

# Sustainability Report 2008



**marine harvest**  
excellence in seafood



# Welcome to Marine Harvest

Marine Harvest is the world's leading seafood company offering farmed salmon and processed seafood to customers in more than 70 markets worldwide. The company is present in all major salmon farming regions in the world and the biggest producer of farmed salmon with one fifth of the global production. In addition to fresh and frozen salmon, Marine Harvest offers a wide range of value added products such as coated seafood, ready-to-eat meals, delicious finger food and smoked seafood. Though salmon is the main farmed product, the company also farms trout and white halibut.

## KEY FACTS

- Marine Harvest Group is the result of the merger between Pan Fish ASA, Fjord Seafood ASA and Marine Harvest N.V. in 2006
- The company employs 6 600 people and has operations in 19 countries worldwide
- Marine Harvest has salmon farming and processing activities in Norway, Chile, Scotland, Canada, Ireland and the Faroes.

Value adding processing activities take place in the US, France, Belgium, the Netherlands, Poland and Chile. In addition Marine Harvest has several sales offices worldwide

- Marine Harvest is listed on the Oslo Stock Exchange (ticker: MHG)
- The company's head office is located in Oslo, Norway

## Content

Marine Harvest in brief	2
Letter from the CEO	3
Organisation and activities	4
Sustainability data for 2008	9
Food safety	10
Food quality	12
Fish welfare	14
Environmental responsibility	18
Social responsibility	33
Quality assurance	39
Contact information	40



# More transparent and accountable

---

Sustainability is commonly defined as meeting the needs of the present without compromising the ability of future generations to meet their own needs. In Marine Harvest we view our efforts to act sustainably not as a choice, but as an obligation. The economic, social and environmental aspects of sustainability are equally important to the success of our business. We depend upon the quality of the natural environment in which we produce our seafood and we must not compromise our surroundings. Our farming operations use feed that depends in part upon limited marine resources. If we do not insist that the wild fish stocks utilised for feed are also sustainably managed, we will run short of food for our salmon. We also promise our shareholders to maximise the long term value of their investments, not only optimise short term profitability.

Last year we published our first report on corporate social responsibility. The report was a good start. Despite limited statistics that report showed our commitment to corporate responsibility. Now, two years after the creation of the new Marine Harvest, we have moved forward. This year we publish a sustainability report, replacing the CSR report, with more statistics from our global operations.

Transparency and an open dialogue is a precondition for progress. Our performance needs to be discussed openly both internally and with stakeholders. In this sustainability report we have for the first time published detailed statistics on our use of antibiotics and energy. Our sustainability report is still not covering all relevant statistics. Data collected from our global operations is not always fully comparable, and we need a more detailed quality assurance of all data before we publish on a group level. Our ambition is to improve transparency further in the coming years and to publish more detailed statistics to support the continued improvements of our operations.

In several key areas we have not only improved our reporting, but can show clear operational improvements. Our use of antibiotics has reached very low levels in all farming regions except Chile. In Chile the use of antibiotics is relatively high

compared with other regions, but the reduction from 2007 shows that we are on the right track.

Also the number of escaped salmon from our farms is closing in on our target of zero escapes. We use new and unwanted incidents to learn and improve. As an example, a pen of fish escaped when the anchoring system failed at a farm in Canada. This was an entirely new experience for our Canadian operations and has been thoroughly investigated. They have mitigated against a repeat by adopting the stringent Norwegian mooring standards for anchoring all net pens. I am certain that we will experience similar setbacks in other areas as we go forward, but equally confident that also new challenges will be solved.

In this year's report we have included detailed discussions on salmon feed and sea lice, two issues where our industry still has challenges. I believe the discussion in these articles shows the complexity of these challenges, and also confirms that we are working hard to improve our operations.

Our serious challenges in Chile are commented upon both in our annual report and in a separate article in this report. The economic and social consequences of the development in Chile should serve as a lesson for all stakeholders. The

new and strict regulations enacted by Chilean politicians, and the new and fruitful cooperation between farmers in Chile should ensure that Chile will again become an important salmon farming region. I am looking forward to closing the chapter on the negative development in Chile and to starting our efforts to rebuild our farming operations.

In 2009 we have increased our focus on the health and safety of our employees. Even though our statistics show good improvement over recent years, we still have unsolved challenges. In our next sustainability report we should be able to report detailed statistics in this area, and to show additional improvement.

In 2008 we produced enough salmon for the preparation of almost 1,5 billion salmon meals, equivalent to one weekly meal for more than 25 million people. That is no small achievement in a world where the demand for food and specifically healthy seafood is growing day by day. This report shows our commitment to ensuring that this food production, wherever it is carried out, can also meet future demands for sustainable development.



Åse Aulie Michelet  
CEO  
June 2009

# Organisation and activities

The Group Management Team of Marine Harvest ASA consists of seven people. In addition to the CEO, CFO and the Director of Corporate Development, each of the Managing Directors of the four major business units are represented. The CEO has overall responsibility for the day-to-day operations in Marine Harvest and is also responsible for ensuring good corporate governance. The CEO reports to the Board of Directors.

The Board of Directors is elected by the shareholders of Marine Harvest ASA. The Board has ten members, including three employee representatives. The members as of March 2009 are as follows:

- Svein Aaser, chairman
- Leif Frode Onarheim, deputy chairman
- Kathrine Mo
- Solveig Strand
- Celina Midelfart
- Thorleif Enger
- Cecilie Fredriksen
- Turid Lande Solheim (employee representative)
- Geir-Elling Nygård (employee representative)
- Frank Øren (employee representative)

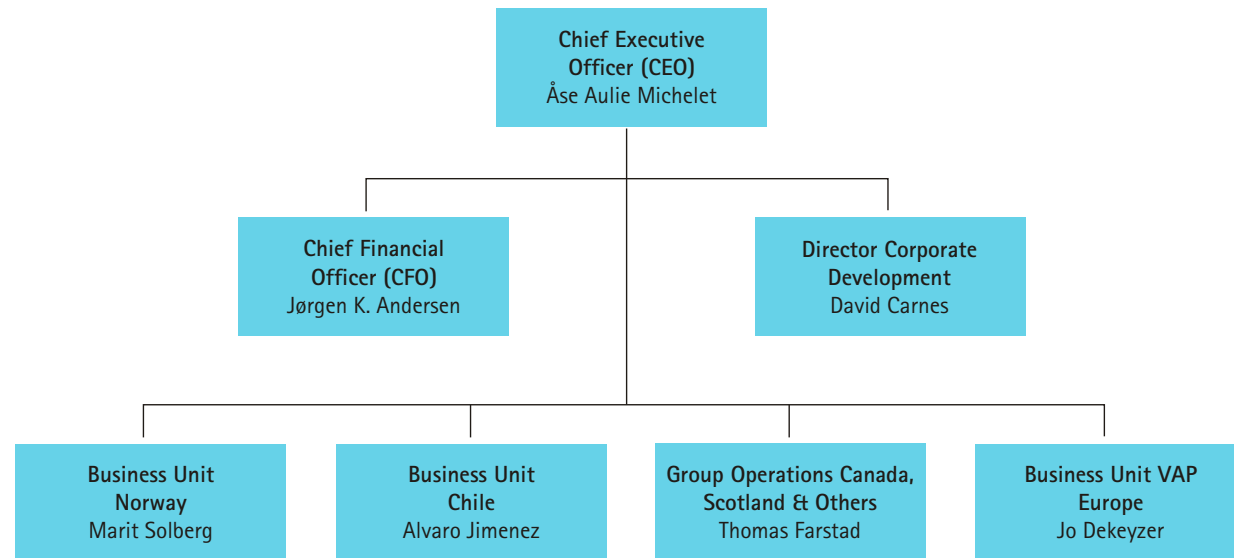


Illustration 1.1 Organogram

### KEY FIGURES 2008

Operating income (NOK million)	13 486,9
Harvesting volume of salmonids (HOG), tonnes	326 623
Operational EBITDA (NOK million)	1 298,9
Operational EBIT (NOK million)	613,6
Operational EBT (NOK million)	-1 167,9
Net Profit (NOK million)	-2 852,0
Operational EBITDA margin	9,6 %
Operational EBIT margin	4,5 %
Total assets (NOK million)	22 736,4
Net interest bearing debt (NOK million)	7 740,6
Book value of equity (NOK million)	9 624,6
Equity %	42,3 %
Cash flow from operations (NOK million)	1 498,6
Net cash flow (NOK million)	10,0
Earnings per share (NOK)	-0,82
Share price (high)	4,26
Share price (low)	0,97
Share price at year end	1,05
Number of shares at year end (million)	3 478,9
Market value (cap) at year end (NOK million)	3 652,8

### CORPORATE GOVERNANCE

Marine Harvest finds that proactive and transparent corporate governance is a prerequisite for delivering increased shareholder value, investor trust and low capital costs.

Good corporate governance builds on responsible communication between shareholders, the Board of Directors and the Group Management Team to develop the company's role as the leading industrial player in the aquaculture industry.

Marine Harvest complies with the Norwegian Code of Practice for Corporate Governance issued by the Norwegian Corporate Governance Board (NUES). Reporting of compliance and any deviations from the Code of Practice are updated and available on Marine Harvest's website.

The Board of Directors has reviewed the group's compliance with the code of practice during the year and the group's steering documents have been amended.

### MISSION AND STRATEGIC GUIDING PRINCIPLES

Marine Harvest's mission is "Seafood for a better life". As guidance, the company has identified four strategic guiding principles which form a basis for decision making and move the organisation in the right direction. See the illustration below.

### ETHICAL GUIDELINES

Marine Harvest has developed a Statement of Ethics which is designed to give structural guidance to all employees. It also shows external parties what they can expect from Marine Harvest concerning behaviour in situations that may be ambiguous, or where there are significant agency issues. A new Code of Conduct with expanded coverage is under development.

Marine Harvest's Statement of Ethics can be found on Marine Harvest's website.



Illustration 1.2

## Organisation and activities

### QMARINE – MARINE HARVEST'S GLOBAL QUALITY PROGRAMME

Marine Harvest has developed a global quality programme called Qmarine. Qmarine holds global standards which provide guidance for the company to act in a responsible way towards society, the natural world, employees and shareholders. The global quality programme is organised in six sections; food safety, food quality, fish welfare, environmental responsibility, social responsibility and quality assurance. You can find more information about Qmarine and how the company performs within these six areas on page 9 onwards.

### WORKING WITH OTHERS

Marine Harvest cooperates with selected organisations where we have common interests toward society and the natural world. At corporate level Marine Harvest ASA has entered into a historical partnership with WWF-Norway. Together Marine Harvest and WWF-Norway will work to reduce the environmental impacts and ecological footprint of aquaculture.

In addition, the company's business units worldwide cooperate with local communities and organisations and support different social and environmental projects.

