Norwegian Food Safety Authority states that incorrect reporting can occur due to differences in practice. The number of breaches of the regulations is not available for 2008. No information is available about the number of supervisory activities in relation to aquaculture before 2008.

Table 21 Supervision of aquaculture by the Norwegian Food Safety Authority – total for all district offices

Year	2008	2009	2010
Number of supervisory activities (inspections and audits)	1362	873	1022
Number of supervisory activities that led to sanctions after a detected breach of regulations	n.a.	416	701
Detection rate	n.a.	47.6	68.6

n.a. = not available

Source: The Norwegian Food Safety Authority's key figure reports and the Norwegian Food Safety Authority's head office

The table shows that the average number of supervisory activities has varied by approximately 1,100 per year during the period 2008 to 2010. The table also shows that the Norwegian Food Safety Authority has uncovered relatively many breaches of the regulations through its supervisory work, with a detection rate of 47% and 68% for 2009 and 2010, respectively. This supervisory work is presented in more detail in the following.

The supervisory work of the district offices

To ensure good fish health and fish welfare through their supervisory work, the district offices mainly carry out 1) inspections and 2) audits. In addition, the offices are tasked with monitoring several diseases through samples collected at fish farms.

1) During an inspection, the district offices investigate factors that reflect the state of fish health and fish welfare at the facility, including the disease situation. An inspection can also include counting the number of lice and dead fish. In addition to the number of dead fish, the reasons why fish die can be examined. If many fine and apparently unharmed fish die, this could be a sign of disease. The inspector can also assess the fish's appetite, sores and the general cleanliness at the facility.

2) In an audit, the emphasis is on the facilities' internal control pursuant to the provisions of the Internal Control Regulations for aquaculture. The facilities' internal control is intended to ensure good fish health and fish welfare pursuant to the requirements of the Food Act and the Animal Welfare Act. As previously mentioned, the Directorate of Fisheries also controls the facilities pursuant to the Internal Control Regulations, and the agencies are therefore able to cooperate on carrying out supervisory activities in this field.

The supervisory activities of the district offices and the regions

Because all fish farms are visited by the Norwegian Food Safety Authority at least once a year, no inspection frequency has been set for the different offices and regions.

The Norwegian Food Safety Authority's head office states that a lot of resources have been spent investigating healthy fish in the past, and it believes it would have been better to base this work on samples taken by the fish health service when diseases are suspected.²⁰⁴ The fish health service takes samples from fish at all facilities several times a year, and, in the Norwegian Food Safety Authority's opinion, it would therefore be expedient and save on resources if the fish health service were also assigned greater responsibility for taking the samples that are part of the monitoring programmes. If disease is suspected, the Norwegian Food Safety Authority intensifies the control level.

Breaches of the regulations uncovered in inspections

Through its control work, the Norwegian Food Safety Authority's district offices shall uncover any violations of the Food Act and the Animal Welfare Act and pertaining regulations. The same acts and regulations provide the legal authority for the coercive administrative measures that the Norwegian Food Safety Authority can impose when it uncovers breaches of the regulations.

When minor breaches of the regulations are uncovered, the district offices can, for example, use reactions such as the so-called 'pointing out of duty' and 'special observations'. This is merely information to the fish farmer stating that a breach of regulations has been identified, and has no direct legal effect.

When the district offices choose to use administrative sanctions, the offices will usually issue a prior notice before the sanction is imposed.²⁰⁵ In the prior notice, the fish farmer is normally given an opportunity to remedy the breach by a specified deadline before a decision is made to implement coercive measures. If the breach of the regulations is of a more serious nature, the district offices can impose administrative sanctions without prior notice. For serious breaches of the

204) All aquaculture facilities must be attached to a fish health service, either a private or a municipal service.

205) Section 16 of the Public Administration Act.

Table 22 Proportion of inspections by the Norwegian Food Safety Authority in which breaches of the regulations were uncovered in the period 2009–2010. Figures as a percentage

Region	Pointing out of duty, special observations etc.	Notice of coercive measure	Decision to implement coercive measure	Report to the police
Finnmark and Troms	32.9	8.7	10.8	0
Nordland	39.5	12.2	17.4	0
Trøndelag and Møre og Romsdal	39.2	8.9	11.5	0
Hordaland and Sogn og Fjordane	32.3	7.9	13.6	0
Rogaland and Agder	27.3	4.4	8.9	0
Total	34.6	7.5	12.5	0

Source: Collated statistics from the Norwegian Food Safety Authority for the period 2009 to 2010

regulations, the legislation warrants reporting the matter to the police.

Table 22 shows the proportion of inspections in the individual regions in which breaches have been uncovered. The breaches are broken down by the reactions 'pointing-out of duty' (and other reactions without legal effect), notice of a decision, decisions to implement coercive measures and reports to the police in the period 2009 to 2010.

The table shows that the district offices uncover breaches of the regulations in a large proportion of inspections. The table also shows that, in cases where breaches of the regulations are uncovered, pointing out of duty and other reactions without direct legal effect are most frequently used in relation to the fish farmer. This means that the district offices consider most breaches of the regulations to be minor.

Underlying statistics from the Norwegian Food Safety Authority show that the fish farmers who receive notice of a decision often comply with the order before coercive measures are implemented. The table also shows that the district offices have used coercive measures in relation to fish farmers in more than 10 per cent of all inspections (most of them have also received a prior notice).

No inspections in 2009 and 2010 resulted in reports to the police.

As regards types of breaches related to internal control and contingency plans, the district offices mention inadequate documentation and carrying out of risk analyses, notification procedures, training of employees and discrepancies between written procedure and established practice.

Some of the district offices state that inspections can uncover discrepancies between the reported and actual amount of sea lice, and that facilities start lice treatment too late. Some of them also mention inadequate handling of dead fish. It can also be difficult to verify the mortality figures reported by fish farmers.

All the district offices state that fish farmers largely report the mandatory operation information as intended each month. If the reporting obligation is not complied with, the district offices will request that the information be sent. The Norwegian Food Safety Authority's head office and most of the district offices state, however, that it varies how far the fish farmers comply with the requirement to notify the Norwegian Food Safety Authority about increased mortality and other factors that may have a negative impact on fish welfare. The reason for this is that this can have serious consequences for the fish farmers.

The district offices state that decisions following inspections are only appealed against to a small or very small extent. In most cases where the fish farmer appeals against a decision, the regional offices have upheld the decision of the district offices.

Other aspects of supervisory work

Legal authority for supervisory work

Almost all the district offices and the Norwegian Food Safety Authority's head office have sufficient legal powers to exercise supervision, including a right to all information and a right to carry out all necessary supervisory activities.

However, most district offices and the Norwegian Food Safety Authority's head office state that the legal authority for coercive measures in connection

with violations of the Food Act is inadequate, in that the Act does not authorise the use of violation fines. In this context, the Norwegian Food Safety Authority's head office states that the Food Act has a wide spectrum of policy instruments – from pointing out of duty to reporting breaches to the police – but that, in connection with violations of the regulations in less serious cases, reports to the police are too demanding and the outcome is too uncertain. Over time, failure to react on the part of the authority can undermine compliance with the regulations, according to the Norwegian Food Safety Authority. The Norwegian Food Safety Authority therefore needs to be able to impose violation fines. Violation fines can be imposed under and in pursuance of the Animal Welfare Act, but not the Food Act.

A majority of the district offices state that the Norwegian Food Safety Authority does not make sufficient use of the available policy instruments to ensure good fish health and fish welfare, and that the Norwegian Food Safety Authority does not always use sufficiently strong sanctions when breaches of the regulations are uncovered. In this context, it is pointed out that it is easier to use sanctions such as pointing out of duty that do not commit the Norwegian Food Safety Authority pursuant to, for example, the Public Administration Act, than to impose coercive measures that inflict costs on the fish farmer.

The Norwegian Food Safety Authority's head office states that the practice may differ between the different regions and district offices as regards what is identified as a non-conformity. Cases that are apparently identical may in reality be different, however. The Norwegian Food Safety Authority's head office also states that the agency does not know enough about whether sanctions are used to an extent that ensures good fish health and fish welfare. The Norwegian Food Safety Authority will review the use of sanctions in collaboration with the regional offices and the district offices during 2011 and, if relevant, in 2012. Strict coercive measures can have serious consequences for the fish farmer. It is therefore important to be sure that the imposed measures have the intended effect. There are many factors that affect fish health, fish welfare and the situation for wild fish, such as salinity, currents, temperature and other factors not regulated by the Norwegian Food Safety Authority's regulations. The Norwegian Food Safety Authority states that it is particularly difficult to assess the effect of the available coercive measures in relation to the protection of wild fish.

Functional requirements – requirements for acceptable fish welfare

The aquaculture regulations contain several functional requirements in relation to fish farmers, including that technical equipment must be suited to ensuring acceptable fish health. Another example of a functional requirement is the provisions on acceptable fish density and adapted water quality. When asked what constitutes acceptable, what constitutes suited and what constitutes acceptable fish mortality, most respond that it is challenging to supervise compliance with this kind of functional requirements. Some district offices state that, because of the absence of specification or definitions of this type of requirement, it is necessary to exercise more discretionary judgement, which increases the risk of non-uniform treatment of enterprises by the offices of the Norwegian Food Safety Authority. Some of the offices also refer to the lack of the technical expertise required to assess whether equipment used by the fish farmers is suited to ensuring fish welfare.

The Norwegian Food Safety Authority's head office also states that it can be difficult to assess what is good enough and sufficient pursuant to the functional requirements of the Aquaculture Operation Regulations in relation to supervision. According to Norwegian Food Safety Authority, functional requirements can make it easier to formulate regulations, but more challenging to exercise supervision. The intention is to stimulate the industry to find solutions that ensure good fish health and fish welfare.

New technical solutions

Some district offices also refer to the requirement that 'new methods and technical solutions shall be tested and documented as justifiable in terms of animal welfare before they are introduced' (cf. the Aquaculture Operation Regulations Section 20), and state that it is the individual district offices that are responsible for following up this requirement. These offices call for a different internal system in the Norwegian Food Safety Authority that can ensure adequate expertise and uniform processing when the enterprises introduce new solutions for the operation of facilities.

The Norwegian Food Safety Authority's head office points out that the requirements for new methods and technical solutions are too little applied in practice. The industry is responsible for documenting compliance with the provision, and the degree of compliance can be verified by

the Norwegian Food Safety Authority' district offices. The Norwegian Food Safety Authority's head office states that this can be very demanding for the district offices. It is also challenging for the Norwegian Food Safety Authority to obtain and consider documentation presented by the fish farmers. The Norwegian Food Safety Authority has not established approval schemes in this area. Instead, the individual district office must evaluate the technical solutions. The Norwegian Food Safety Authority suggests that one possible solution is that experts with the required expertise be tasked with approving new methods and technical solutions.

Unannounced inspections are rarely used

According to the Norwegian Food Safety Authority, an inspection shall be unannounced, but the authority does not have its own vessels for transporting inspection personnel to the facilities. The district offices and the fish farmers therefore usually have to agree a time for an inspection. The Norwegian Food Safety Authority's head office states that it does not regard it as a problem that, in practice, inspections are rarely carried out unannounced, because the fish farmers, in Norwegian Food Safety Authority' opinion, will not be able to conceal deficiencies and shortcomings at a facility before the inspection is carried out. None of the district offices has mentioned the lack of unannounced inspections as a significant weakness in the supervisory work.