In Marine Harvest Canada the engagement takes three forms:

- with First Nations Bands to support their social, health and education needs
- with community groups to build walking trail bridges and wharfs with donated Marine Harvest equipment
- with wild salmon stakeholder groups with donations of hatchery equipment

Marine Harvest Scotland works closely with local communities and organisations to develop environmental and social initiatives. Marine Harvest Scotland supports food and sports arrangements, both financially and by active involvement, and participates in projects to raise money for charity organisations. The company also cooperates closely with local wild salmon and sea trout organisations such as the Lochaber District Salmon Fishery Board and the River Lochy to protect wild fish species. In addition Marine Harvest Scotland works closely with research communities to develop new and improved techniques for fish farming.

Marine Harvest VAP Europe works closely together with local communities, scientific organisations and non-governmental organisations on social, educational and environmental needs. Marine Harvest VAP Europe supports local community charities and events, cooperates

closely with research institutes to monitor the sustainability of the unit's seafood resources and is also active in developing and supporting improved techniques for farming and fishing.

Marine Harvest Norway is involved in several local projects and has donated money for local sports clubs and sport facilities, in addition to other projects such as development of local infrastructure.

### ACTIVITIES

Marine Harvest's two main activities are fish farming and seafood processing.

### Fish farming

Fish farming involves raising fish in water in order to produce food. Marine Harvest's main product is Atlantic salmon which is farmed in fjords and along the coasts of Norway, Chile, Scotland, Ireland, the Faroes and Canada. In

addition to salmon, Marine Harvest farms trout and Atlantic halibut.

The life cycle of a farmed salmon is quite similar to the cycle of a wild salmon with reproduction, growth and maturation. The sequence begins in freshwater and moves on to seawater. The life stages are divided into broodstock, eggs, alevins, fry, parr, smolt and adult.

Throughout the farming sequence, from closed tanks on land to net pens in open water, Marine Harvest pays great attention to ensuring high standards of hygiene and fish welfare, and to the sustainability of its activities. The farming sites must meet high standards of water circulation, water quality, water temperature, depth beneath the pens and distance to other sites.

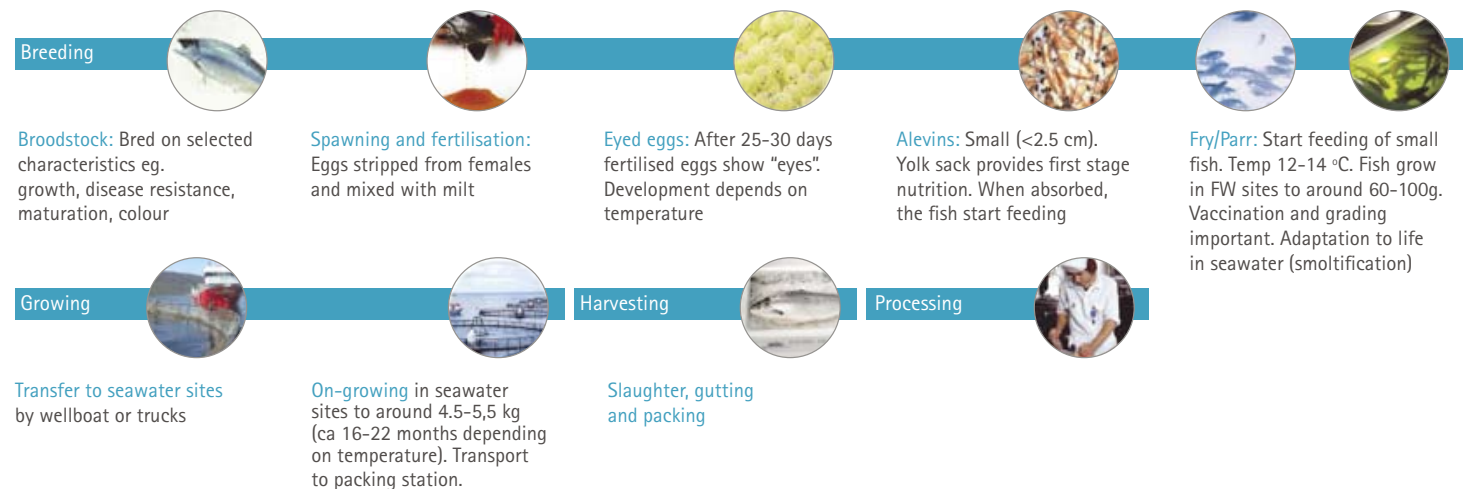


Illustration 1.3 The Atlantic salmon life cycle

The total production cycle takes approximately 10-16 months in freshwater plus 14-22 months in seawater. In sum 24-36 months.

## Organisation and activities

### Seafood processing

Marine Harvest's seafood processing activities can be divided into primary processing, secondary processing and value added processing.

Primary processing involves gutting before the fish is sold as whole fish, fresh or frozen, with or without head. Secondary processing describes the process where the fish is further processed into fillets, steaks or portions. A fillet can be trimmed on a scale from A-F, where the F-fillet is a fully trimmed fillet with skin off. Value added processing means transforming ordinary fish or seafood into a variety of seafood products such as coated seafood, ready-to-eat meals, finger food and smoked seafood.

All Marine Harvest processing plants operate to high levels of quality and hygiene, meeting strict specifications from regulators and from leading customers around the world.

### Sourcing, packaging and distribution

Approximately half of the fish which is processed at the value adding facilities in Europe and the US come from Marine Harvest's own aquaculture activities. The other half is sourced from wild catch and includes species like cod and other whitefish and flatfish. In addition aquaculture species like pangasius, shrimps and mussels are purchased from third parties.

Marine Harvest's main concern when distributing products is to maintain the freshness and quality of the products by ensuring efficient packaging and an unbroken cool-chain. In order to keep the processed products fresh as long as possible, different packaging techniques are used like Modified Atmosphere Packaging (MAP) and vacuum packaging. Fresh fish are packed in ice in insulated boxes which keep them in good

condition for several days.

The products are distributed by a combination of road, rail, ship and air freight. In Belgium Marine Harvest has a specialist distribution activity which delivers fresh fish as well as frozen seafood from different value added processing plants. The customers are food service businesses such as restaurants and catering companies throughout Belgium.

### EXTERNAL EFFECTS OF MARINE HARVEST ACTIVITIES

Fish farming is cultivating the blue pasture. Similar to the development of historic bio-cultures like agriculture, horticulture and forestry, Marine Harvest's activities may leave ecological foot-prints on the environment and communities in which they take place. Being aware of the negative and positive effects that Marine Harvest's activities have on the environment and communities, the company has incorporated measures to monitor and manage these in its global quality programme.



## Organisation and activities

### ECONOMIC IMPACT AND COMMUNITY ACTIONS

In addition to the topics identified in the table, Marine Harvest recognises that its presence in some countries or regions is sufficient in scale to have a measurable effect on the economy of that country or region.

The activities of Marine Harvest have significant economic impacts in Norway, Chile and Scotland. Additionally, Marine Harvest enterprises bring benefits to communities through:

- the provision of employment
- increasing the skill and education levels of employees
- contribution to local charitable, sports and cultural activities
- contribution to charities and foundations in other regions or countries



Activity	Potential environmental impact	Potential community impact
Fish processing	<ul style="list-style-type: none"> <li>- Pollution by water discharged to sea, municipal sewerage system or to land drainage</li> <li>- Consumption of energy derived from fossil fuels, with associated generation of greenhouse gases</li> </ul>	<ul style="list-style-type: none"> <li>- Odour and noise</li> <li>- Damage to health of employees resulting from inadequate health and safety precautions</li> <li>- Damage to health of consumers by contaminant microorganisms or undesirable substances in food products</li> </ul>
Distribution	<ul style="list-style-type: none"> <li>- Consumption of fossil fuels and generation of greenhouse gases by transport and in production of packaging</li> <li>- Pollution of the environment by waste packaging</li> </ul>	<ul style="list-style-type: none"> <li>- Noise and traffic congestion</li> </ul>
Fish farming	<ul style="list-style-type: none"> <li>- Sustainability of raw materials for feed</li> <li>- Pollution of aquatic environment from waste feed, faeces, medicine use and antifoulant treatment of nets</li> <li>- Visual intrusion of fish farms on lakes and in coastal regions</li> <li>- Reduction in biodiversity around fish farms</li> <li>- Genetic impact on wild fish by escaped farm fish</li> <li>- Spread of diseases and parasites from farmed to wild fish</li> </ul>	<ul style="list-style-type: none"> <li>- Disruption of coastal economies based on fishing and tourism</li> <li>- Damage to health of employees resulting from inadequate health and safety precautions</li> </ul>

Qmarine:

# Marine Harvest's global quality programme

Marine Harvest has developed and is implementing a global quality programme called Qmarine. Qmarine holds information, guidance and standard operating procedures which helps Marine Harvest act responsibly towards society, the natural world, our employees and shareholders.

Qmarine is organised in six strategic sections. Each is continuously developed through experience and by introducing new and improved practices. These sections are discussed in more detail in the following chapters.

## PROGRESS IN 2008

The content and details of Qmarine were in development at the beginning of 2008. This initial development process which involved wide consultation, was completed in May.

The next step was to introduce Qmarine to all Marine Harvest businesses and to raise awareness among employees. This involved visits and presentations to business management teams, newsletters, articles on the Marine Harvest intranet. Posters were distributed to all sites together with Qmarine identity items.

A global quality management database, MQM, now holds standard operating procedures

relating to all six strategic sections of Qmarine. Qmarine is increasingly integrated into the daily activities of Marine Harvest businesses.

## AMBITIONS FOR 2009

In 2009 Marine Harvest corporate management will give clear leadership in the integration of Qmarine as the Marine Harvest global quality programme.

## ABOUT THIS REPORT

This report describes those parts of the fish farming to food product value chains where Marine Harvest companies are active. These include breeding, hatcheries, farming of juveniles and adult fish, harvesting and processing of fish, sales and distribution of fish and value added processing of seafood products with associated sales and distribution.

The report identifies the main topics of sustainable development relevant to those activities. It describes the Qmarine global quality programme, which includes measures to steer and monitor sustainable performance in the identified topics. The report incorporates a selection of 2008 data relevant to sustainable development.

### Berenberg Sustainability Rating

In 2008, Centre Info, an independent Swiss Consultant, awarded Marine Harvest an A rating by using a rating system developed for the Berenberg Funds' 'Sustainable European Small and Mid Cap Fund.' For more information, see [www.berenberg.de](http://www.berenberg.de)



Qmarine:

# Food safety

Marine Harvest is committed to providing customers with documented safe food. Food safety issues and the development of food safety legislation are monitored continuously to ensure that Marine Harvest is aware of all known potential hazards and that its products are in compliance with food safety requirements.

The assurance of food safety is based on three main programmes:

- Control of undesirable substances
- Control of food-borne pathogens
- Tracking and tracing

Procedures for handling non-conformities, including corrective actions, rapid alerts and product recalls are in place.

## Undesirable substances

Undesirable substances include substances present at trace levels in the environment or in raw materials used in fish feed, e.g. dioxins, PCBs and heavy metals, and residues of medicines used to treat disease.

Marine Harvest has a global monitoring and

control programme for undesirable substances using laboratories approved by Marine Harvest and applying accredited methods. Examples of results from monitoring in recent years are shown on the next page.

Medicines are applied only under veterinary supervision by trained operators and in accordance with legal requirements. Specified withdrawal periods are strictly observed and fish are checked for any residues before harvest.

## Food borne pathogens

Food-borne pathogens include microorganisms (bacteria and viruses) and parasites.

Marine Harvest has detailed systems for monitoring and control of pathogens. The sampling procedures, the methods of analysis and the notification and handling of non-conformities are all specified for the operations.

## Tracking and tracing

Tracking and tracing is an important tool in the event of an adverse incident. All Marine

Harvest production and processing facilities keep records of all deliveries, from fish eggs and feed to ingredients for value added processing and packaging materials. Every production step is recorded. The records make it possible to trace back any product to its origins.

Every box or package of fish delivered from a Marine Harvest processing plant has a batch number on the label. This is the key for tracing purposes.

### PROGRESS IN 2008

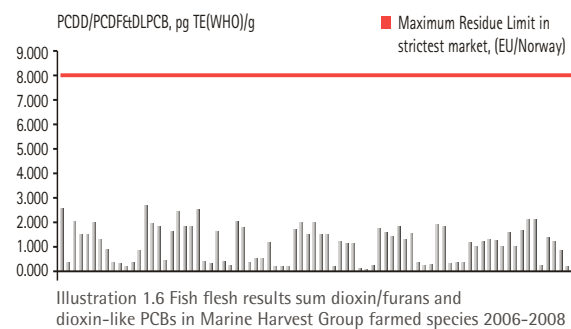
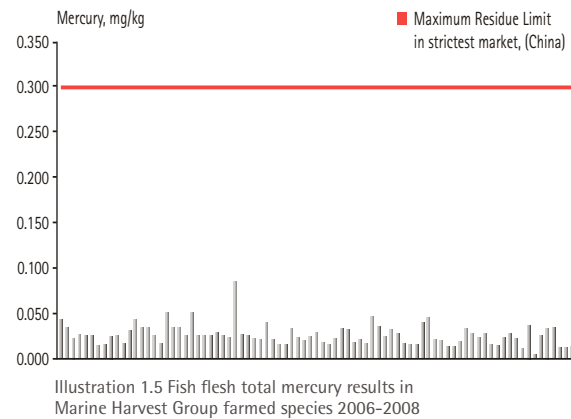
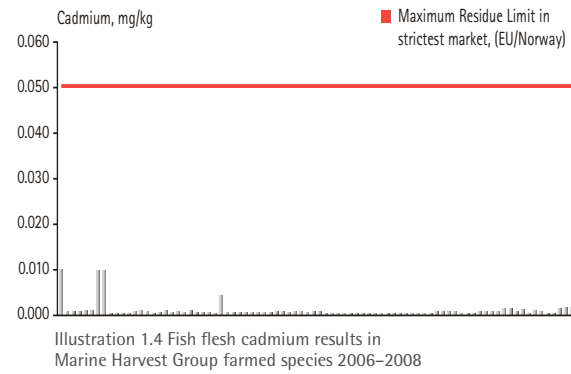
Food safety always has a top priority position in all relevant activities of Marine Harvest and in 2008 there were no significant food safety incidents to report.

In the interests of continuous improvement, the group food safety team in Marine Harvest took steps to raise levels of hygiene at all processing plants. This was achieved by increasing the awareness of operatives and supervisors to the food safety procedures specified in the MQM database of Qmarine. Particular attention was given to minimising the risk for possible contamination by the bacterial contaminant

listeria (*Listeria monocytogenes*). Many Marine Harvest customers in Europe and the US have a zero tolerance for the presence of listeria. These bacteria can cause illness if present on ready-to-eat dishes and smoked fish. Contamination can be avoided through strict hygiene in line with current good manufacturing practices. The Marine Harvest food safety team prepared a 'best practice manual' for listeria management.

### AMBITIONS FOR 2009

The intention for 2009 is to maintain the high level of food safety achieved in 2008 and improve where possible.



### Complex and precautionary

The complexity of meeting the differing legal requirements of different regulatory authorities was demonstrated in 2008 when salmon from Marine Harvest Chile were rejected by the FDA (Food and Drug Administration) of the US. Detention was based on FDA not approving the use of specific veterinary drugs registered for use in all other salmon farming regions, and some also approved for use with salmon produced within the US. As a consequence Marine Harvest has changed its use of the medication to abide by FDA regulations.

Our commitment to precautionary action with respect to food safety was also demonstrated in 2008. In December 2007, salmon from Marine Harvest Canada were reported by the FDA to have tested positive to the possible presence of malachite green. Marine Harvest does not use malachite green in any of its activities.

Malachite green is a dye that also is an effective disinfectant and fungicide and was used in aquaculture hatcheries. It was banned from use in all food-producing

animals, including fish, since 2002, mainly as a precaution because of the lack of toxicological data.

Tests by an independent laboratory in January 2008 on fish from the same site were negative. In February the FDA reversed the detention order that had been placed on the shipment. Even though the January result proved negative, Marine Harvest Canada had contacted all customers that had received fish from that site and asked them to return any remaining stock.



Qmarine:

# Food quality

---

Marine Harvest's objective is to deliver food with high technical and nutritional quality to meet customer requirements and consumer expectations.

Technical quality means the products will conform to the specifications agreed with customers. These specifications cover parameters such as quality grade, trim, the content of fat and pigment and packaging. They also cover microbiological quality, which determines the shelf life of fresh products.

Nutritional quality relates to the role of fish and fish products as natural healthy food. Fish, and specifically fatty fish, contain nutritious proteins and are rich in important minerals, vitamins and long chain omega-3 fatty acids. Important minerals found in fish include iodine and selenium. Key vitamins in fish are vitamins A, D, B1, B2, B3 and B12.

Marine Harvest farmed fish derive the minerals, vitamins and fatty acids from their diet. For that reason, Marine Harvest holds detailed discussions on feed specifications with feed suppliers to ensure that all these valuable nutrients are present in its farmed fish.

## PROGRESS IN 2008

Food quality continued to be a high priority for Marine Harvest in 2008 and there was only one important food quality incident, at the beginning of the year, which is described on page 13. Among the ways in which a company can create a quality culture in its operations is through implementing the requirements for and obtaining relevant quality certifications. In some instances these are required by customers and in all cases they are appreciated by customers.

The certification status at the end of 2008 is shown in the table on the next page.

Certification is gained following audits conducted by third party organisations that assess whether the business has measures and procedures in place that are in line with the specifications laid down by the standards organisation concerned. These audits are repeated regularly to ensure that the business maintains these measures and procedures. Together with audits often conducted by major customers, such as international retailers, this means for many Marine Harvest operations audit visits are frequent events.

## AMBITIONS FOR 2009

Through the continuing development and implementation of Qmarine, standards and reliability will be maintained at present high levels or raised further.



## Qmarine: Food quality

### Quality and related certificates held by Marine Harvest operations in 2008

Business	Activity	Certification
Canada	Farming	ISO 14001 in freshwater and seawater operations.
Chile	Farming	SIGES in freshwater and seawater operations.
	Primary processing	The current SIGES does not cover primary processing.
Chile/Americas	Value adding	IFS at 3 of 4 plants in Chile SIGES at 2 of 4 plants in Chile Cook & Thurber quality audit at Ducktrap plant in US and plants in Chile
European Value Added Processing	Processing plants in Belgium, France, the Netherlands and Poland	BRC, IFS, ISO 9001, MSC
Faroes	Farming	GlobalGAP certification is planned
Ireland	Farming (all)	ISO 19001 & ISO 14001 (100% of sites), EcoLabel (83% of sites), OHSAS 18001 (83% of sites).
	Farming organic	Naturland, Biosuisse, AB France, IOFGA, PGI
	Processing	ISO 9001, ISO 14001, EcoLabel, OHSAS 18001, BRC, plus Naturland, Biosuisse, AB France, IOFGA
Norway	Farming	GlobalGAP (100% of sites), ISO 9001 (50% of sites), ISO 14001 (70% of sites) in freshwater and seawater operations Label Rouge on selected sites
	Primary processing	GlobalGAP, ISO 9001, ISO 14001, BRC
	Cod juveniles	ISO 9001, ISO 14001
	Sterling halibut	ISO 9001, ISO 14001
Scotland	Farming	GlobalGAP, Label Rouge, Freedom Food, ISO 9001, ISO 14001, PGI, CoGP
	Processing	BRC, Label Rouge, ISO 9001, ISO 14001, Freedom Food

In 2007, Marine Harvest reported six out of eight freshwater operations to have ISO 9001 and six out of seven seawater operations to have between them the following certifications: ISO 9001, ISO 14001, EurepGAP (now GlobalGAP), SIGES, OHSAS 18001 and the organic standards Naturland, Biosuisse, AB France, IOFGA.

### Food quality incident in Scotland

On 11 February 2008 Marine Harvest Scotland became aware of a food quality problem in the form of an apparent taint of diesel initially associated with Atlantic salmon harvested on 5 February. The taint, in the form of an unpleasant odour and taste, was most apparent when the fish were prepared for eating.

A crisis team was immediately formed and the supply chain from fish farm to boxes for dispatch was investigated. The well boat that brought the fish from the farm to the harvesting station was inspected on 11 February and suspended from duties. Steps were put in place to notify customers who had received fish which had been harvested on 5 February. The local Environmental Health Officer was notified and the information passed on to the Food

Standards Agency (FSA). The FSA indicated that the taint was a food quality matter and did not represent a safety risk.

Further investigations indicated fish from subsequent harvests on 6, 7 and 8 February could have been affected. As a precaution, Marine Harvest implemented a product recall for all fish harvested from 3 to 12 February, in line with guidance from the FSA.

Subsequent investigations indicated the problem arose from an unusual combination of circumstances and the central factor was a change in the source of pump cooling water used in the well boat. The pumping system has been returned to its original form. No further incidents have been reported.

- BRC is the British Retail Consortium, which specifies food safety standards that are internationally recognised.
- EcoLabel is a European Union labelling scheme indicating food products have been produced with attention to minimising environmental impacts.
- Freedom Food is an animal welfare standard established in the United Kingdom by the Royal Society for the Prevention of Cruelty to animals (RSPCA).
- GlobalGAP sets standards for good agriculture and aquaculture practices and has established a standard for salmon farming. It was initiated in 1997 by European retailers to set standards for sustainable and safe food.
- IFS is the International Food Standard, which is part of an international food safety initiative endorsed by many international and national retailers and certification bodies; see [www.ifs-online.eu](http://www.ifs-online.eu).
- ISO 9000 is an international standard for a quality management system and ISO 14000 is an international standard for an environmental management system.
- Label Rouge is a French national standard for high quality food.
- Naturland, Biosuisse, AB France and IOFGA are organic certification bodies.
- OHSAS 18001 is an occupational health and safety standard.
- SIGES is a comprehensive quality certification developed by the Chilean aquaculture industry to meet national and international regulations for good practices for quality, environmental management and employee health and safety.
- MSC is the Marine Stewardship Council, which is an independent, non-profit organisation that inspects and issues certificate to those fisheries it finds to be sustainably managed.
- PGI is Protected Geographical Indication, an EU quality indication.