High inspection activity, but a lot of sea lice and disease

The district offices and the Norwegian Food Safety Authority's head office state that the challenges facing the aquaculture industry relating to diseases and sea lice are often due to biological and natural conditions. Although both the Norwegian Food Safety Authority and the fish health service monitor fish health and diseases closely at all facilities, it is difficult to avoid farmed fish contracting disease to some extent, according to the Norwegian Food Safety Authority's head office. The aquaculture industry has grown strongly, and the amount and density of fish in the cages and between cages and sites make it difficult to avoid infection by both diseases and sea lice. The Norwegian Food Safety Authority states that the general fish health and fish welfare situation is acceptable, but that it can be improved. The current loss percentage of 20 per cent is too high, in the Norwegian Food Safety Authority's opinion. The Norwegian Food Safety Authority therefore supports the proposal by the Committee

on the Use of Marine Areas by Aquaculture to demand a reduction in biomass in facilities that have a loss percentage exceeding a given limit.

Several district offices also point out that measures and indicators are lacking for what constitutes good fish health and fish welfare. There are thus no clear guidelines for how the industry should set targets for the individual facility in this context.

Some of the Norwegian Food Safety Authority's offices state that greater coordination of measures is necessary, including delousing and fallowing, to prevent infection and to combat sea lice and existing diseases. The regional office for the counties of Agder and Rogaland drew up a proposal for zone regulations for sea lice that would cover the whole Boknafjord system (the Ryfylke basin). The region proposed that all fish farmers in the area in question should synchronise all operations, including joint releases, fallowing of at least one month, and joint delousing as required. In the consultation process, the Norwegian Food Safety Authority received several submissions objecting to a zone of this size. As of October 2011, the Norwegian Food Safety Authority is working on a new consultation paper.

The Norwegian Food Safety Authority has introduced two zone regulations for sea lice in the counties of Nord-Trøndelag and Hordaland. The purpose is to coordinate measures against salmon lice in the zone in order to prevent the parasite from having a regulating effect on the wild salmon stock and to prevent harm to salmon and other salmonids in aquaculture facilities. The aim is also to reduce the total amount of treatments for salmon lice during the course of a season to limit the development of resistance, and to limit the spreading of resistant lice. The regulations contain requirements for joint fallowing of large areas every other year and for the coordination of other measures against salmon lice.

Area management has been established elsewhere along the coast without this being regulated through regulations. In the Nordmøre area, the Norwegian Food Safety Authority's district office has collaborated with the industry on the development of an operating model (the Nordmøre model) that ensures that all facilities in the municipalities from Hustadvika up to and including Sør-Trøndelag coordinate operations in relation to when fish are released and when the sites are fallowed.

Table 23 Average annual coverage rate for inspections of aquaculture facilities in operation, 2007–2010. Figures as a percentage

Region	Inspection coverage rate for smolt	Inspection coverage rate for marine growers	Inspection carried out
Finnmark	0.0	0.5	Yes
Troms	0.0	0.0	No
Nordland	0.0	0.2	Yes
Nord-Trøndelag	19.1	1.4	Yes
Sør-Trøndelag	0.0	0.0	No
Møre og Romsdal	0.6	0.3	Yes
Sogn og Fjordane	2.4	1.7	Yes
Hordaland	0.0	0.2	Yes
Rogaland	4.0	0	Yes

Source: Information received from the county governor offices and collated statistics from the Directorate of Fisheries' aquaculture register (as of 18 May 2011)

5.3.3 The county governors' supervisory activities

Pursuant to the Pollution Control Act, everyone engaged in fish farming must have a discharge permit, cf. chapter 4.3. The pollution control authorities represented by the county governors are tasked with ensuring, through inspections, that the fish farmers comply with the requirements stipulated in their discharge permits, and with requirements for protection of the natural environment from pollution, and that they reduce existing pollution. The pollution control authorities are also tasked with checking that the aquaculture facilities comply with the requirements for systematic health, environmental and safety activities²⁰⁶ and the requirements for the handling of waste.²⁰⁷

The investigation of the county governor offices' supervisory activities in relation to aquaculture covers the coastal counties from Rogaland north to Finnmark.²⁰⁸ For 2011, these county governor offices planned to allocate approximately two full-time equivalents to supervising the aquaculture industry. Other aspects of the use of resources and guidance are presented in Appendix 7.

As for the Directorate of Fisheries and the Norwegian Food Safety Authority, there were around 1,500 sites at which fish were farmed as of 2011, and which have thereby been given permission to pollute within the limits stipulated in their discharge permits. The Norwegian Climate and

Pollution Agency has a facilitating and guiding role in relation to the county governors' supervision of aquaculture, including in relation to the latter's inspection activities. The Norwegian Climate and Pollution Agency is also tasked with ensuring equal treatment by the county governor offices. The Norwegian Climate and Pollution Agency is a subordinate agency of and is managed by the Ministry of the Environment.

The county governor offices' risk assessments and selection of aquaculture facilities for inspection

The frequency of inspections of aquaculture facilities is decided on the basis of the risk class to which the individual facility belongs. The risk class is decided by the recipient conditions at the facilities. Aquaculture facilities are normally assigned to class 3 or class 4, which means that the recipient is deemed to be relatively good. The Norwegian Climate and Pollution Agency states in an interview that work is being done to establish a uniform and operative risk system at all the county governor offices.

The county governor offices' supervisory activities in relation to aquaculture

An inspection coverage rate has been calculated for the county governor offices. Table 23 shows the average annual proportion of aquaculture facilities (number of licences) that have been inspected by county, broken down into smolt farms and grow-out farms, during the period 2007 to 2010.

Table 23 shows that the county governor offices have carried out few inspections of the aquaculture industry during the period 2007–2010. Two of the nine county governor offices have not

206) Regulations of 12 June 1996 No 1127 relating to Systematic Health, Environment and Safety Activities in Enterprises (Internal Control Regulations).

207) Regulations of 1 June 2004 No 930 relating to the Recycling of Waste (the Waste Regulations).

208) Rogaland, Hordaland, Sogn og Fjordane, Møre og Romsdal, Sør-Trøndelag, Nord-Trøndelag, Nordland, Troms and Finnmark.

carried out inspections of the aquaculture industry during the period in question. Four of the offices have carried out inspections of either smolt farms or grow-out farms, while three offices have carried out inspections of both grow-out farms and smolt farms. The inspection coverage rate has been consistently low in the counties in which inspections have been carried out. Nord-Trøndelag, however, has carried out inspections of nearly all the smolt farms during the four-year period from 2007 to 2010.

The county governor offices point out that the aquaculture industry has not been a priority area for its supervisory activities. Other areas such as hazardous waste and environmentally harmful chemicals have been assessed as entailing a higher risk. The county governor offices therefore point out that, given a shortage of personnel, it has not been seen as important to prioritise inspections of aquaculture facilities. The Norwegian Climate and Pollution Agency has traditionally not expected the county governor offices to prioritise such inspections, and nor has it imposed other supervisory activities on the county governors.

The Norwegian Climate and Pollution Agency and several of the county governor offices point out, however, that the Agency initiated an inspection campaign for aquaculture in 2009. A pre-project was then carried out in which several county governor offices carried out a small number of inspections. In 2010, there was an inspection campaign at three facilities in three different counties.²⁰⁹ According to the Norwegian Climate and Pollution Agency, the results of this work showed that there was a clear need for improvement in the aquaculture industry and therefore also a need for more inspections. In the period May to September 2011, a more extensive inspection campaign was therefore carried out targeting aquaculture facilities in the counties of Rogaland, Hordaland, Sogn og Fjordane, Møre og Romsdal, Sør-Trøndelag, Nord-Trøndelag, Nordland, Troms and Finnmark. The theme of the campaign was the aquaculture facilities' pollution impact on the recipient, knowledge about their own impact, and preventive work in relation to the Internal Control Regulations. The campaign included five areas, and breaches of the regulations were uncovered in all these areas. The areas were 1) environmental goals, 2) environmental risk assessment, 3) recipient surveys, 4) management follow-up, 5) operations and preventive

maintenance. A total of 72 inspections were carried out as part of this campaign.

Uncovered breaches of the regulations

Through their inspections, the county governor offices shall uncover violations of the Pollution Control Act, the Regulations on Systematic Health, Environment and Safety Activities in Enterprises (the HSE Internal Control Regulations) and the Product Control Act (chemicals – substitution). Follow-up of the conditions stipulated in discharge permits is also an important supervisory task, but the conditions stipulated in the permits vary, according to the Ministry of the Environment. The Norwegian Climate and Pollution Agency is working on a template for discharge permits that will make it possible to place greater emphasis on conditions laid down in the Pollution Control Act in inspections. The Act and pertaining regulations warrant the imposition of coercive administrative measures by the county governor offices when they uncover breaches of the regulations. In cases involving serious violations, the Pollution Control Act authorises the county governors to report the matter to the police.

When the county governor offices choose to use administrative sanctions in connection with breaches of the regulations, the offices will normally give notice of coercive measures before a sanction is imposed.²¹⁰ In the prior notice, the fish farmer is normally given an opportunity to remedy the unlawful circumstances by a specified deadline, before a decision is reached on coercive measures.

Table 24 shows the proportion of inspections by the county governor offices in which breaches of the regulations were uncovered in the period 2007–2010.

The table shows that the county governor offices uncover breaches of the regulations to a large extent. The county governors uncovered breaches of the regulations in 38 of 44 inspections during the period 2007 to 2010. Several of the county governor offices uncovered breaches of the regulations in all the inspections they carried out. Relatively few inspections were carried out in these counties, however. Breaches were registered in all 72 inspections in 2011.

A review of all inspections during the period 2007 to 2010 shows that, at all the facilities at

209) Three smolt farms and six grow-out farms: a total of nine farms.

210) See Section 16 of the Public Administration Act.

Table 24 Proportion of inspections by the county governor offices in which violations were uncovered, 2007–2010

Region	Number of inspections	Number of inspections in which breaches of the regulations were uncovered	Detection rate
Finnmark	2	2	100
Troms	0	n.r.	n.r.
Nordland	3	3	100
Nord-Trøndelag	16	12	75
Sør-Trøndelag	0	n.r.	n.r.
Møre og Romsdal	3	3	100
Sogn og Fjordane	13	12	92.3
Hordaland	2	1	50
Rogaland	5	5	100
Total	44	38	86.4

n.r. = not relevant

Source: Inspection statistics from the county governor offices

which breaches of the regulations were uncovered, the breaches that were pointed out were rectified by the fish farmers before the county governor implemented coercive measures. The county governors point out that the non-conformities that are uncovered are not normally of a serious nature. The Norwegian Climate and Pollution Agency points out that there are many breaches of the regulations and that the aquaculture companies appear to have little insight into the impact they have on the natural environment. No inspection has uncovered breaches of the regulations of such a nature that it has been deemed necessary to report the matter to the police. In the inspection campaign in 2011, 766 partial non-conformities were registered in relation to the five control themes. However, no facility had more than one non-conformity per control theme (maximum five non-conformities).

See Appendix 8 for a detailed overview of the types of breaches that were uncovered in inspections by the county governor offices.

6 Assessments

For several years now, the overriding goal of Norway's aquaculture policy has been to ensure sustainable growth and development of the industry while at the same ensuring that the aquaculture industry is a profitable and viable rural industry, cf. for example Recommendation No 150 to the Storting (1995–1996), Report No 48 to the Storting (1994–1995) and the Aquaculture Act (2005). In Recommendation No 161 to the Storting (2002–2003), the Standing Committee on Energy and the Environment pointed out that further growth of the aquaculture industry required greater adaptation to the environment.

The investigation shows that the aquaculture industry has grown considerably since the 1980s and that the production of farmed fish had more than doubled from approximately 490,000 tonnes in 2000 to more than one million tonnes in 2010. The sales value of the farmed fish amounted to more than NOK 30 billion in 2010. The industry contributes to employment and value creation along large parts of the coast and it is an important export industry for Norway.