Qmarine:

# Fish welfare

In Qmarine, fish welfare is addressed under two headings, Farming practices and Health management.

Good farming practices aim at rearing fish under conditions that suit their biological needs and use husbandry techniques that minimise stress, aggression and injury.

Health management is based on frequent monitoring of the health status of the fish, with rapid response when this status is compromised. When responding Marine Harvest will use only permitted medicines as prescribed by specialist veterinarians. In the interests of continuous health improvement across the aquaculture industry, Marine Harvest cooperates with vaccine manufacturers in the development of new vaccines.

## Farming practices

Good farming practices include aspects such as feed formulation, feed management and stocking density. Correct feed formulation ensures that the fish obtain the nutrition they require for a healthy existence. Efficient feed manage-

ment ensures that they have access to the feed they need, without over-feeding. Stocking density (the number of fish per cubic metre in the pens) should be kept at levels that ensure the well being of the fish.

Further aspects of fish welfare in farming practices relate to minimising stress at times of handling the fish for processes such as grading and vaccination. The last stage in which a responsible aquaculture company such as Marine Harvest aims to minimise stress is in the lead up to slaughter. Marine Harvest has made significant advances in this stage and these are described later.

### Stocking density

Holding too many fish in a net pen would not be a sound farming practice as overcrowding would lead to poor animal welfare standards, subsequent poor stock performance, and increase the risk of spreading disease.

Stocking density in a net pen will start low as the fish are first introduced and increase as they grow. In Marine Harvest, the specified stocking densities at harvest are around 15–25 kg per

cubic metre (1,000 litres of water), depending on the location. This means that even at maximum stocking rates the fish occupy less than 3% of the cage volume and have more than 97% of the space for free movement. Although they have this space available, the fish often congregate and swim together as a school.

Factors such as temperature can affect the rate of growth of the fish. At the same time, poor weather conditions may delay harvests in the interests of fish welfare and the health and safety of employees. In combination these factors may lead to the stocking density exceeding the target maximum for a short period.



Stocking density reported in 2008 in kg/m<sup>3</sup>

Country	Target maximum	Actual maximum	% of pens exceeding maximum
Canada	24	29.4	7.5*
Chile	17	14	0
Faroes	20	>20	5**
Ireland	20***	15	0
Norway North	25	24	0
Norway Mid	25	25	0
Norway West	20	20	0
Norway South	20	23	2
Scotland	17	19	4

\*A reduced target of 24 kg/m<sup>3</sup> was set during 2008 and the actual maximum relates to the previously stocked fish representing 50% of the operating pens in 2008

\*\*No pens exceeded the legal limit of 25 kg/m<sup>3</sup>  
 \*\*\*For the production the production of Clare Island Organic Salmon in Ireland, the maximum stocking density is 10 kg per cubic metre.

## PROGRESS IN 2008

### Welfare parameters around stunning

Marine Harvest Norway is co-funding a research project with the University of Bergen and a research institute in Belgium to identify the parameters by which to assess the welfare of the fish in the approach to slaughter. The ultimate objective is to find the most humane method of slaughter. The use of carbon dioxide is currently the most widespread stunning method applied in the Norwegian industry. This method will be phased out as the sole stunning method in the future. However, satisfactory

alternatives are not yet available. Application of the well-functioning automated percussion stunning system pioneered in Marine Harvest Scotland is difficult for several reasons. Most of the fish in Norway are transported to processing in flow-through wellboats, a transportation system which makes the fish more active at point of arrival than if done in contained systems. Also, there is not capacity available to transport the Norwegian harvest volume in contained well boats as applied in Scottish standards. Furthermore, fish harvest size in Norway is generally bigger than in Scotland which means fish would be more prone to

self-inflicted damage during handling in the system applied in Scotland. Alternative methods like electro-stunning have been trialed, but this method provides even less accuracy and predictability.

### Innovation in Canada and Norway

An innovative harvesting method was introduced by Marine Harvest Canada which improves fish welfare during harvesting. At the same time it has reduced costs and improved product quality. The technology is being transferred to Marine Harvest Norway. A specially constructed boat travels to the production site and the fish are channelled so that they swim to the point of stunning and are only out of water for less than one second before being stunned, thereby minimising stress from lack of oxygen. Immediately after stunning the fish are bled and chilled to 1°C.

Additionally, the system dispenses with the need to move live fish to slaughter in an open well boat. Instead, they are moved after slaughter and in a closed vessel. That brings two further benefits. The boat can carry several times as many fish, thereby reducing fuel consumption and the production of greenhouse gases. As the vessel is closed, it brings a higher level of biosecurity to the transporting of the fish.

In a tri-lateral funded project Marine Harvest Norway, the boat owner Napier and Innovation Norway have invested NOK 50 million in a larger version of the Canadian boat in 2008. This came into service in Norway, region South, in January 2009.

### AMBITIONS FOR 2009

The primary intentions for 2009 are to maintain the current attention to the welfare of farmed fish in Marine Harvest. Additionally, Marine Harvest will continue progress in the research and development of improved practices in the period leading up to and including stunning.

An investigation into stronger materials for the nets used in pens which would protect the fish from the stress of predator attack is described in the next chapter.

## Health management

### ISA in Chile

The major disease topic of 2008 was the continuing outbreak of Infectious Salmon Anaemia (ISA) throughout the industry in Chile. This is described in more detail in the section on Chile, page 35.

### PD in Norway

The other significant disease affecting Marine Harvest in 2008 was Pancreas Disease (PD), mainly affecting Marine Harvest Norway. By mid year – summer is the peak season for PD – the industry in Norway had 42 confirmed sites, with 11 belonging to Marine Harvest.

The PD Steering Group, headed by Marine Harvest Norway, has developed a joint industry master plan against PD, counting multiple operational and structural measures including vaccination against the disease. In combination with precautionary measures relating to the use of equipment and well boats, the PD

## Qmarine: Fish welfare

master plan is believed to have helped to hold the disease in check.

There were no outbreaks at Marine Harvest's Norwegian sites in the final four months of the year, compared with five in the same period of 2007.

### Medicines

#### Vaccination

In 2008 100% of Marine Harvest salmonids were vaccinated against diseases relevant to their location and where registered vaccines were available. In 2008, Marine Harvest Chile vaccinated 100% of its fish in Chile against SRS (Salmonid Rickettsial Septicaemia, *Piscirickettsia salmonis*) using newly available vaccines. This followed numerous laboratory tests and field trials by Marine Harvest with candidate SRS vaccines since 2006 to determine both effectiveness and safety. This vaccination programme contributed to a reduction in antibiotic use, see below. There was no approved, effective vaccine to combat the ISA virus.

#### Antibiotics

As with other animals and humans, both wild and farmed fish are susceptible to attack from infectious pathogens. If left untreated, infectious diseases can compromise welfare and cause mortalities. Any drug used by Marine Harvest is approved by the competent authorities in the production country. No drugs are used prophylactically or to promote growth.

Drugs are prescribed by certified veterinarians only and strict withdrawal periods are held to assure residue levels are within legal limits of the destined market.

38,492 kg of antibiotics were used by Marine Harvest Group in 2008 for disease control, a reduction from 74,057 kg in 2007. For salmonid production, total liveweight produced in 2008 was 373,874 tonnes resulting in an average of 103g antibiotic per tonne produced, a reduction from 188.6g per tonne in 2007. This development accounted for an overall decrease in antibiotic use of 45.2% from 2007- 2008 in Marine Harvest Group salmonid farming.

The difference from 2007 was mainly due to a substantial reduction in Chile where Marine Harvest undertook an active campaign to decrease the volume of antibiotics used. In addition, early in 2008, Marine Harvest Chile implemented a strategy to vaccinate 100% of smolts against SRS (Salmonid Rickettsial Septicaemia). The effect of this strategy was a reduction in antibiotic use of 23.5% from 2007- 2008. Despite this, and due to existing unvaccinated standing stock, Chile continued to be the main user of antibiotics in Marine Harvest Group as there were fewer effective vaccines available to combat the main bacterial disease problems.

Norway, the country with the most mature salmon farming industry, demonstrates how the need for antibiotics is reduced as the

industry develops. Marine Harvest Norway used only 15 kg of antibiotics in 2008. Peak consumption of antibiotics in Norwegian aquaculture occurred in the late 1980s and early 1990s when approximately 49 tonnes of antibiotic were used in the production of around 56,000 tonnes of salmonids.

#### Antifungals

Products are used in hatcheries and freshwater production to protect eggs and fry from fungal

attack. In 2008 a total of 72,866 litres were used in Marine Harvest operations (158,835 litres in 2007).

#### Sea lice treatments

As part of the control programmes for sea lice, in 2008 Marine Harvest used a total of 311 kg active ingredients in oral treatments (1,075 kg in 2007) and 96.5 kg bath treatments (41.5 kg in 2007), not including hydrogen peroxide.

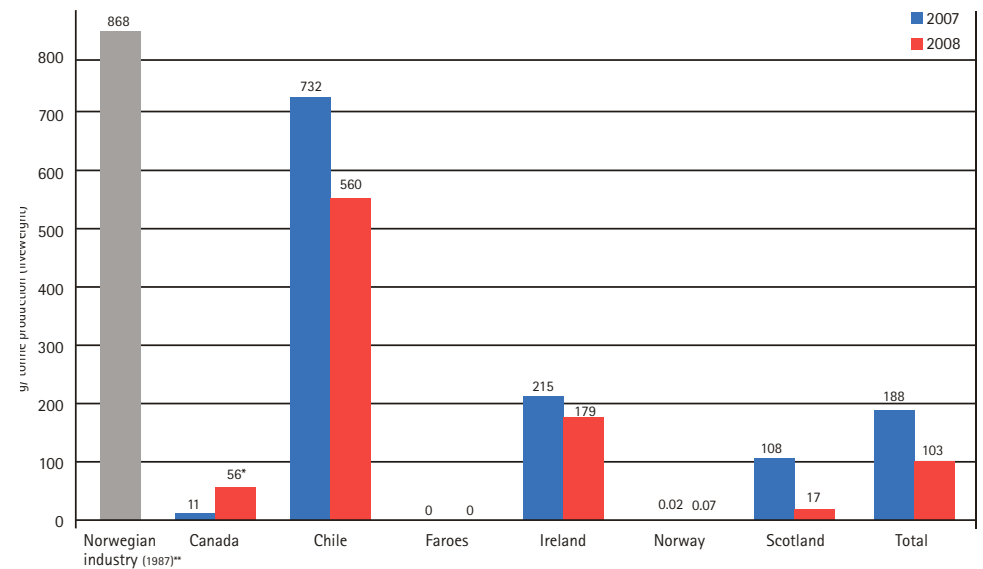


Illustration 1.7 Antibiotics 2007-2008 Marine Harvest Group

\*The rise in Canada in 2008 was due to two treatments for a common bacterium at a single farm and does not represent a general upward trend in the use of antibiotics. The five year trend for antibiotic use for MH Canada is about 11g/tonne.