Several ministries and agencies, as well as municipalities and county authorities, are responsible for parts of the management of aquaculture. The management regime is complex, but the roles and areas of responsibility of the various bodies generally appear to be clearly defined. It is also positive that the Ministry of Fisheries and Coastal Affairs and the Ministry of the Environment now collaborate when decisions about production growth are to be considered, and that environmental considerations have been increasingly emphasised in these processes since 2007.

However, the investigation shows that, as of 2011, the aquaculture industry is not sufficiently adapted to the environment and that sustainability considerations do not seem to be taken into account to the extent assumed by the Storting's Standing Committee on Energy and the Environment and the Standing Committee on Business and Industry, cf. Recommendation No 161 to the Storting (2002–2003) and Recommendation No 150 to the Storting (1995–1996).

Here, reference is made, among other things, to widespread findings of salmon lice and extensive losses of farmed fish as a result of disease. In addition, there is a significant proportion of farmed fish among wild fish in rivers and watercourses as a result of the persistently high escape figures for farmed fish. Obtaining sufficient feed resources that are harvested in sustainable manner is also a challenge.

The investigation also shows several shortcomings in the management of the aquaculture industry. In this context, particular reference is made to the fact that, in the processing of applications for licences to engage in fish farming, it is largely matters relating to the individual site and not to the overall load from several fish farms in a wider area that are assessed. It is therefore questioned whether the processing of operating licences ensures an aquaculture industry that is environmentally justifiable pursuant to the requirements of the Aquaculture Act section 1 and whether measures from the Ministry of Fisheries and Coastal Affairs, such as regional regulation of production and other measures, would have resulted in better account being taken of the environmental load when processing applications. Reference is also made in this context to the recommendation from the Committee on the Use of Marine Areas by Aquaculture that the coast should be divided into production areas in accordance with detailed rules in order to ensure sustainable management of the aquaculture industry.

There are also shortcomings in connection with the municipalities' planning work, and with supervision and the processing of aquaculture applications by the Norwegian Food Safety Authority. In the Norwegian Food Safety Authority, identical cases involving applications for operating licences have different outcomes without there being objective reasons for this. The processing of applications by the county governors seems to be more uniform. There are also differences in the use of sanctions by the Norwegian Food Safety Authority and the Directorate of Fisheries. It is also unfortunate that the authorities have not developed a better method for verifying the biomass in aquaculture

facilities. Taken together, these shortcomings in management give grounds for asking whether the Ministry of Fisheries and Coastal Affairs, the Ministry of Agriculture and Food and the Ministry of the Environment need to develop their administration in order to fulfil the Storting's expectations that the aquaculture industry shall be managed in manner that ensures that the industry is sustainable and environmentally sound.

There is also disagreement among the administrative agencies about the extent and consequences of the environmental impact of the aquaculture industry. Lack of knowledge can explain some of this disagreement. Moreover, few indicators have been developed that can measure the extent to which the management regime is achieving the goal of a sustainable and environmentally sound aquaculture industry, cf. the Regulations on Financial Management in Central Government and the requirement for sufficient management information. The ongoing collaboration between the fisheries and environmental authorities on developing a better knowledge base by specifying the sustainability elements in the aquaculture industry and developing indicators and threshold values is therefore seen as important to the further development and regulation of the aquaculture industry.

6.1 A sustainable and environmentally sound aquaculture industry

Escaped fish and genetic introgression

Norway has endorsed a number of international agreements on the conservation of wild salmon, and it is a goal that impacts that threaten the genetic diversity of salmon shall be reduced to a non-harmful level by 2010, cf. Proposition No 32 to the Storting (2006 -2007). In order to safeguard wild salmon stocks, it is a goal that escapes of farmed fish are kept to an absolute minimum (cf. Recommendation No 183 to the Storting (2006–2007) concerning proposition No 32 to the Storting (2006–2007)), and the overriding vision of zero escapes, cf. Proposition No 1 to the Storting (2006–2007) for the Ministry of Fisheries and Coastal Affairs. Escaped farmed fish can result in undesirable environmental impacts through genetic interaction between escaped farmed fish and wild fish. This can reduce the wild fish's ability to survive. Escaped fish can also spread diseases and lice to wild fish.

The investigation shows that, according to the reported escape figures for salmon, escapes increased from approx. 300,000 fish in 2001 to 900,000 in 2006. The reported escape figures have decreased since 2007 and have been between 100,000 and 300,000 annually, including the first six months of 2011. However, the investigation shows that there is also great uncertainty attached to the reported escape figures, and that the actual escape figures are probably higher. In this light and taking into consideration that the total Norwegian wild salmon population comprises around 500,000 fish, the escape figures must still be regarded as too high. It is therefore questioned whether the overall measures taken by the Ministry of Fisheries and Coastal Affairs to prevent escapes are sufficient to reach the goal of ensuring an environmentally sound aquaculture industry. The investigation also asks whether the Ministry of Fisheries and Coastal Affairs and the Ministry of the Environment have made sufficient use of expedient policy instruments to realise the goal that the environmental impacts shall not be a threat to the genetic diversity of wild salmon, cf. Proposition No 32 to the Storting (2006 -2007).

Fish health and fish welfare

Farmed fish shall be of a high standard as regards health, and it is an important goal that disease in the fish farming industry shall not have a regulating effect on stocks of wild fish, and that as many farmed fish as possible shall grow to slaughter age with minimal use of medicines, cf. Recommendation No 150 to the Storting (1995–1996), Report No 48 to the Storting (1994–95), and Proposition No 1 to the Storting (2009–2010).

The investigation shows that many fish are lost in connection with the production of farmed fish, both relatively and in absolute figures. More than 47 million salmonids were lost in 2010 alone. A large proportion of the fish were lost due to disease. The high loss figures also entail large financial losses for the industry, and they represent inefficient use of marine areas in the coastal zone. Even though a certain amount of losses must be expected in large-scale biological production, it is questioned whether today's loss levels are in accordance with the goal that as many farmed fish as possible shall grow to slaughter age, cf. Proposition No 1 to the Storting (2009–2010).

The question is also raised of whether the Ministry of Fisheries and Coastal Affairs has

introduced sufficient measures, such as coordinated fallowing and regional regulation of the biomass, to combat and reduce the losses from disease among farmed fish, and whether the existing system of production regulation contributes to good fish health and good fish welfare.

In addition to viral diseases, a high incidence of the parasite salmon lice has been one of the biggest problems in the industry in recent years. Salmon lice have a negative impact on wild stocks, among other things by harming the fish and make them more susceptible to other diseases. Salmon lice can also represent a welfare problem for farmed fish. The investigation shows that extensive regulations and concerted measures to combat salmon lice do not appear to be sufficient to reduce the problem. Even though there may be geographical variations, the investigation shows that the total lice level in 2010 was roughly at the same level as in 2009, when the amount of salmon lice found had increased to a level that led the Ministry of Fisheries and Coastal Affairs to stop a planned expansion of production capacity for farmed salmon. There are also problems relating to resistance to several delousing agents, which has further reduced the possibility of combating the problem. Against this background, the lice situation must be described as giving cause for concern, especially in light of the precondition that fish farming shall not have a negative impact on the wild fish population, cf. Proposition No 1 to the Storting (2009–2010).

Pollution

It has been a requirement for several years that pollution from aquaculture must not exceed the recipient's tolerance limit, and it is a priority to endeavour to limit discharges of pharmaceuticals, chemicals and organic pollution, and to ensure that waste and by-products are adequately handled, cf. Recommendation No 150 to the Storting (1995–1996), Report No 48 to the Storting (1994–95), and Proposition No 1 to the Storting (2009–2010).

The investigation shows that the state of the environment at most fish farms is good. However, the monitoring system (MOM) that is used to measure the state of the environment under fish farms is not adapted to today's large-scale farms, which are also often located in marine areas for which the monitoring system is not designed. There is therefore a risk that the measurements of the state of the environment will be misleading. The investigation also shows that there is a lack

of knowledge about the regional effects of discharges from the aquaculture industry. The result is that agencies and expert groups differ in their assessment of the importance of discharges of nutrient salts by the fish farming industry. The result of this lack of knowledge is that no one knows how much nutrient salts and organic material the recipient and surrounding environment can tolerate. The Ministry of Fisheries and Coastal Affairs' and the Ministry of the Environment's follow-up of the work of the expert committee that is assessing the importance of discharges from the aquaculture industry is therefore very important. The ongoing efforts to ensure a better adapted system for monitoring discharges is also regarded as important.

Because of the high total incidence of lice, the amount of discharges of chemicals in connection with delousing increased from 208 kg in 2008 to 6,454 kg in 2010. The investigation shows that the concentration of certain delousing agents has been shown to be at a level that can threaten natural life in the sea. In light of the goal of limiting discharges of chemicals, the question is therefore put to Ministry of the Environment of whether this is in accordance with the prioritisation of limiting discharges of chemicals and pharmaceuticals, cf. Recommendation No 150 to the Storting (1995–1996).

Use of marine areas:

Access to sufficient suitable areas has been emphasised as an important goal in the work of ensuring sustainable growth and development of the aquaculture industry, cf. Report No 48 to the Storting (1994–1995), Report No 19 to the Storting (2004–2005) and Recommendation No 8 to the Storting (2010–2011). The current use of marine areas is the result of strong growth and the allocation of an increasing number of licences to engage in fish farming without this being based on an overall plan. In Report No 19 to the Storting (2004–2005), the Ministry of Fisheries and Coastal Affairs pointed to the need to develop a strategy for efficient use of marine areas in the coastal zone. Given that the current use of marine areas is a contributory cause of some of the environmental challenges, the Ministry of Fisheries and Coastal Affairs' follow-up of the work done by the Committee on the Use of Marine Areas by Aquaculture is therefore seen as being very important in relation to ensuring better use of marine areas and thereby a more robust aquaculture industry.

It has been pointed out that municipal plans are an important policy instrument for ensuring environmentally friendly area use and for contributing to clarifying conflicting interests in the coastal zone. The investigation shows that most coastal municipalities have adopted plans that regulate the coastal zone. A large number of plans are not sufficiently updated, however. The municipalities also do little to clarify the status of marine areas in the plans. The plans also do little to address area-related issues relating to the consequences of aquaculture across municipal boundaries. It is therefore questioned whether the Ministry of the Environment has taken sufficient steps to ensure that the municipalities can prepare plans for the marine areas that are in accordance with the goal of using such planning processes to coordinate and prioritise between conflicting interests, cf. Recommendation No 192 to the Storting (2004–2005).

The use of feed in the aquaculture industry

The aquaculture industry's need for feed is to be covered without over-fishing of wild marine resources, cf. Proposition No 1 to the Storting (2009–2010) for the Ministry of Fisheries and Coastal Affairs. The aquaculture industry is dependent on large quantities of wild fish for fish feed. If the aquaculture industry is to be sustainable, the management of the fish resources used in this feed must also be sustainable. The investigation shows that the fishing pressure among European states, including Norway, on important species such as blue whiting and sandeel has contributed to a strong reduction in some of these stocks. It is particularly when there is a lack of agreement between Norway, the EU, the Faeroe Islands and Iceland on the management of common stocks that such fishing pressure can arise. It is positive, therefore, that the coastal states reached agreement in 2008 on a management plan for blue whiting. This plan can protect stocks. As of 2011, there is no agreement between the coastal states about mackerel, and this could lead to a reduction in mackerel stocks. It is seen as important that the Ministry of Fisheries and Coastal Affairs continues its efforts to secure agreement on the management of all the common fish stocks that are used in fish feed in accordance with the principle that sustainable management of fish stocks requires the regulation of fisheries, cf. Proposition No 1 to the Storting (2009–2010) for the Ministry of Fisheries and Coastal Affairs and the UN Convention on the Law of the Sea Part V, Articles 61 and 62. Pursuant to the Convention on the Law of the



Fish feed.

Photo: Nofima

Sea, it is also a requirement that coastal states endeavour to cooperate on conserving and developing the stocks that they share.

More than half the raw materials for Norwegian fish feed are imported. The Ministry of Fisheries and Coastal Affairs does not always know whether the raw materials that are imported are from sustainable fisheries. Even though the industry also has an independent responsibility for ensuring that raw materials come from sustainable fisheries, it is also a question of whether the Ministry of Fisheries and Coastal Affairs should do more to ensure that the raw materials that are imported come from sustainable fisheries in line with the international efforts to prevent illegal, unreported and unregulated fishing, cf. Proposition No 1 to the Storting (2009–2010) for the Ministry of Fisheries and Coastal Affairs.

The investigation also shows that the use of trimmings from fish for human consumption represents an untapped potential. Only 35 per cent of the by-products of cod are used, for example. The Ministry of Fisheries and Coastal Affairs is working on regulations aimed at ensuring that a larger proportion of by-products from fish for human consumption are landed. It is therefore reasonable to expect that trimmings from fish for human consumption will be utilised to a greater extent and used in fish feed in future, and that the Ministry of Fisheries and Coastal Affairs continues to act as a driving force in this work in line with the goal of ensuring better utilisation of by-products from living marine resources, cf. Proposition No 1 to the Storting (2010–2011).

6.2 The use of policy instruments to ensure a sustainable and environmentally sound aquaculture industry

The Aquaculture Act is intended to promote the profitability of the industry within the bounds of sustainable development. The Act states that the Ministry of Fisheries and Coastal Affairs decides the extent to which licences are allocated for fish farming. The Ministry of Fisheries and Coastal Affairs is thereby responsible for setting the limit on total production in the aquaculture industry. In its efforts to ensure increased growth in the aquaculture industry, the Ministry of Fisheries and Coastal Affairs has increased the maximum allowed production capacity for salmonids in several allocation rounds since the 1980s. Up until 2007, sustainability considerations do not appear to have been taken into account to any great extent. The investigation shows that, prior to the increase by 65 new licences in 2009, a more extensive assessment was carried out of whether this expansion was environmentally justifiable. In connection with the proposed increase in the biomass in 2010, the environmental impact was also assessed at the overall level, and this was thereby more in line with the requirements for environmental impact assessments set out in the Instructions for Official Studies and Reports.

Licences to engage in fish farming are allocated following an application, and, pursuant to the Aquaculture Act, the consideration of new and changed fish farming licences shall contribute to ensuring sustainable growth and development of the aquaculture industry, cf. sections 1 and 6 of the Act. The processing of aquaculture cases is intended to contribute to ensuring that the environment and optimal use of the coastal zone are taken into consideration.

As mentioned in the introduction to this chapter, when processing applications for fish farming licences, it is primarily factors relating to the individual site that are considered, and not the overall environmental load caused by several fish farms in the area around the individual site. In light of the fact that the environmental challenges facing the aquaculture industry are related to regional areas, it is questioned whether the processing of aquaculture cases contributes sufficiently to ensuring an environmentally justifiable aquaculture industry in accordance with the requirements of Section 1 of the Aquaculture Act, and whether measures by the

Ministry of Fisheries and Coastal Affairs, such as regional measures and regulation, would have led to greater account being taken of the environmental load when processing applications. Reference is also made in this context to the recommendation from the Committee on the Use of Marine Areas by Aquaculture that the coast should be divided into production areas in accordance with detailed rules in order to ensure sustainable management of fish farms.

The investigation also shows that discretionary judgement is used when environmental aspects are assessed in connection with the processing of aquaculture cases, and that this can result in identical cases being dealt with differently. The vignette survey shows that, in connection with the Norwegian Food Safety Authority's processing of aquaculture cases, the outcomes of identical cases differ. There may also be weaknesses in the applications, and the offices may have divergent views on the extent to which applications are sufficiently documented. Because the Norwegian Food Safety Authority's processing of aquaculture cases can have serious consequences for individual fish farmers, and because of the non-statutory principle that identical cases shall be dealt with identically unless there are objective reasons for reaching different decisions, it is questioned whether the Ministry of Fisheries and Coastal Affairs and the Ministry of Agriculture and Food have taken sufficient steps to ensure uniformity in the Norwegian Food Safety Authority's processing of aquaculture cases.

The investigation shows that the county governors' consideration of aquaculture cases in connection with the vignette survey leads to divergent outcomes to a smaller extent than was the case for the Norwegian Food Safety Authority. However, the vignette survey shows that the county governors have somewhat divergent views on what constitutes sufficient documentation of an aquaculture application and that there were also certain shortcomings in the applications that were not pointed out in all the responses to the vignette survey. It is also important, therefore, that the Ministry of the Environment continues to strengthen its efforts to ensure uniform processing of aquaculture applications by the county governor offices.

Supervision is a fundamental means of ensuring sustainable growth and development of the aquaculture industry through control and appropriate sanctions. Supervisory activities shall also be

risk-based, cf. Proposition No 1 to the Storting (2009–2010) for the Ministry of Fisheries and Coastal Affairs and Proposition No 1 to the Storting (2009–2010) for the Ministry of Agriculture and Food. The investigation shows that the supervisory bodies, the Directorate of Fisheries, the Norwegian Food Safety Authority and the county governor offices, differ in their approach to supervisory activities with respect to the selection of enterprises for inspection, the number of inspections carried out and the use of reactions and sanctions. The question is raised of whether the Ministry of Fisheries and Coastal Affairs and the Ministry of the Environment should harmonise the supervisory activities of the three bodies to a greater extent, cf. the goal that the fisheries authorities shall engage in coordinated supervision together with other sector authorities when possible (Proposition No 1 to the Storting (2008–2009) for the Ministry of Fisheries and Coastal Affairs).

The investigation also shows that both the Norwegian Food Safety Authority and the Directorate of Fisheries uncover breaches of the regulations in more than half the inspections they carry out. Such extensive breaches of the regulations give grounds for questioning whether the Ministry of Fisheries and Coastal Affairs and the Ministry of Agriculture and Food have established a practice for the use of sanctions that has a sufficiently preventive effect, cf. the requirement that violations shall be followed up in an effective and adequate manner, and that effective rules and tools relating to the act's sanctions provisions shall be adopted (Proposition No 1 to the Storting (2007–2008) for the Ministry of Fisheries and Coastal Affairs), and the requirement that supervision shall result in the greatest possible compliance with the regulations (Proposition No 1 to the Storting (2009–2010) for the Ministry of Agriculture and Food).

Moreover, the investigation shows that there are considerable regional and local differences in the use of sanctions in both the Norwegian Food Safety Authority and the Directorate of Fisheries. The use of coercive measures by the Directorate of Fisheries' regions, for example, has varied between around two per cent and 24 per cent, while, among the Norwegian Food Safety Authority's regions, it has varied between nine per cent and more than 17 per cent. The Norwegian Food Safety Authority also points out that practice can vary between the regions. In this light, it is questioned whether the Ministry of Fisheries and Coastal Affairs and the Ministry of Agriculture

and Food have taken sufficient steps to ensure harmonised use of sanctions by the regional offices of the Directorate of Fisheries and the Norwegian Food Safety Authority.

Maximum allowed biomass is the production regulation system currently applicable to aquaculture. It is therefore an important supervisory task for the Directorate of Fisheries to ensure that the production of farmed fish does not exceed the maximum allowed biomass, cf. Proposition No 1 to the Storting (2008–2009) for the Ministry of Fisheries and Coastal Affairs. The investigation shows, however, that the Directorate of Fisheries does not have a suitable method for verifying the biomass figures reported by fish farmers. The fact that the ministry has failed to take sufficient steps to establish procedures that ensure that the system for the regulation of aquaculture production is complied with is deemed to be unsatisfactory given the expectation that control work shall ensure that the biomass in connection with the production of salmon and trout does not exceed the maximum allowed biomass.

Appendix 1: Roles and responsibilities in the management of aquaculture

Table 1 shows which ministries are formally involved in the management of aquaculture and which subordinate agencies and statutes play a part in the management of aquaculture. The Ministry of Fisheries and Coastal Affairs has primary responsibility for the management of aquaculture.

The Ministry of Fisheries and Coastal Affairs is the owner of the Directorate of Fisheries and has management responsibility for the Norwegian Food Safety Authority in aquaculture matters. The Norwegian Food Safety Authority also administers the Food Act in connection with aquaculture. The act is owned by the Ministry of Health and Care Services, but responsibility for relevant parts of it has been delegated to the Ministry of Fisheries and Coastal Affairs. The Ministry of Fisheries and Coastal Affairs

therefore collaborates closely with the Ministry of Agriculture and Food and the Ministry of Health and Care Services on the management of aquaculture.

The Ministry of the Environment is the owner of the Norwegian Climate and Pollution Agency and of a number of acts that are relevant to aquaculture. The Directorate for Nature Management has been assigned responsibility for coordinating the environmental authorities' management signals to the county governors, also in relation to aquaculture.

Table 2 shows the most important administrative bodies in relation to aquaculture and their areas of responsibility in the management of aquaculture.

Table 1 The ministries involved in the management of aquaculture

Ministry	Area of responsibility in aquaculture	Formal management responsibility	Legislation – owner
The Ministry of Fisheries and Coastal Affairs	Primary responsibility for the management of aquaculture	The Directorate of Fisheries The Norwegian Food Safety Authority The Norwegian Coastal Administration*	The Aquaculture Act The Food Act The Animal Welfare Act The Harbour Act*
The Ministry of Agriculture and Food	Formal owner of the Norwegian Food Safety Authority	The Norwegian Food Safety Authority	The Animal Welfare Act
The Ministry of the Environment	Chief pollution control authority and chief authority in relation to land/area use administration. Follow-up and guidance pursuant to the Nature Diversity Act and the Water Regulations.	The Norwegian Climate and Pollution Agency / The county governor offices	The Pollution Control Act The Planning and Building Act. The Nature Diversity Act The Act relating to Salmonids and Fresh-Water Fish etc.
The Ministry of Health and Care Services	Formal owner of the Food Act	The Norwegian Food Safety Authority	The Food Act
The Ministry of Petroleum and Energy*	Formal owner of the Norwegian Water Resources and Energy Directorate and the Water Resources Act	The Norwegian Directorate of Water Resources and Energy*	The Water Resources Act*

*Only touched on to a small extent or not at all in the investigation.

Table 2: Administrative bodies and responsibilities in the management of aquaculture

Directorate/agency	Responsible for the following goals	Administers regulations	Administrative tasks
The Directorate of Fisheries	Goal 1: To prevent escaped fish and genetic interaction	The Aquaculture Act	Supervision of the aquaculture industry
The Norwegian Food Safety Authority	Goal 2: Safeguard fish health and welfare	The Food Act, the Animal Welfare Act and the Act relating to Animal Health Personnel	Processing of aquaculture cases Supervision of the aquaculture industry Supervision of fish health personnel The development of regulations
Norwegian Climate and Pollution Agency / county governor offices	Goal 3: To keep discharges at an acceptable level	The Pollution Control Act	Processing of aquaculture cases (discharge permits) Supervision of the aquaculture industry
The county authorities	Goal 3: To keep discharges at an acceptable level	The Aquaculture Act (the Allocation Regulations)	Power of decision in the processing of aquaculture cases (including requirements for environmental impact assessments in the allocation phase)
The Directorate of Fisheries	Goal 3: To keep discharges at an acceptable level	The Aquaculture Act (the Aquaculture Operation Regulations)	The processing of aquaculture cases (approval of operating plans and environmental monitoring in the operating phase) Supervision of the aquaculture industry
	Goal 4: That the aquaculture industry has a site structure and use of marine areas that reduces the environmental impact and risk of infection		
	Goal 5: That the aquaculture industry's demand for raw materials for feed shall be covered without over-fishing wild marine resources.		