\*\*Norwegian Seafood Federation (FHL)<http://www.fhl.no/statistikk/antibiotikabruk-article410-10.html>

#### Marine Harvest Scotland gains Freedom Food certification

In June 2008, the UK's second largest retailer Sainsbury's launched its new range of sustainably sourced salmon products with Responsibly Sourced Salmon supplied exclusively by Marine Harvest Scotland via The Seafood Company, Foodvest. Sainsbury's is the second largest UK retailer of both fresh and smoked salmon, representing approximately 23 per cent of the UK market.

One of the requirements met by Marine Harvest Scotland was certification under the Freedom Food animal welfare scheme. Selected freshwater and seawater sites achieved the Freedom Food certification. In addition, the sites met further requirements of Sainsbury's and The Seafood Company. Freedom Food is the farm assurance and food labelling scheme of the RSPCA (Royal Society for the Prevention of Cruelty to Animals).

Set up in 1994 to improve welfare standards for animals reared for food, it recently added

a protocol specifically for farmed salmon in 2002. The Marine Stewardship Council lists Freedom Food salmon as one of its "fish to eat" and "one of the best choices". Freedom Food auditors followed the entire Marine Harvest Scotland production sequence, from the hatcheries in Norway that supply the eggs, the hatchery in Scotland, the freshwater and seawater sites, the well boats and percussive stunning.

Sainsbury's Responsibly Sourced salmon has been built around five measurable qualities: healthy, safe, tasty, fresh and sustainable – stemming from Sainsbury's five corporate and social responsibility principles. These qualities have a particular focus on the environment, sustainability, nutritional benefits and animal welfare. The salmon for Sainsbury's must set a high standard in all qualities.



Qmarine:

# Environmental responsibility

Marine Harvest's quality policy states that the company will minimise the environmental impact of its activities and operate in harmony with the environment, neither depleting resources beyond their capacity, nor introducing materials or substances that cause lasting harm.

Environmental impact is a key concern for Marine Harvest and subject to continual attention to improve the sustainability of supplying excellent seafood derived from farmed fish and the wild catch.

In Qmarine, environmental responsibility is divided into four sections: Sustainability, Biodiversity, Chemical input and Energy and waste.

## Sustainability

Sourcing of fish from wild catch is a central sustainability concern. This is important to Marine Harvest in two ways. The value added processing (VAP) activities obtain a portion of their raw material fish directly from the commercial fisheries. The fish farming activities of Marine Harvest indirectly consume fish from the commercial reduction fisheries as the

fishmeal and fish oil in fish feed are made from wild caught fish.

### PROGRESS IN 2008

#### Value added products

In cooperation with the Belgian fisheries institute Marine Harvest VAP Europe monitors its seafood range on sustainability criteria such as fish stock situation, management of fish stock and fishery methods. This auditing method is based on the methodology of the WWF and also validated by the WWF.

At the outset of 2008, Marine Harvest VAP Europe, specifically Marine Harvest Pieters NV (Bruges) was already operating with Marine Stewardship Council (MSC) chain of custody certification for its purchasing, processing and sales of Alaska pollock (origin USA), Hoki (origin New Zealand) and Hastings Dover sole (origin UK). Other VAP activities, Marine Harvest Sterk in the Netherlands and Marine Harvest Belgium (the fish smoking activity in Ostend), respectively hold certification for Alaska pollock (origin USA) and wild Coho salmon (origin Alaska). The MSC is an independent, non-profit organi-



## Qmarine: Environmental responsibility

sation that inspects and issues certificates to those fisheries it finds to be sustainably managed.

Holding certification means the relevant further processed products of Marine Harvest can carry the MSC white/blue tick logo on the packaging.

Marine Harvest VAP Europe has a suppliers' manual that includes its commitments toward sustainability. The opening paragraph contains the following statement: "Procurement of

aquaculture and wild caught fish and seafood compliant with the FAO Code of Conduct for Responsible Fisheries will be a priority for Marine Harvest."

Underlining this commitment, Marine Harvest VAP Europe is fully financing the PangaProgress®Program, which is developing sustainable farming of pangasius. Pangasius is a freshwater fish mainly farmed in Vietnam and increasingly popular in Europe and the US.

The young aquaculture business in Vietnam is growing rapidly. The PangaProgress®Program is an initiative of Marine Harvest VAP Europe, the University of Ghent (Belgium), the Research Institute for Aquaculture No2 of Vietnam and pangasius producer Vihn Hoan in Vietnam. The key areas of attention are natural selection of broodstock, a rich and healthy diet, and clear water farming ponds. In parallel with this project, Vihn Hoan is investing in AquaGAP certification of its farming activities. The AquaGAP standard focuses on sustainable farming practices.

Marine Harvest VAP Europe sources its fresh yellow fin tuna from specific suppliers in Sri Lanka. This decision is based on the long line fishing methods used and the initiation of sustainable fishing management by the government of Sri Lanka. Sri Lanka has incorporated the sustainability practices of the Indian Ocean Tuna Commission (IOTC), an intergovernmental organisation mandated to manage tuna and tuna-like species in the Indian Ocean and adjacent seas. All landed fish are registered to allow for monitoring of the biomass of yellow fin tuna by IOTC and National Aquatic Resources Agency of Sri Lanka. Marine Harvest VAP Europe has selected two suppliers that meet the above requirements and have EcoLabel or Friends of the Sea certification. Additional purchasing practices to support sustainability include the requirement for farmed salmon to be GlobalGAP certified and fish sourced from Iceland, a major source of supply of wild caught fish, to conform to the Iceland Concept of sustainably caught top quality fish.

### Aquaculture

The sustainability of fish feed used in Marine Harvest aquaculture is discussed in the article "Efficient utilisation of scarce resources" on page 26, which also includes a description of Marine Harvest's participation in the WWF Salmon Aquaculture Dialogue.

In addition to these activities, in 2008 Marine Harvest provided salmon farming data to an international study to prepare a full life cycle assessment (LCA) of salmon farming in Canada, Chile, Scotland and Norway. The project was organised by and will be reported by SIK (Swedish Institute for Food and Biotechnologies), Dalhousie University in Canada and Ecotrust from Portland, Oregon. The results of the study will be submitted for publication in a scientific journal during 2009. It is the first worldwide LCA of a single food product and will expand on conventional environmental impact assessment to include impacts on nearby ecosystems and will bring in social welfare aspects such as fair wages and worker safety.

While feed is an important aspect in the above mentioned LCA study and the Salmon Aquaculture Dialogue, both of these initiatives are examining the full spectrum of sustainability factors in salmon farming and Marine Harvest is pleased to be part of them.

In April 2008 Marine Harvest entered into a historical partnership with WWF-Norway in which the two organisations are working together to reduce the environmental impacts and ecological footprint of aquaculture.



## Qmarine: Environmental responsibility

In October 2008, Marine Harvest was able to report an important advance in feed sustainability coming from results of a farm-scale trial conducted at the Centre for Aquaculture Competence (CAC) in Norway. CAC is a large-scale research station jointly owned by Marine Harvest with the AKVA Group and Skretting, one of Marine Harvest's main feed suppliers. The trial used experimental feed with low fishmeal content and produced farmed salmon that yielded more fish protein than was present in the marine raw materials they consumed in their feed. This is a significant step toward making salmon aquaculture a net positive fish protein producer.

## Biodiversity

The negative biodiversity impact of salmon aquaculture comes mainly from the presence of faeces and uneaten feed in the aquatic environment, the interchange of parasites with wild species and the impact of escaped fish on the wild fish.

The efforts of Marine Harvest to control the main parasite, sea lice, are discussed in other sections of this report.

### Feed and faeces

Marine Harvest is aware that, because of the scale of fish farming activities in some regions, aquaculture is a contributor to marine organic discharge.

Marine Harvest continuously works with feed

suppliers and the suppliers of feeding equipment to increase further the efficiency of feeds and feeding. Each improvement reduces the discharges relating to net pen salmon aquaculture.

The number and location of fish farms are closely controlled by national or local authorities in all the countries in which Marine Harvest has aquaculture activities. One of the reasons is to ensure that the farms are adequately spaced, are sited in places where there is a good flow of water to carry away the

waste feed and faeces, dispersing it for natural biodegradation.

The size of a permitted farm is dictated by the carrying capacity of the site. Elaborate mathematical models are developed to calculate the carrying capacity of sites before licences are granted and Marine Harvest actively participates in gathering the required data, and in monitoring the state of the environment around its farms while they are active.

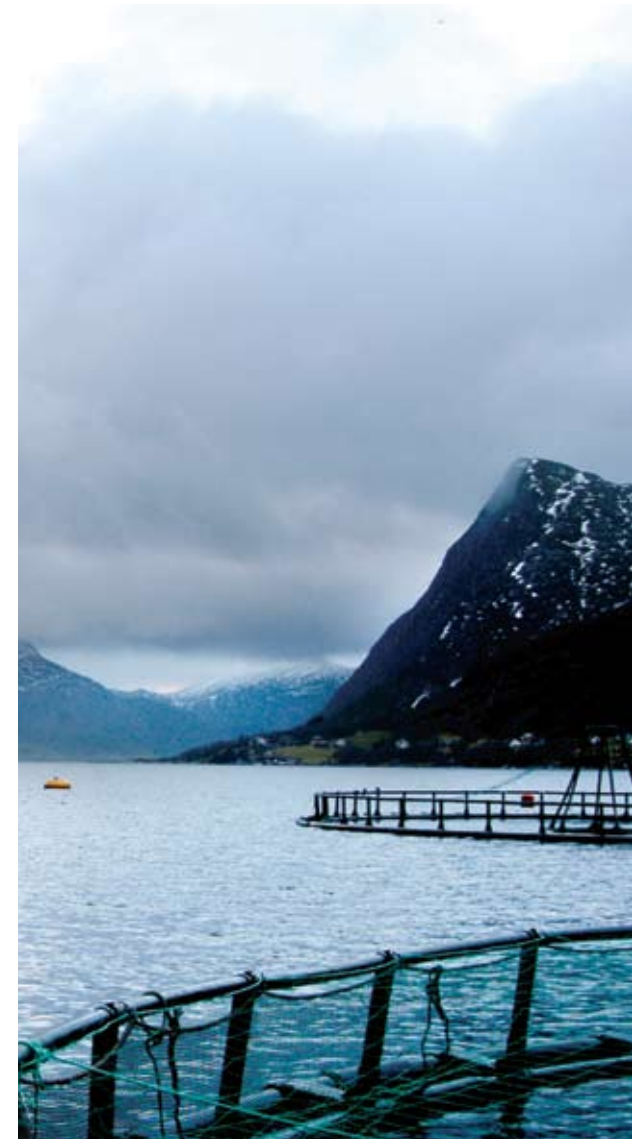
### Careful selection of locations

In Norway, all fish farmers need to obtain an authorization and a right to operate in a specific location. The permission is given by the government and is regulated by the Norwegian Aquaculture Act (Akvakulturloven). The right to operate in a specific location is given by the Directorate of Fisheries, based on an evaluation of area disposition, fish health, food safety, environmental sustainability, harbours and fairways.