Appendix 2: Escapes of farmed cod

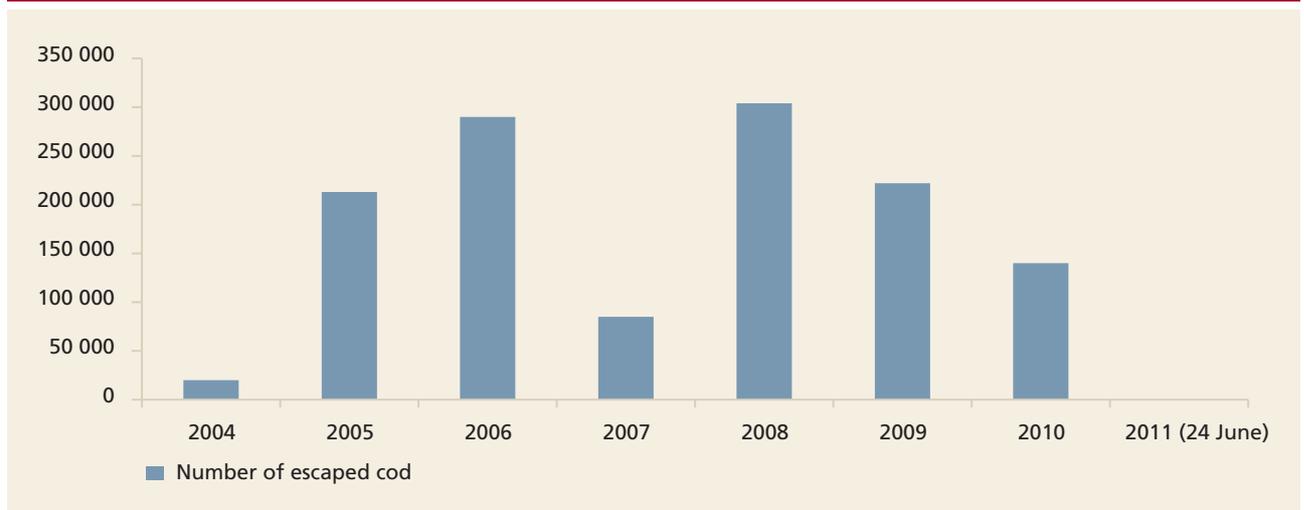
Figure 1 shows the extent to which farmed cod escape.

The figure shows that the escape figures for cod vary from year to year – from 20,000 fish to more than 300,000 fish – without there being a clearly positive or negative trend. No escapes of farmed cod were registered in the first six months of 2011.

Farmed cod have proven more prone to escape than salmon and rainbow trout. Cod behave differently in the cages than the other two species

mentioned. They search for holes and they have been observed gnawing their way through the nets. This is supported by clear and, in part, inexplicable wastage during production.²¹¹ The same is shown if the escape figures for cod are compared with the production of salmon and trout. For each tonne of salmon produced, 0.7 salmon escape, while for each tonne of cod produced, around 15 escapes.²¹²

Figure 1 Escape figures for cod for the period 2004–2011*



* Escape figures for cod registered from 2004.

Source: The Directorate of Fisheries (the Directorate's figures were last updated on 24 June 2011)

211) The Government's Sustainability Strategy.

212) Based on escape figures and production figures for 2001 to 2009 for salmon and 2004 to 2010 for cod, respectively.

Appendix 3: Different calculations of percentage losses

Even though losses are expressed in terms of the number of fish, different methods are used to calculate the relative losses or percentage losses. Very divergent loss percentages are therefore often quoted for the aquaculture industry depending on which calculation method is used. In an internal memo from 2011, the Directorate of Fisheries states that it has been little concerned with percentage losses in its presentation of aquaculture statistics.

The Directorate points out that the main difference is between calculating the loss percentage on the basis of the annual amount of fish and basing the calculation on the loss as a percentage of a generation of released fish. The latter method entails tracking the fish from release to slaughtering, which takes longer than a year. By using a release generation, the amount of fish, or the denominator, will be the same, while the numerator, or the number of lost fish, will be higher since it is calculated over a period of more than one year. This method is little used today, and the Directorate of Fisheries states that the statistics must be checked and better collated if it is to be possible to calculate losses on the basis of release generations.

There are also different ways of calculating the loss percentage within one year. Here, it will be the denominator, or the number of fish in the cage, that varies, depending on how one chooses to calculate the number of fish. The numerator, or the number of fish lost over the course of a year, will be the same. One method, which is called the circulation loss method, was used by Statistics Norway until spring 2011. It is based on the number of fish as of 1 January in the year in question plus the number of released fish. The number of fish lost during the year is then divided by this total. According to the Directorate of Fisheries, the denominator will be unnaturally high using this method because fish released during the course of the year are also included. In the above-mentioned memo, the Directorate proposes switching to a different method called the average stock loss method. This method adjusts for fish being removed for slaughter during the year and

calculates the average stock of fish by adding together the stock as of 1 January and the stock as of 31 December and dividing the total by two.

Appendix 4: Differences in discharges of nutrient salts from aquaculture by county

The amount of discharges of nutrient salts is directly linked to production, which means that discharges of nutrient salts are greatest where production is highest. According to the Norwegian Institute of Marine Research's risk assessment, Hordaland and Nordland were the two counties that produced most and consequently had the largest discharges of nutrient salts in 2009. Even though these counties produced roughly equal amounts of salmonids, discharges of nutrient salts per square kilometre were much higher in Hordaland than in Nordland because of the difference in marine areas. The production of phytoplankton is the most important effect of discharges of nutrient salts.

Figure 1, which is a reproduction of Figure 5.3.1 in Risk assessment – Environmental impacts of Norwegian aquaculture, 2010 (p. 86), shows the estimated increase in phytoplankton per square kilometre by county as a result of discharges from aquaculture based on production in 2009.

The figure shows that the percentage increase in the production of phytoplankton from discharges of nitrogen is estimated to be 4.8 per cent for Hordaland and 0.6 per cent for Troms and Finnmark.¹ Rogaland, where production is small compared with other counties, but relatively large per square kilometre,²¹² will experience an increase in phytoplankton production of around 2.5 per cent as a result of discharges from aquaculture. Hordaland and Rogaland, which are the two most aquaculture-intensive counties with the greatest discharges of nutrient salts per square kilometre,²¹² are also the two counties where there is most uncertainty about the problem of eutrophication, cf. the discussion of the Hardangerfjord and Boknafjord in chapter 4.3. According to the County Governor of Rogaland, it is known that large amounts of nutrient salts are being introduced into the area in the Boknafjord, but too little is known to determine whether this is due to aquaculture.

Figure 1 Calculations of the percentage increase in phytoplankton per sq. m as a result of discharges from aquaculture by county, 2009



Source: The Norwegian Institute of Marine Research

1) The figures are based on 100 per cent of the dispersed nitrogen that is discharged being used for the production of phytoplankton.

Appendix 5: Other management of industrial fish

The management of Norway pout, capelin and sprat

Norway pout

ICES has issued recommendations for total quotas for several years. According to the Ministry of Fisheries and Coastal Affairs, stocks of Norway pout were weak in the mid-2000s and the quotas were therefore small. According to the Norwegian Institute of Marine Research, stocks were reduced less as a result of fishing and more because of weak cohorts of Norway pout. Figure 1 shows the development of catches, and recommended and allocated quotas in the period 1995–2011.

Figure 1 shows that catches in the 1990s were for the most part on a par with the recommended total quotas even though the allocated quotas were higher than the recommended total quotas. In the 2000s, the allocated quotas have been in accordance with the recommended quotas, and the catches have been lower than the total quotas. In their quota advice for 2011, however, ICES and the Norwegian Institute of Marine Research

state that, even if no Norway pout are caught in 2011, the spawning stock will fall below the precautionary limit in 2012. In accordance with these recommendations, direct fishing for Norway pout is not permitted in the Norwegian economic zone in 2011.

Figures from Statistics Norway and ICES show that Norway and Denmark have been the biggest fishers of Norway pout. Norway's share of the total catch has been more than 40 per cent in the period 2000 to 2010.

Capelin

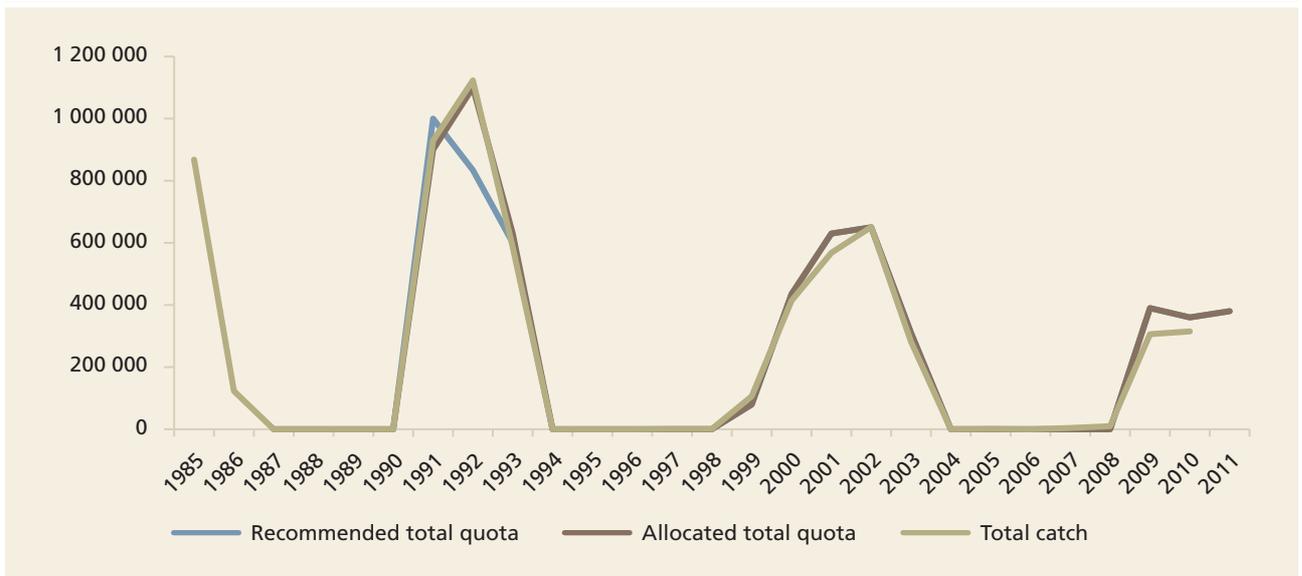
The management of capelin in the Barents Sea takes place in close cooperation between Norway and Russia (cf. Document No 3:8 (2010–2011) for a discussion of the management of the fish resources in the Barents Sea). Figures from ICES show that there has been strong agreement between the recommended total quotas, the stipulated total quotas and catches of capelin during the period 1987 to 2011, cf. Figure 2 on the following page.

Figure 1 Recommended and stipulated quotas and catches of Norway pout, 1995–2011. Tonnes



Source: ICES

Figure 2 Recommended and stipulated quotas and catches of capelin, 1985–2011. Tonnes



Source: ICES

The figure shows that the quotas and catches have varied considerably during the period in question. The Norwegian Institute of Marine Research states that young herring eat capelin larvae and that the relatively large stock of young herring in the Barents Sea during the periods 1984–1986, 1992–1994 and from 2000 was the most important reason for the weak capelin cohorts during the same periods. As of 2010, the Norwegian Institute of Marine Research expects recruitment conditions for capelin to be good.

Sprat

According to the Norwegian Institute of Marine Research, most of the sprat is fished by the Danish industrial trawler fleet. ICES assesses stocks every year, but there is some uncertainty attached to the calculation of stocks, and ICES does not issue quota advice for the North Sea and Kattegat stocks. According to ICES, the harvesting of sprat in recent years does not appear to have created problems for stocks.

Fisheries management in Peru

According to FAO, fisheries have an important place in Peru's economy in that they are the second most important source of foreign currency. Pelagic fish are an important part of the fisheries and the anchoveta fishery is the biggest by far. Measured by quantity, it can account for more than 90 per cent of total landings in Peru during a year. More than 90 per cent of the anchoveta is used in the production of fishmeal, and Peru is the world's biggest producer of

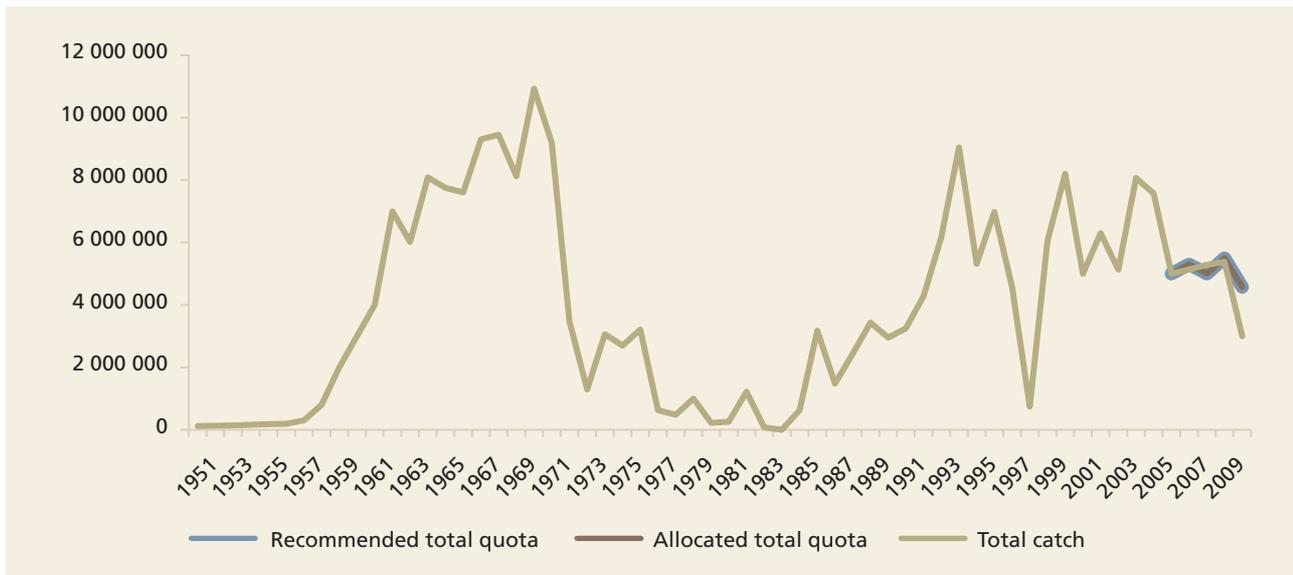
fishmeal and fish oil. China, Germany and Japan are the biggest importers of fishmeal from Peru.

According to FAO, the fisheries in Peru are managed by the Ministry of Production through the Vice-ministry of Fisheries. The goal of Peru's fisheries management is to ensure rational management of the fish resources and to conserve nature. There are several specialised directorates and public decentralised organisations under the ministry. IMARPE (Instituto del Mar del Perú) is an important research institution, and it is part of the ministries' management support. IMARPE is responsible for assessing stocks of anchoveta by means of various marine surveys.

The Peruvian anchoveta fishery, which started in the 1950s, is one of the most important individual fisheries in the world. Figure 3 shows the annual catch volumes of anchoveta landed in Peru during the period 1951 to 2010. The figure also shows the recommended total quotas and stipulated total quotas from 2006.

The figure shows that catches of anchoveta have varied considerably over the 60-year period from 1951 to 2010. The anchoveta fishery grew strongly from its inception in the 1950s until into the 1960s, and large quantities of anchoveta were landed annually in the 1970s. The year 1970 was a peak year, with catches of more than 10 million tonnes. According to FAO, catch quantities decreased as the 1970s progressed and during large parts of the 1980s due to a combination of

Figure 3 Annual catch volumes of Peruvian anchoveta 1951–2010, and the recommended and stipulated total quotas, 2006–2010. In tonnes



Source: Ministry of Production, Peru and Fishsource.org

overfishing and natural factors such as El Niño (large fluctuations in temperature in the tropical part of the eastern Pacific) in 1972 and 1973, which contributed to a strong reduction in stocks.

In the early 1980s, the catch was around 200,000 tonnes a year. Catches increased later in the 1980s, reaching a peak in the mid-1990s at approximately seven million tonnes of fish. The reduction in 1998 was due to a powerful El Niño. Availability increased quickly, however, and catches increased to around eight million tonnes around 2000. According to FAO, the species has proven to be capable of growing again after strong reductions in stocks. In the years 2006 to 2009, the catches were around five million tonnes, falling thereafter to three million tonnes in 2010.

Fisheries management in Peru compared with international criteria

The United Nations Convention on the Law of the Sea from 1982 is the overriding legal framework for all national, regional and international measures in the marine sector. Following up the United Nations Convention on the Law of the Sea, the United Nations Fish Stocks Agreement includes a number of provisions relating to the management of fisheries. In 1995, FAO also adopted requirements and criteria for how the world's fisheries nations can ensure sustainable and responsible management of the ocean's resources (Code of Conduct for Responsible Fisheries). Among other things, the criteria

concern the use of stock assessments, the stipulation of quotas, the regulation of fisheries to prevent the discarding of fish, by-catch provisions, the closing of fishing grounds and resource control.

A survey was conducted in 2008 of the extent to which the world's 53 biggest fisheries nations comply with the criteria FAO has defined for what can be described as good fisheries management.² Overall, Norway was deemed to have the best fisheries management, complying with more than 60 per cent of the criteria. Peru's compliance rate was estimated to be less than 40 per cent. Nations with a compliance rate of less than 40 per cent were deemed to have an inadequate fisheries management. However, Peru had the highest compliance rate among the nations whose management was deemed to be inadequate. Among the 53 nations surveyed, 27 were assessed as having poorer management than Peru. The reason why Peru was deemed to not adequately comply with the criteria overall was its failure to stipulate quotas on the basis of stock assessments and insufficient control measures to prevent illegal fishing. The survey concerned Peru in general.

2) *Safe Conduct? Twelve years fishing under the UN Code.* University of British Columbia, Canada, Tony J. Pitcher and Ganapathiraju Pramod et al., December 2008.

Appendix 6: Negative recommendations and high risk assessments of areas along the coast in connection with an increase in aquaculture activity

Abbreviations and the goals used in the table are explained under the table.

Table 1 Negative recommendations and high risk assessments of areas along the coast in connection with the proposed increase in biomass in existing aquaculture facilities

Area	Negative recommendations and high risk assessments
East Finnmark	HI: medium-high risk in relation to goal 1 VI: high risk in relation to goal 3 DN: advises against Finnmark
Central Finnmark	HI: medium-high risk in relation to goal 1 DN: advises against Finnmark
West Finnmark	HI: medium-high risk in relation to goal 1 VI: high risk in relation to goal 3 DN: advises against Finnmark
North Troms	HI: high risk in relation to goal 1 VI: high risk in relation to goal 3
Central Troms	HI: high risk in relation to goal 1 VI: high risk in relation to goal 3
South Troms	HI: high risk in relation to goal 1 VI: high risk in relation to goal 3 MT: medium-high risk in relation to goal 3
Vesterålen and Lofoten	VI: high risk in relation to goal 3
Salten and Ofoten	HI: high risk in relation to goal 1
Helgeland	-
Nord-Trøndelag	HI: high risk in relation to goals 1 and 3 VI: high risk in relation to goal 3 MT: high risk in relation to goal 3 DN: advises against Trøndelag Fdir. Trøndelag Region: high risk in relation to goal 4 for Indre Folda in Nærøy municipality
Sør-Trøndelag	HI: high risk in relation to goal 1 VI: high risk in relation to goal 3 DN: advises against Trøndelag Fdir Trøndelag Region: high risk in relation to goal 4 for Hemnefjorden, Hemne and Snillfjord municipalities
Nordmøre	HI: high risk in relation to goals 1 and 3 VI: high risk in relation to goal 3 MT: high risk in relation to goal 3
Romsdal	HI: high risk in relation to goals 1 and 3 VI: high risk in relation to goal 3 MT: high risk in relation to goal 3
Sunnmøre	HI: high risk in relation to goals 1 and 3 VI: high risk in relation to goal 3 MT: high risk in relation to goals 3 and 4
Nordfjord	HI: high risk in relation to goals 1 and 3 VI: high risk in relation to goal 3
Sunnfjord	HI: high risk in relation to goals 1 and 3 VI: high risk in relation to goal 3 Fdir Region West: high risk in relation to goal 1
Sogn	HI: high risk in relation to goals 1 and 3 VI: high risk in relation to goal 3 Fdir Region West: high risk in relation to goal 4 Ytre Sogn
Nordhordland	HI: high risk in relation to goals 1 and 3 VI: high risk in relation to goal 3 DN: advises against the whole of Hordaland Fdir Region West: high risk in relation to goal 3

Area	Negative recommendations and high risk assessments
Midhordland	HI: high risk in relation to goals 1 and 3 VI: high risk in relation to goal 3 MT: high risk in relation to goals 3 and 4 DN: advises against the whole of Hordaland
Sunnhordland	HI: high risk in relation to goals 1 and 3 VI: high risk in relation to goal 3 MT: high risk in relation to goal 4 DN: advises against the whole of Hordaland Fdir Region West: high risk in relation to goals 1, 3 and 4
North Rogaland	HI: high risk in relation to goal 3 VI: high risk in relation to goal 3 MT: high risk in relation to goal 3 Klif: recommends no increase in the Boknafjord area and particularly not in the Jøsenfjord, Årdalsfjord and Lysefjord [concerns goal 2] Fdir Region South: high risk in relation to goals 1, 2, 3 and 4 for specified areas
South Rogaland	HI: high risk in relation to goal 3 VI: high risk in relation to goal 3 MT: high risk in relation to goals 3 and 4
Vest-Agder west of Lindesnes	HI: high risk in relation to goals 1 and 3 MT: high risk in relation to goals 3 and 4

Source: The Directorate of Fisheries

HI: The Norwegian Institute of Marine Research
VI: The Norwegian Veterinary Institute
MT: The Norwegian Food Safety Authority
DN: The Directorate for Nature Management
Klif: The Norwegian Climate and Pollution Agency
Fdir: The Directorate of Fisheries

The goals are taken from the Government's Strategy for an Environmentally Sustainable Norwegian Aquaculture Industry.

Goal 1: Genetic impact and escape. The goal is that aquaculture shall not contribute to lasting changes in the genetic properties of wild fish stocks.

Goal 2: Pollution and discharges. The goal is that all fish farming sites in use shall be in an acceptable environmental state and not have discharges of nutrient salts and organic material that exceed the tolerance limit of the recipient.

Goal 3: Diseases, including parasites such as salmon lice. The goal is that disease in fish farming shall not have a regulating effect on stocks of wild fish, and that as many farmed fish as possible shall grow to slaughter age with minimal use of medicines.

Goal 4: Use of marine areas. The goal is that the aquaculture industry shall have a site structure and use of marine areas that reduces the environmental impact and risk of infection.

Appendix 7: Resource use, competence and guidance in connection with supervisory activities

The Directorate of Fisheries

Resource use

The figures for resource use in the regions are not very uniform, but for the regions for which complete information is available, the figures show that there has been an increase in the use of resources in relation to aquaculture in the Directorate's regions from 2001 to 2011. The situation is not fully comparable, however, among other things because of changes in tasks. (For example, some of the Directorate's tasks were transferred in connection with the establishment of the Norwegian Food Safety Authority in 2004.)