In order to minimize impact on the environment, Marine Harvest carefully selects the locations where the production sites are placed. A good location must be environmentally sustainable, ensure good quality of the fish produced and give low produc-

tion costs. The locations are selected after an evaluation based on current conditions, degree of exposure, seafloor topography and tests on sediment.

All fish farmers must frequently follow a surveillance program to ensure the sustainability of the seabed below the site. This is called MOM (Seawater-Surveillance-Modeling) and is regulated through the Norwegian standard NS 9410. The program results in a confirmation performed by an independent company, stating if our activities have any influence at the environment. The MOM program is a useful tool to document that our use does not cause our common environment to deteriorate.



## Qmarine: Environmental responsibility

### PROGRESS IN 2008

In 2008 all six salmon farming businesses of Marine Harvest had environmental monitoring programmes and all apart from Marine Harvest Scotland were actively involved in special biodiversity or environmental protection projects. Marine Harvest Scotland will embark in this area during 2009.

The Environment Department of Marine Harvest Chile used an environment predictive model for application to existing and new farm sites in 2008. The model analyses data from the sediment below the farm site to assess the impact of solids from the farm on the sea bed. This helps in evaluating the carrying capacity of a site and in reducing the impact of farming on the sea beds. Factors taken for input include depth, current speed and direction (the slowest flow is the most important) and feeding. The model contributes to finding places that are less susceptible to the build up of pollution, assessing optimum fallow periods (when the site is empty between farming cycles) and finding the real production potential of sites. Marine Harvest strongly believes this will contribute to more productive and more sustainable salmon farming.

Marine Harvest Ireland became the first company to qualify for the Irish Sea Fisheries Board accredited eco-standard for salmon aquaculture, the Irish Quality Eco-Salmon Standard. The award was announced at the Boston Seafood Show in February 2008. Accreditation to the standard guarantees that the salmon has been produced with care for the environment that is above and beyond all existing requirements.

### Fallowing

Fallowing, leaving a site empty between production cycles, is an essential measure to allow the flora and fauna on the seabed to return to normal. The required fallowing period depends on the individual sites and on local regulations. All Marine Harvest farming businesses have set themselves target minimum fallowing periods. These are shown in the table together with an indication of how well each business managed to meet its targets.

#### Fallowing periods reported in 2008

Business	Activity	Fallow target minimum weeks	Average fallow	% of sites below target
Canada	Freshwater	4	22	0
	Seawater	8	12	2
Chile	Freshwater	9	9	0
	Seawater	12	12	0
Faroes	Freshwater	—	—	—
	Seawater	8	14	0
Ireland	Freshwater	—	—	—
	Seawater	6	7	43*
Norway	Freshwater	—	—	—
	Seawater	8	16	6
Scotland	Freshwater	6	6	0
	Seawater	6	13	0

The following businesses only use tanks for freshwater production and therefore do not use lake-based freshwater sites: Norway, Faroes and Ireland.

### Escapes

The continuing objective of Marine Harvest is to achieve a record of zero escapes. Progress is made through training and by improvements to the farming installations. Escapes may occur as a result of storms or predators damaging the pens, but also due to failure in operational routines.

Escapes recorded in 2008 are listed in the table on page 22.





**Wild salmon in the River Vosso**

The wild salmon of the River Vosso in Norway are famous and make up the largest wild Atlantic salmon strain off the coast of Norway measured as average weights on returns. However, around 1990, their numbers collapsed for several reasons. In 2008, Marine Harvest Norway together with other salmon farmers joined a multi-party project to aid a recovery in their numbers. Key elements of the project are increasing hatchery capacity and establishing pen-based farming in the river system. It is a five year project which this year released 50,000 smolt. Approximately 2–4% are expected to return as adults in 2010 and later years. Environmental scientists have now indicated the reproductive capacity of the river as sufficient to maintain a stable population when the numbers have been rebuilt. The project is unique in having brought together fish farmers, wild fish interest groups, river owners and local communities. Marine Harvest committed to provide NOK 350,000 a year until 2012 and made an additional start-up donation of NOK 450,000.

Escape incidents reported in 2008

Business	Activity	Number of incidents 2008	Number of fish escaped	Approx weight of escaped fish	Number of incidents 2007	Number of fish escaped
Canada	Freshwater	1	~20	juveniles	1	20
	Sea water	3	108,589*	2 kg	7	<100
Chile	Freshwater	0			1	1,300
	Sea water	0				
Faroes	Freshwater	0	2,000	3 kg		
	Sea water	1				
Ireland	Freshwater	0				
	Sea water	0				
Norway	Freshwater	2	500	0.1 kg	2	36,200
	Sea water	2	45	0.8 kg	1	6
Scotland	Freshwater	0	7,444	5 kg	1	15,000
	Sea water	2			2	63,708
Total		11	118,598		15	116,334

\*Marine Harvest Canada's loss of a single net of fish at three locations in 2008 reversed a recent trend of few escapes. Internal and regulatory investigation of these events has resulted in improved containment procedures as well as the adoption of the Norwegian Standard for cage mooring.

## Chemical input

The main chemical input from aquaculture is from medicines and the treatment of pen nets with antifoulants.

The use of medicines in Marine Harvest is always in strict compliance with the relevant regulations prescribed by certified veterinarians. See page 16 for more detailed information.

Antifoulants prevent the growth of algae (seaweed) on the nets. A covering of algae on the net will hinder water circulation through the cages and cause oxygen depletion.

The extent to which treatment is needed varies between locations. The table on page 24 shows the proportion of nets treated by each salmon farming business in 2008, and the proportion treated in 2007.

### Projects in Canada

- Marine Harvest Canada is cooperating in a project with First Nations communities of Alert Bay and the Canadian Department of Fisheries and Oceans (DFO) to assess the potential effects of salmon farming on clam beds. These important cultural foods are harvested from the beaches by First Nations communities. Marine Harvest Canada has pledged to continue its support of this research that may result in changes to policy that directs the location of farms.
- The DFO and Marine Harvest Canada are also active together with the Centre for Aquaculture Health in a project to assess the use of sentinel cages as an early warning system for sea lice. The technique was developed in Norway for research purposes and this Canadian project is

assessing it as a practical method for the aquaculture industry. Sentinel cages are small net pens stocked with a few clean farmed salmon and placed on the outskirts of a farming region.

- Marine Harvest Canada has also established a record of publishing the lice numbers found on its farms on its website to show that they are maintained at very low levels. This action is in combination with the Marine Harvest Canada decision to follow its farms along the Broughton Archipelago during the out-migrating season of local wild salmon to avoid any cross transfer of sea lice. The Broughton Archipelago is a series of islands and islets between the coast of mainland British Columbia and Vancouver Island

with channels, inlets and fjords used by wild salmon emerging from local rivers as passageways to the waters of the Pacific Ocean.

- Under Canadian regulations, when a new salmon farm is established, or an existing one enlarged, the aquaculture company must make a 'compensation for habitat loss'. This is often through activities such as removing general debris from another part of the seabed. Marine Harvest Canada has become a local expert in establishing eel grass beds as compensation for habitat loss. Eel grass is like a short reed and has a thick rhizome network. It provides an ideal habitat for small fish, including young wild salmon, enabling them to shelter from predators until large enough to fend for themselves.



## Energy and waste

Energy efficiency is important for efficient production and processing, provided it does not compromise food safety or the health and safety of employees. The efficient use of energy is a focus for all Marine Harvest businesses. Salmon farming is energy efficient compared to farming of land-based animals. Nonetheless Marine Harvest works diligently to minimise the use of energy, both to reduce costs and to secure a limited ecological footprint from the company's operations.

The table below shows energy consumption for production activities, from broodstock to primary processing. The reported numbers are not fully comparable between business units as the degree of processing varies between the units. There are also differences in the use of contractors between the units, impacting the accuracy of reported numbers and the comparability between units. In some cases energy used by contractors has been estimated.



### Treatment of nets

Business	% nets treated 2008	% nets treated 2007
Canada	92	100
Chile	100 in summer 60 in winter	100
Faroes	65	100
Ireland	0	20
Norway	67	80
Scotland	23	40

Only copper oxide containing products were used.

### Energy consumption in fish farming and primary processing in 2008

Business	kWh from supply grid	kWh/t produced	Propane, litres	Litres/t produced	Diesel/gasoline, litres	Litres/t produced
Canada	13,033,000	302	1,518,000	35	2,151,000	50
Chile	1,167,000	19	179,000	3	229,000	4
Faroes	2,909,000	368	0	0	511,000	65
Ireland	2,513,000	300	0	0	701,000	84
Norway	41,432,000	194	710	0.003	3,726,000	17
Scotland	1,673,000	41	119,000	3	1,320,000	32
Coldwater species	8,011,000**	-	0	-	57,000	-
Total	70,737,000	-	1,816,000	-	8,694,000	-

In addition 32,863 litres of fuel oil was used in Norway.

Two countries obtain a significant proportion of their electricity from renewable resources: Norway 98%\* (hydroelectric) and the Faroe Islands 45% (40% hydroelectric and 5% wind generated).

\* Source: Norwegian Water Resources and Energy Directorate (2007)

\*\* The majority of the production in the business unit Coldwater species takes place in land-based seawater tanks. This explains the high use of energy in this part of the production. A major part of the activity involves juvenile production for external sale and thus energy consumption per tonne produced is not applicable.

## Qmarine: Environmental responsibility

The following table gives the equivalent data for the value adding processing activities of Marine Harvest in the Americas and in Europe.

### Energy consumption in value adding processing operations in 2008

Region	kWh from supply grid	Natural gas	Propane, litres	Diesel, litres
Americas	26,625,000	0	200,000	192,000
Europe	31,563,000	2,186,000	693,000	10,000
Total	58,188,000	2,186,000	893,000	202,000

The following table gives the total energy consumption of Marine Harvest in 2008. This was used in the supply of 114,250,000 salmonid eggs and 9,303,755 salmonid juveniles that were sold externally, 327,000 tonnes of salmonids, 798 tonnes of Sterling halibut, 1,969,879 cod juveniles and 56,256 tonnes of value added seafood products.