In the regions' experience, the work of supervising aquaculture has for the most part been strengthened in recent years. In this context, several regions refer to the establishment of the Aquaculture Management Section in the Directorate in 2011. Moreover, the Directorate of Fisheries was allocated NOK 10 million extra in 2009, which was earmarked for strengthening the Directorate of Fisheries' supervisory work.

Competence

In interviews and letters, the regions state that employees who work on aquaculture generally have higher education qualifications, for example marine biologists, engineers and fisheries science graduates. Some of them also have relevant work experience from the aquaculture industry. In addition, the offices use in-house lawyers to formulate reports to the police and other legal tasks. None of the regions reports shortcomings in the general competence situation.

Internal competence development and guidance

The Directorate of Fisheries' head office organises training courses for staff on topics such as on-site work, inspections of smolt farms, the aquaculture register, the map system and courses in the NYTEK regulations. Some of the regions point out that in-house training has been strengthened since the Aquaculture Management Section was established in 2011.

A separate certification scheme has been established with approved instructors for inspectors who are to carry out internal control audits. The Directorate's head office has also set up four

expert groups in the following areas: biomass, smolt, NYTEK and MOM surveys. The expert groups are tasked with further developing competence in these areas.

The Directorate has introduced several control forms for use in supervisory activities that come in addition to the instruction letter.¹ The forms have been continuously updated. In 2011, the forms will be revised by the Directorate in cooperation with the regions. Some of the regions point out in that connection that changes are necessary as a result of amendments to the regulations. New provisions have subsequently been introduced that have resulted in the control form no longer being adequate.

The Directorate of Fisheries' head office confirms in an interview that there is lack of checklists etc. that can be used in connection with inspections. There is some guidance material in certain areas and more will be produced in future. The expert groups have an important role in this connection.

The Norwegian Food Safety Authority

Resource use

There were approximately 1,330 full-time equivalents attached to the Norwegian Food Safety Authority in 2011. The Norwegian Food Safety Authority uses more than 730 full-time equivalents in all to plan and carry out inspections. Of this total, 35 are used to carry out inspections of aquaculture enterprises.

Competence

Most of the district offices state that they have sufficient competence as regards aquaculture. Several of the offices point out, however, that they are vulnerable in relation to personnel with the relevant expertise being replaced because there are generally few employees at each office. In the experience of the Norwegian Food Safety Authority's head office, the district offices generally have the required competence.

1) The Directorate of Fisheries sends an annual instruction letter to the regional offices. The letter sets out the supervisory tasks that are to be carried out in relation to aquaculture.

Internal competence development and guidance

The Norwegian Food Safety Authority has not introduced formal guidelines for carrying out inspections, but a requirements template has been created in the Authority's database, MATS. It lists which provisions shall and can be investigated during an inspection.

Asked whether the requirement template in MATS is an expedient tool in inspection work, several of the district offices reply that the templates in MATS are not sufficiently detailed. It is pointed out, however, that it is possible in MATS to enter separate items that are to be investigated during inspections.

There is no overall guidance material for carrying out inspections, but guidance material is produced in connection with inspection campaigns that the district offices can use. For aquaculture, this applies to inspections addressing the incidence of salmon lice and the use of pharmaceuticals. Guidelines have also been produced for the use of sanctions in all types of supervisory activities carried out by the Norwegian Food Safety Authority. Moreover, according to the Norwegian Food Safety Authority, a large commentary document has been produced on the Aquaculture Operation Regulations, and there are also detailed guidelines for all the monitoring programmes.

The Norwegian Food Safety Authority's head office states that the information could have been brought together to a greater extent and made more accessible. It is currently retrieved from different systems. Work is being done to improve this. The Norwegian Food Safety Authority points out that work is being done to update all the auxiliary material to bring it into line with new regulations and to have it published through the Norwegian Food Safety Authority's current support tools KIM² and MATS.

The district offices state that the training of inspection personnel takes place through in-house courses, gatherings and meetings. New inspectors are given practical guidance in inspection work at the individual offices. As in the Directorate of Fisheries, a separate certification scheme has been established in connection with internal control audits, with approved instructors for inspectors who are to carry out internal control audits. Secondment is used in this connection as part of the training.

The county governor offices

Resource use

According to the figures from the county governor offices, slightly more than two full-time equivalents would be devoted to the supervision of aquaculture in 2011. By comparison, 0.2 full-time equivalents were devoted to the supervision of aquaculture in 2001. The figures from the county governors show that the increase in the resources used on inspections of aquaculture applies to most offices.

The county governor offices have also increased their use of resources in other supervisory areas. In 2001, the offices used slightly more than four full-time equivalents on supervision, while the corresponding figure for 2011 was approx. 15 full-time equivalents. The relative increase has been greatest for aquaculture.

Internal competence development and guidance

A campaign memo is prepared for each inspection campaign. It serves as guidance when carrying out inspections. The campaign memo for the inspection campaign in 2011 describes the purpose of the campaign, the relevant legislation and how enterprises are to be selected for inspection. It also contains a template for an inspection report. According to the Norwegian Climate and Pollution Agency, the campaign memo is prepared in close consultation with the county governor offices. The campaign memo is therefore also an important aid in relation to coordination and cooperation. The annual seminar for county governor offices comes in addition. It is important in relation to providing general guidance and developing a shared understanding of the offices' areas of responsibility.

The Norwegian Climate and Pollution Agency has prepared a standard that the county governors can use for inspections of aquaculture. The county governors do not agree about how the standard works, however.

2) The Norwegian Food Safety Authority's quality system.

Appendix 8:

List of breaches of the regulations uncovered by the county governors in connection with inspections

The review of all the county governor offices' inspection cases in the period 2007 to 2010 shows that the most typical non-conformities are: 1) shortcomings in internal control, 2) failure to comply with the discharge permit, and 3) shortcomings in the handling of hazardous waste.

1) Shortcomings in internal control

The biggest proportion of non-conformities (31 of 44 inspections) concerns shortcomings in enterprises' internal control. Here, the county governors point out that there are often weaknesses in the risk assessments and the environmental targets for the facilities, and particularly in relation to the natural environment. For example, the county governors call for concrete verifiable targets for facilities' use of chemicals and recipient conditions. The Norwegian Climate and Pollution Agency and some of the county governors state that the non-conformities pointed out are clear and unambiguous. Even though, in the county governors' assessment, the fish farmers do not take a sufficiently preventive approach to preventing pollution, inadequate preventive work has not been found to lead to pollution problems at the facilities to any great extent.

The legal authority to require environmental surveys follows from Section 35 of the Aquaculture Operation Regulations. The county governors do not take separate samples of the seabed in connection with inspections, but they can utilise the mandatory MOM B surveys in the operating phase. As previously pointed out, there is broad agreement in the government administration that these surveys are not an expedient method of shedding light on the environmental situation at fish farms. However, pursuant to the Pollution Control Act, the Internal Control Regulations and the Aquaculture Operation Regulations Section 36, the county governors can demand more extensive surveys of the environmental conditions at fish farms. Because of the joint instructions for the Norwegian Climate and Pollution Agency and the Directorate of Fisheries, the county governors have been reluctant to demand more extensive surveys of the aquaculture facilities, in the Norwegian Climate and Pollution Agency's assessment.

A review of a sample of discharge permits compared with the relevant inspection reports shows that the county governor offices may be more specific than the discharge permits in their inspection reports with respect to which requirements apply to the facilities' internal control. When asked about this, the Norwegian Climate and Pollution Agency and some of the county governor offices point out that the requirements set out in the discharge permits are vaguely worded and that endeavours are being made to find a clearer way of formulating the requirements. The Norwegian Climate and Pollution Agency points out, however, that the controls address factors that are defined in the Internal Control Regulations, including environmental targets and requirements for risk assessments. Some of the other county governor offices therefore also point out that the requirements set out in discharge permits are sufficiently specific.

2) Shortcomings in compliance with discharge permits

In 16 of 44 inspections, the county governors found that the enterprises failed to meet the conditions in the discharge permits. Some of these 16 facilities had produced more fish than the stated maximum allowed biomass. One smolt farm, for example, had 1.3 million fish in production during an inspection, compared with its annual permit for 500,000 fish. Breaches uncovered at facilities that have failed to comply with their discharge permit were related to deficiencies in the systems for discharges, including the treatment of waste water and the location of discharge points in the sea.

3) Handling of hazardous waste

The county governors uncovered breaches of the regulations for the handling of hazardous waste in 14 of 44 inspections. The inspection reports show that, among other things, the deficiencies concerned intermediate and long-term storage of diesel and chemicals and the delivery of hazardous waste to approved waste disposal facilities.

In addition to non-conformities with the requirements in the regulations, the county governor offices have issued remarks to the facilities. In such cases, the breaches of the regulations are not serious enough for there to be grounds for instituting coercive measures, but, in the county governor offices' assessment, improvements may be necessary at a facility in order to meet requirements relating to health, safety and the environment. Remarks of this kind were issued at 13 of the facilities. The remarks are often related to the same type of breaches of the regulations as referred to above. A remark has no legal effect.

Appendix 9: References

Interviews

One or more interviews have been carried out with the following parties:

- The Ministry of Fisheries and Coastal Affairs
- The Ministry of the Environment
- The Directorate of Fisheries
- The Directorate of Fisheries, regional office Nordland
- The Directorate of Fisheries, regional office Trøndelag
- The County Governor of Nord-Trøndelag
- The County Governor of Rogaland
- The Norwegian Climate and Pollution Agency
- The Norwegian Food Safety Authority's head office
- The Norwegian Food Safety Authority's regional office in Rogaland and Agder
- The Norwegian Food Safety Authority's regional office in Haugalandet
- The Norwegian Food Safety Authority's regional office in Nordmøre
- The Norwegian Food Safety Authority's regional office in Alta
- The Norwegian Institute for Nature Research
- The Norwegian Veterinary Institute
- The Directorate for Nature Management

Letters containing questions

- Letters containing questions have been sent to the following district offices of the Norwegian Food Safety Authority: Hardanger, Ålesund, Hitra, Namdal, Salten, Tromsø, East Finnmark and Bergen.
- Letters containing questions have been sent to the following district offices of the Directorate of Fisheries: Finnmark, Troms, Møre og Romsdal, West and South.
- Letters containing questions have been sent to the following county governors: Finnmark, Troms, Nordland, Sør-Trøndelag, Møre og Romsdal, Sogn og Fjordane and Hordaland.