### Total energy consumption of Marine Harvest operations in 2008

Business	kWh from supply grid	Natural gas	Propane, litres	Diesel, litres
Farming	70,737,000	0	1,816,000	8,694,000
VAP	58,188,000	2,186,000	893,000	202,000
Total	128,925,000	2,186,000	2,709,000	8,896,000

Full data on energy consumption was not available from all sites in 2007.

### Energy efficiency in Chile

The new headquarters building of Marine Harvest Chile is heated using geothermal energy and avoids the production of greenhouse gases.

Marine Harvest Chile subscribed in 2003 to a Clean Production agreement proposed by the Chilean government. Clean production focuses

on providing energy effectively with lower levels of pollution and waste. In line with this objective, management chose geothermal energy to heat the new building. The system came into operation in 2008. The building of 906 square metres now uses 75% less energy than if heated by conventional methods. Heating by oil would require 55,000 litres a year.



Marine Harvest Chile's headquarter building is heated using geothermal energy.

### Waste treatment in 2008

% of waste	Recycled by Marine Harvest	Recycled by third parties	Composted	Incinerated	Landfill
Faroes	0	60	2	38	0
Ireland	0	16	53	26	5
Norway	0	80	5	10	5

Therefore, the geothermal system is avoiding the annual production of 22 tonnes of carbon dioxide in the atmosphere and depletion of finite resources.

### Waste management

Comprehensive tracking of waste by type and the treatment of waste as specified in Qmarine

is not yet in place.

The table above indicates how waste is treated in the production activities, from hatchery to primary processing, in three of the six production countries.

# Salmon farming: Efficient utilisation of scarce resources

Salmon farming produces healthy food with a higher feed efficiency than any other intensive meat production. However, complex challenges related to sourcing of sustainable feed ingredients need to be solved.

Aquaculture is an important part of the world's food supply. World fish stocks are fully exploited with total catches of around 90 million tons. According to FAO, future growth in marine food supply will come from aquaculture. In 2020 aquaculture will provide quantities of fish comparable to wild fisheries<sup>1</sup>. As aquaculture grows, there will be more competition for raw materials used in animal feed.

## EFFICIENT MEAT PRODUCER

Salmon farming is among the most efficient ways to produce meat. The feed conversion ratio (FCR) defines how much feed is required to produce 1 kg fish. For salmon farming, the feed conversion ratio is around 1.2 (with some variation). This means that in order to produce 1 kg of salmon, you need around 1.2 kg of feed. Although not directly comparable due to differences in the composition and energy density of the feed, it can be mentioned that other food industries like the poultry-, pig-, sheep- and cattle industry have feed conversion ratios of 2, 3, 8 and 8<sup>2</sup> respectively.

The low feed conversion ratio of salmon farming is explained partly by the following factors:

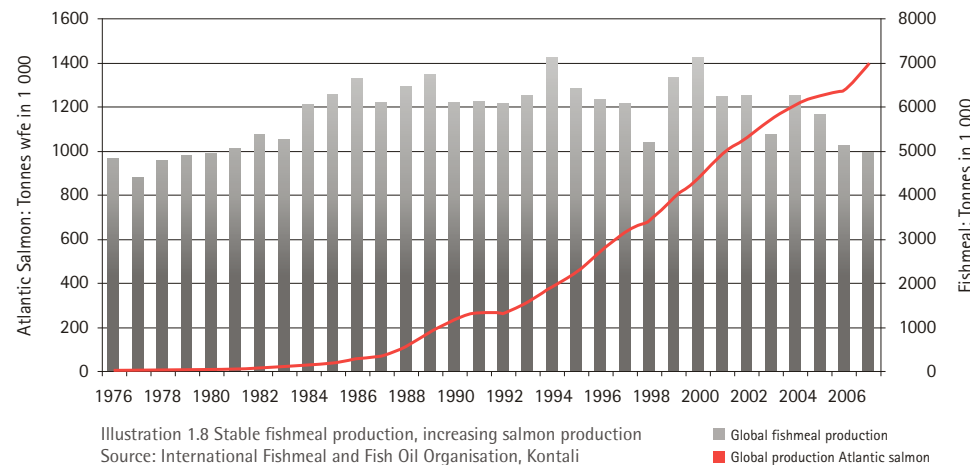
- Salmon feed has a high energy content and is highly digestible
- Salmon are very efficient at utilising the protein in the feed, and much more so than other farmed animals. The protein retention, which is a measure of protein utilisation, can be as high as 45 percent<sup>3</sup> in salmon whilst corresponding figures for poultry and pig are 18 and 13 percent<sup>4</sup>, respectively. The high protein retention gives

salmon farming an ecological advantage compared to other meat productions as more of the proteins included in the feed are converted into meat

- As salmon live in water, they need less energy to support body integrity than land animals
- A salmon needs less energy to maintain bodily functions as its body temperature is always similar to the ambient temperature, normally between 6 and 16 degrees Celsius

## STABLE FISHMEAL PRODUCTION

The introduction of salmon farming has not led to any increase in the world's fishmeal production or increased catch of pelagic fish. Statistics show that while salmon production has increased from 200 000 tons in 1990 to around 1.5 million tons in 2008, fishmeal production has been stable at around 5-7 million tons over the last 30 years. See illustration 1.8.



<sup>1</sup> FAO 2005/R. Tveterås

<sup>2</sup> Marine Harvest, Wikipedia, British Pig BPEX Yearbook 2007, www.pork.org

<sup>3</sup> Måseval, BioMar, 2004 (Personal communication)

<sup>4</sup> Havbruksrapporten 2001

## Qmarine: Environmental responsibility

While salmon production has increased, the amount of fishmeal and fish oil used in salmon feed has been significantly reduced. Statistics from Marine Harvest's main feed supplier Skretting show that while salmon feed sales between 2004 and 2007 increased by 27 percent, consumption of fishmeal and fish oil decreased 7 percent and 6 percent respectively<sup>6</sup>. Leading researchers believe this trend can be expected to continue (see illustration 1.9).

### 100 PERCENT UTILISATION OF RESOURCES

Wild fish used in fish feed come from so-called reduction fisheries and are mainly small, bony pelagic species that are not generally suited for the consumer market. Had there been a demand and market to use these species directly for human consumption they would have been priced

higher and hence not used for feed production<sup>7</sup>. Using wild fish to produce fishmeal is an efficient way to use the whole resource. When producing fishmeal, 100 percent of the wild fish is utilised. When used directly for human consumption, between 50 and 60 percent of the fish can end up as waste, like guts, skin, head and bones<sup>8</sup>. In the aquaculture industry guts, heads, bones and trimmings are playing an increasingly important role as raw material for fish meal used in other animal feed. In Norway, 100 percent of the by-products from salmon production are fully utilised<sup>9</sup>.

From time to time, comparisons are made between the amount of wild fish used in fish feed, and the amount of farmed fish produced. Such comparisons are problematic in at least three

respects. First because the use of this raw material for salmon farming is the most efficient utilisation of this raw material for the production of food. Second 100 percent of the wild fish is utilised in feed production, while a significantly lower percentage would be available for alternative use. Third because the comparisons normally are calculated on the basis of use of fish oil in the feed. Fish oil is a by-product from production of fishmeal. The wild fish is not caught because of the need for oil. Even though 2-3 kg of wild fish is required to extract the necessary amount of fish oil used for feed, the process gives a surplus of fishmeal which is used in other food production. Historically fish oil has even in some cases been used a fuel.

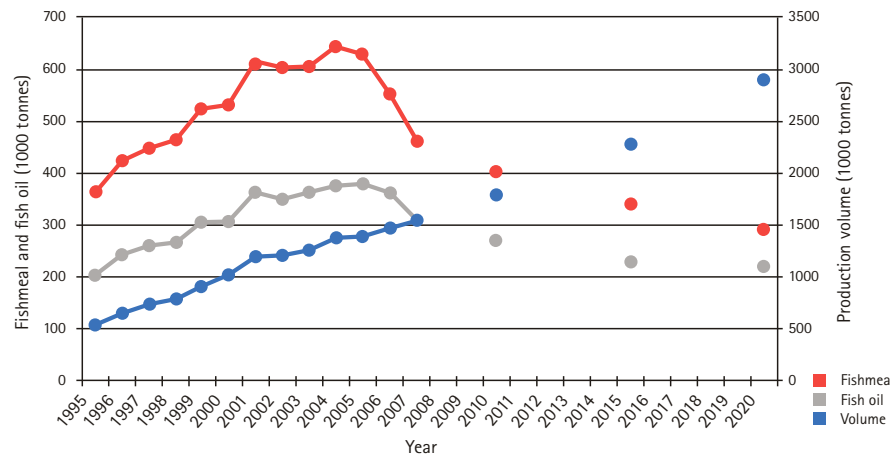


Illustration 1.9 Use of fishmeal and fish oil in feed  
Source: Tacon, A.G.J., Metian, M. Global overview of the use of fishmeal and fish oil industrially compounded aquafeeds: Trends and future prospects, *Aquaculture* (2008)

### Fishmeal and fish oil – facts and figures

- World production of fishmeal and fish oil in 2007 was 4.97 million tons and 1.045 million tons respectively.
- The salmon farming industry accounted for approximately 10 percent of total fishmeal production and 38 percent of total fish oil production in 2006 (Tacon & Metian, 2008).

Source: IFFO Yearbook 2008, Skretting, FHL

### Fisheries management

- United Nations Convention on the Law of the Sea of 10 December 1982 is an international agreement which defines the rights and responsibilities of nations in their use of the world's oceans. The convention gives the coastal states permission to establish exclusive economic zones of maximum 200 nautical miles from the shore and sovereign rights related to the natural resources in this area.
- International Code of Conduct for Responsible Fisheries was approved in 1995.
- An international action plan against Illegal, Unreported and Unregulated Fishing was approved in March 2001.
- There are four key organisations involved in assessing/reporting on the status of feed fish stocks. These are in addition to FAO (Food and Agriculture Organization of the United Nations) and ICES (International Council for the Exploration of the Seas), IMARPE in Peru and IFOP in Chile.
- To read more, please visit UN's website, Oceans and Law of the Sea, <http://www.un.org/Depts/los/index.htm>

Source: United Nations, Norway's Ministry of the Environment, Norway's Ministry of Fisheries and Coastal Affairs, Skretting, Wikipedia

<sup>6</sup> Skretting's homepage, <http://www.skretting.com/internet/SkrettingGlobal/webInternet.nsf/wprld/68B4A81709CBC6ABC12574260025F55F?OpenDocument>

<sup>7</sup> The Norwegian Seafood Federation (FHL), [http://www.fhl.no/getfile.php/DOKUMENTER/Q%26A\\_om\\_fiskefor\\_ENG.pdf8](http://www.fhl.no/getfile.php/DOKUMENTER/Q%26A_om_fiskefor_ENG.pdf8)

<sup>8</sup> Professor Elin Kjorsvik, Norwegian University of Science and

Technology. Feature article in the Norwegian newspaper Adresseavisen (April 2009).