Acts and regulations

- The Norwegian Constitution, Act of 17 May 1814; Article 110b was added by constitutional amendment of 19 June 1992 No 463
- Act of 10 February 1967 relating to Act relating to procedure in cases concerning the public administration, the Public Administration Act
- Act of 13 March 1981 No 6 concerning Protection Against Pollution and concerning Waste; the Pollution Control Act.
- Act of 14 June 1985 No 68 relating to the farming of fish, shellfish, etc., the Fish Farming Act
- Act of 15 May 1992 No 47 relating to Salmonids and Fresh-Water Fish etc., the Salmonid and Fresh-Water Fish Act
- Act of 24 November 2000 No 82 relating to River Systems and Groundwater, the Water Resources Act
- Act of 19 December 2003 No 124 relating to food production and food safety etc., the Food Act
- Act of 7 May 2004 No 21, Act and Instructions relating to the Office of the Auditor General, the Auditor General Act
- Act of 17 June 2005 No 79 relating to Aquaculture, the Aquaculture Act
- Act of 27 June 2008 No 71 relating to Planning and the Processing of Building Applications, the Planning and Building Act.
- Act of 17 April 2009 No 19 relating to Harbours and Fairways, the Harbour Act
- Act of 19 June 2009 No 97 relating to animal welfare, the Animal Welfare Act.
- Act of 19 June 2009 No 100 relating to the Management of Biological, Geological and Landscape Diversity, the Nature Diversity Act

Parliamentary documents

- The Appropriation Regulations. Adopted by the Storting on 26 May 2005
- Document No 14 (2002–2003) Report to the Storting by the committee studying the Storting's control function. The Storting's Monitoring of the Government and Administration

Propositions to the Odelsting

- Proposition No 55 to the Odelsting (1990–91) *Om lov om endring i lov 14. juni 1985 nr. 68 om oppdrett av fisk, skalldyr m.v. (On the Act amending the Act of 14 June 1985 No 68 relating to the farming of fish, shellfish etc.)*
- Proposition No 47 to the Odelsting (2003–2004) *Om lov om endring i plan- og bygningsloven (konsekvensutredninger) (On the act amending the Planning and Building Act (environmental impact assessments)).*
- Proposition No 61 to the Odelsting (2004–2005) *Om lov om akvakultur (akvakulturloven) (On the Act relating to Aquaculture (the Aquaculture Act))*
- Proposition No 52 to the Odelsting (2008–2009) *on the Act relating to the Management of Biological, Geological and Landscape Diversity (Nature Diversity Act)*

Reports to the Storting

- Report No 48 to the Storting (1994–1995) *Havbruk – en drivkraft i norsk kystnæring (Aquaculture – a driving force in Norway's coastal economy)*
- Report No 43 to the Storting (1998–1999) *Vern og bruk i kystsona – tilhøvet mellom verneinteresser og fiskerinæringene (Conservation and use in the coastal zone – the relationship between conservation interests and the fisheries industries)*
- Report No 12 to the Storting (2001–2002) *Protecting the Riches of the Seas*
- Report No 19 to the Storting (2004–2005) *Marin næringsutvikling – Den blå åker (Marine business development – the Blue Field)*
- Report No 32 to the Storting (2006–2007) *Om dei fiskeravtalane Noreg har inngått med andre land for 2007 og fisket etter avtalane i 2005 og 2006 (The fisheries agreements that Norway has entered into with other countries for 2007 and fishing under the agreements in 2005 and 2006)*
- Report No 18 to the Storting (2009–2010) *Fiskeravtalane Noreg har inngått med andre land for 2010 og fisket etter avtalane i 2008 og 2009 (The fisheries agreements that Norway has entered into with other countries for 2010 and fishing under the agreements in 2008 and 2009)*

Recommendations from standing committees

- Recommendation No 161 to the Storting (1982–1983) *Innstilling fra utenriks- og konstitusjonskomitén om samtykke til å ratifisere konvensjon av 2. mars 1983 til vern av laks i det nordlige Atlanterhav (Recommendation from the Standing Committee on Foreign Affairs and Constitutional Matters regarding consent to the ratification of the Convention of 2 March 1983 for the Conservation of Salmon in the North Atlantic Ocean)*
- Recommendation No 92 to the Storting (1985–86). *Innstilling fra utenriks- og konstitusjonskomiteen om samtykke til ratifikasjon av en konvensjon av 19. september 1979 vedrørende vern av ville europeiske planter og dyr og deres naturlige leveområder (Bern-konvensjonen), med visse forbehold, og under angivelse av erklæring (Recommendation from the Standing Committee on Foreign Affairs and Constitutional Matters regarding consent to the ratification of the Convention of 19 September 1979 on the Conservation of European Wildlife and Natural Habitats (the Berne convention), under certain conditions and with the submission of a declaration)*
- Recommendation No 168 to the Storting (1992–1993) *Innstilling fra kommunal- og miljøvernkomiteen om samtykke til ratifikasjon av en konvensjon om biologisk mangfold av 22. mai 1992 (Recommendation from the Standing Committee on Local Government and the Environment regarding consent to the ratification of the Convention on Biological Diversity of 22 May 1992)*
- Recommendation No 150 to the Storting (1995–1996) *Innstilling fra næringskomiteen om havbruk – en drivkraft i norsk kystnæring (Recommendation from the Standing Committee on Business and Industry concerning aquaculture – a driving force in Norway's coastal economy)*

- Recommendation No 227 to the Storting (1995–96) *Innstilling fra utenrikskomiteen om 1) ratifikasjon av De forente nasjoners havrettskonvensjon av 10. desember 1982, med tilhørende norske erklæringer, og 2) tiltrædelse til avtale av 28. juli 1994 om gjennomføring av del XI i De forente nasjoners havrettskonvensjon av 10. desember 1982 (Recommendation from the Standing Committee on Foreign Affairs relating to 1) the ratification of the United Nations Convention on the Law of the Sea of 10 December 1982 with pertaining Norwegian declarations, and 2) accession to the agreement of 28 July 1994 relating to the implementation of part XI of the United Nations Convention on the Law of the Sea of 10 December 1982)*
- Recommendation No 168 to the Storting (1999–2000) *Innstilling fra energi- og miljøkomiteen om vern og bruk i kystsona. Tilhøvet mellom verneinteresser og fiskerinæringane (Recommendation from the Standing Committee on Energy and the Environment regarding conservation and use in the coastal zone. The relationship between conservation interests and the fisheries industries.)*
- Recommendation No 134 to the Storting (2002–2003) *Innstilling fra energi- og miljøkomiteen om opprettelse av nasjonale laksevassdrag og laksefjorder (Recommendation from the Standing Committee on Energy and the Environment on the establishment of national salmon watercourses and salmon fjords)*
- Recommendation No 161 to the Storting (2002–2003) *Innstilling fra energi- og miljøkomiteen om vasskraft og kraftbalansen (Recommendation from the Standing Committee on Energy and the Environment regarding the protection of the riches of the seas).*
- Recommendation No 210 to the Storting (2002–2003) *Innstilling fra kontroll- og konstitusjonskomiteen om rapport til Stortinget fra utvalget til å utrede Stortingets kontrollfunksjon. Stortingets kontroll med regjering og forvaltning (Recommendation from the Standing Committee on Scrutiny and Constitutional Affairs regarding the report to the Storting by the committee studying the Storting's control function. The Storting's Monitoring of the Government and Administration). Innstilling fra kontroll- og konstitusjonskomiteen om instruks om Riksrevisjonens virksomhet (Recommendation from the Standing Committee on Scrutiny and Constitutional Affairs regarding the instructions concerning the activities of the Office of the Auditor General) Recommendation No 136 to the Storting (2003–2004) *Innstilling fra kontroll- og konstitusjonskomiteen om instruks om Riksrevisjonens virksomhet (Recommendation from the Standing Committee on Scrutiny and Constitutional Affairs regarding the instructions concerning the activities of the Office of the Auditor General)**
- Recommendation No 192 to the Storting (2004–2005) *Innstilling fra næringskomiteen om marin næringsutvikling – Den blå åker. (Recommendation from the Standing Committee on Business and Industry regarding marine business development – the Blue Field).*
- Recommendation No 183 to the Storting (2006–2007) *Innstilling fra energi- og miljøkomiteen om vern av villaksen og ferdigstilling av nasjonale laksevassdrag og laksefjorder (Recommendation from the Standing Committee on Energy and the Environment on the conservation of wild salmon and the designation of salmon watercourses and salmon fjords)*
- Recommendation No 8 to the Storting (2010–2011) *Innstilling fra næringskomiteen om bevilgninger på statsbudsjettet for 2011, kapitler under Nærings- og handelsdepartementet, Fiskeri- og kystdepartementet, Landbruks- og matdepartementet og enkelte kapitler under Fornyings-, administrasjons- og kirke departementet (rammeområdene 9, 10 og 11) (Recommendation from the Standing Committee on Business and Industry regarding allocations in the national budget for 2011, chapters under the Ministry of Trade and Industry, the Ministry of Fisheries and Coastal Affairs, the Ministry of Agriculture and Food, and some chapters regarding the Ministry of Government Administration, Reform and Church Affairs (framework areas 9, 10 and 11)*

Propositions to the Storting

- Proposition No 31 to the Storting (1982–83) *Om samtykke til å ratifisere konvensjonen av 2. mars 1982 til vern av laks i det nordlige Atlanterhav (On consent to the ratification of the Convention of 2 March 1982 for the Conservation of Salmon in the North Atlantic Ocean)*
- Proposition No 12 to the Storting (1985–86) *Om samtykke til ratifikasjon av en konvensjon av 19. september 1979 vedrørende vern av ville europeiske planter og dyr og deres naturlige leveområder (Bern-konvensjonen), med visse forbehold, og under avgivelse av erklæring (On consent to the ratification of the Convention of 19 September 1979 on the Conservation of European Wildlife and Natural Habitats (the Berne convention), under certain conditions and with the submission of a declaration)*

- Proposition No 56 to the Storting (1992–93) *Om samtykke til ratifikasjon av en konvensjon om biologisk mangfold av 22. mai 1992 (On consent to the ratification of the Convention on Biological Diversity of 22 May 1992)*
- Proposition No 37 to the Storting (1995–96) *Om samtykke til ratifikasjon av FNs havrettskonvensjon av 10. desember 1982 (On consent to the ratification of the United Nations Convention on the Law of the Sea of 10 December 1982)*
- Proposition No 79 to the Storting (2001–2002) *National Salmon Rivers and Salmon Fjords*
- Proposition No 7 to the Storting (2002–2003) *Om samtykke til godkjenning av EØS-komiteens beslutning om innlemmelse i EØS-avtalen av direktiv om vurdering av miljøvirkningene av visse planer og programmer (On consent to the approval of the EEA Joint Committee's decision to incorporate into the EEA Agreement the directive on the assessment of the environmental impact of certain plans and programmes)*
- Proposition No 32 to the Storting (2006–2007) *Om vern av villaksen og ferdigstilling av nasjonale laksevassdrag og laksefjorder (On the conservation of wild salmon and the designation of salmon watercourses and salmon fjords)*
- Proposition No 1 to the Storting (2006–2007) for the Ministry of Fisheries and Coastal Affairs
- Proposition No 1 to the Storting (2007–2008) for the Ministry of Fisheries and Coastal Affairs
- Proposition No 1 to the Storting (2008–2009) for the Ministry of Fisheries and Coastal Affairs
- Proposition No 1 to the Storting (2009–2010) for the Ministry of Fisheries and Coastal Affairs
- Proposition No 1 to the Storting (2010–2011) for the Ministry of Fisheries and Coastal Affairs
- Proposition No 1 to the Storting (2006–2007) for the Ministry of Agriculture and Food
- Proposition No 1 to the Storting (2007–2008) for the Ministry of Agriculture and Food
- Proposition No 1 to the Storting (2008–2009) for the Ministry of Agriculture and Food
- Proposition No 1 to the Storting (2009–2010) for the Ministry of Agriculture and Food
- Proposition No 1 to the Storting (2006–2007) for the Ministry of the Environment
- Proposition No 1 to the Storting (2007–2008) for the Ministry of the Environment
- Proposition No 1 to the Storting (2008–2009) for the Ministry of the Environment
- Proposition No 1 to the Storting (2009–2010) for the Ministry of the Environment

Regulations

- Regulations of 6 December 1996 No 1127 relating to Systematic Health, Environment and Safety Activities in Enterprises, the Internal Control Regulations
- Regulations of 27 January 2000 No 65 Control measures for residues of specific substances in foodstuffs, production animals and fish to ensure food safety, the Residue Control Regulations.
- Regulations of 1 June 2004 No 930 relating to the Recycling of Waste, the Waste Regulations
- Regulations of 1 June 2004 No 931 relating to pollution control, the Pollution Regulations
- Regulations of 22 December 2004 No 1798 relating to authorisations for the breeding of salmon, trout and rainbow trout, the Salmon Allocation Regulations
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