<sup>9</sup> Rubin, Varestømsanalyse 2007

## Qmarine: Environmental responsibility

### SUSTAINABLE FISHERIES MANAGEMENT

Even though salmon farming represents an efficient utilisation of marine raw materials, the use of these raw materials can be problematic when the sustainability of the different fish resources is contested.

Marine Harvest is dependent on sustainable fish stocks in order to secure its supply of marine feed raw materials in the long run. The company believes fishing quotas must be set based on true sustainability principles. Marine

Harvest's challenge is that the company can not directly influence the quotas. Each fishing nation is responsible for managing its fish stocks in a sustainable way. Feed and salmon producers have little direct influence on governments with regard to the management of fisheries resources. Scientific organisations like the International Council for the Exploration of the Seas (ICES), IMARPE in Peru and IFOP in Chile give advice on fisheries management, but it is the governments in each country that enforce the legal fisheries management system

and regulations<sup>10</sup>. See illustration 2.0.

However, Marine Harvest believes it is possible to influence the process even though the company has no direct influence. By using the purchasing power as the largest producer of farmed salmon and by working to achieve changes in the value chain, Marine Harvest believes changes will come.

Governments do not always follow the advice from research communities and as long as a

quota is set, fish will be caught accordingly. The fishmeal-, feed- and salmon producers have therefore initiated several initiatives in order to contribute to sustainable fisheries management.

The International Fishmeal and Fish oil Organisation (IFFO) is establishing a new standard for sustainable fishmeal and fish oil.

In addition, the WWF-initiated Salmon Aquaculture Dialogue is working to establish a com-

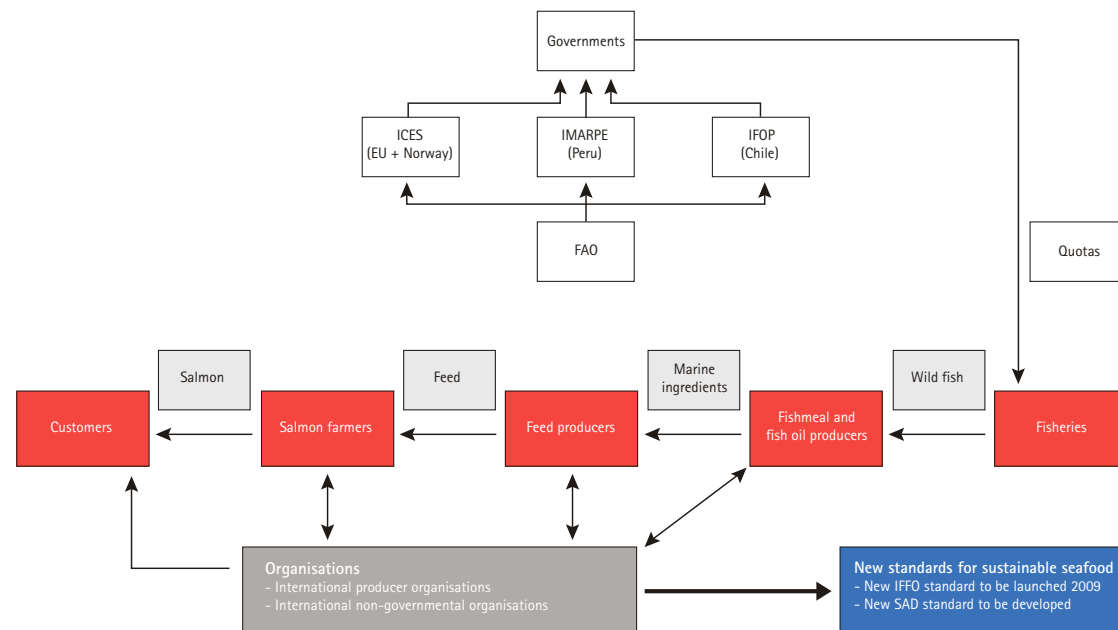


Illustration 2.0 The governments in each country enforce the legal fisheries management system and regulations  
Source: Marine Harvest

### From marine ingredients to vegetable proteins and other animal proteins

- The main ingredients in the industrially compounded salmon feed are fishmeal, fish oil, vegetable proteins, carbohydrates and additives.
- Due to limited access to marine ingredients, the trend is to replace more and more of the marine ingredients with vegetable ingredients.
- In addition to replacing marine ingredients with vegetable ingredients, other animal proteins such as feather meal and poultry meal are used in some countries due to their nutritional qualities.

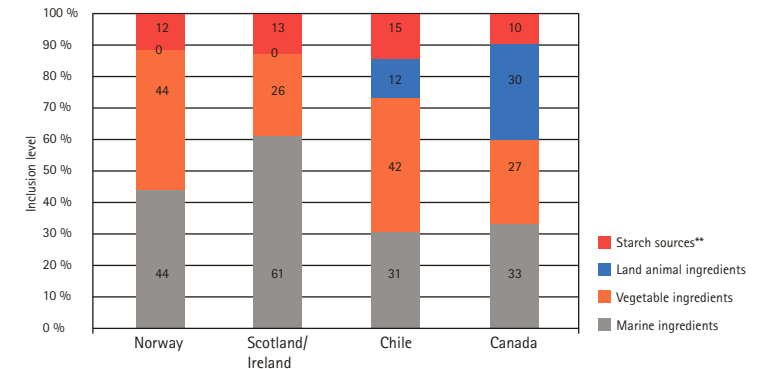


Illustration 2.1 Average inclusion level of raw materials in salmon grower feed\*  
Source: Marine Harvest  
\* Inclusion levels vary during the year according to availability.  
\*\* Starch sources are used as binders

<sup>10</sup>United Nations, Norway's Ministry of the Environment, Norway's Ministry of Fisheries and Coastal Affairs, Skretting, Wikipedia

mon standard for sustainable salmon farming. Marine Harvest is actively participating in this dialogue, together with environmental organisations, research communities, buyers of salmon, regulators and salmon farming companies worldwide.

So far the willingness of consumers to pay the extra cost of salmon produced after stricter sustainability criterias has been limited. Marine Harvest has nonetheless developed niche products, like our Clare Island Irish Organic salmon, produced according to standards that go beyond today's industry standards. By offering products that are produced while paying extra attention to the environment we contribute to the education of environmentally conscious consumers.

#### Salmon Aquaculture Dialogue

Marine Harvest is a member of the steering committee of the Salmon Aquaculture Dialogue coordinated by WWF US and established in 2004. Other organisations and companies represented on the steering committee include environmental NGOs and salmon producers organisations. The dialogue provides a meeting place where views and concerns can be exchanged in a constructive manner. Its goal is to credibly develop and support the implementation of measurable, performance-based standards that minimise or eliminate the key negative environmental and social impacts of salmon farming, while permitting the industry to remain economically viable. To date, the Salmon Aquaculture Dialogue has established goals and objectives, identified seven key areas of impact, published reports on five of these impact areas, and drafted principles and criteria. Key documents and more information are available on the website at [www.worldwildlife.org/salmondialogue](http://www.worldwildlife.org/salmondialogue).

Source: Marine Harvest, Salmon Aquaculture Dialogue

Qmarine:

# Solving the sea lice challenge

Salmon farming has potential negative implications for its surroundings, including wild salmon. Addressing the sea lice challenge is one of the most important tasks for the salmon farming industry worldwide.

Wild Atlantic salmon stocks on both sides of the Atlantic have been on the decline since the beginning of modern industrialisation. This is well documented in the WWF report "The Status of Wild Atlantic Salmon: A river by River Assessment" that came out in 2001. The report states that various forms of pollution and decline in water quality, building of hydroelectric power stations, destruction of spawning grounds, construction of physical barriers that prevent migration (no fish ladder), and over-exploitation by offshore fisheries are some of the historic reasons for the decline. The report uses the river Rhine in Germany as one example of how what was once the best salmon river in Europe was destroyed by various human activities.

Salmon farming is mentioned in the report as a more recent contributor to the decline in wild salmon stocks and that the countries with the most intensive salmon farming activities in later years have seen the biggest drop in wild salmon returns to their rivers. However, countries such as the Baltic States and Finland,

where there is little or no salmon farming, have also seen a dramatic decline in stocks. In Finland, the WWF report states that 25 of the historic salmon rivers are categorised as extinct. Along the Pacific coast of North America, stocks of Pacific Salmon are in decline from California to Alaska, while farming of salmon takes place only in British Columbia.

The British Columbia Pacific Salmon Forum, a government appointed committee, published its final report in January 2009. This report also documents that decline in wild salmon stocks on the east coast of the US and Canada started many decades prior to commercial salmon farming, pointing to a number of reasons why this decline has occurred.

The salmon farming industry acknowledges that under certain circumstances sea lice of farm origin can present, in some locations and for some host species populations, a significant threat<sup>1</sup>, and is working diligently to minimize such risk. The industry has therefore implemented several direct and indirect measures to support the preservation of wild salmon. For farmed salmon, sea lice rarely reach levels where the condition of the fish is compromised due to continuous monitoring of sea lice levels, preventative approaches and control.



*The salmon farming industry has many years of experience with regards to preventing and controlling sea lice but is continuously working to develop novel and more effective tools for lice control.*

<sup>1</sup> Salmon Aquaculture Dialogue, Working Group Report on Sea Lice (March 2009, page 12)

## Qmarine: Environmental responsibility

### NON-MEDICINAL APPROACHES FOR LICE CONTROL

Sea lice are naturally occurring parasites of salmonids and a normal wild salmon can harbour several sea lice. Infections on salmonids were common and well documented before the establishment of salmonid farming. Various species of wild salmon have been captured on the major oceans, and found to be infected with larval, adult and gravid female sea lice<sup>2</sup>.

Sea lice have therefore also been present on salmon farms since the introduction of farming. With the increased production of farmed salmon this has led to an increased number of potential hosts for the sea lice.

The salmon farming industry has many years of experience in preventing and controlling sea lice but is continuously working to develop novel and more effective tools for lice control.

One of the most interesting approaches has been the development of biological control by the use of wrasse/cleanerfish. Wrasse has proven to be a successful biological tool and

the industry is currently using around one million sustainably sourced individual goldsinny wrasse per annum<sup>3</sup>. In addition, ballan wrasse are also being developed for use on larger salmon. Marine Harvest Norway will start farming ballan wrasse in 2009.

The use of active feed supplements is another area of innovation by Marine Harvest which has yielded positive results. By incorporating specific natural and approved ingredients to the diet, greater control over lice infection and improved medicinal performance has been demonstrated. Pioneered and now widely used by Marine Harvest Scotland Ltd this novel approach is now under development in Marine Harvest Norway.

Other non-medicinal tools are firmly integrated into husbandry, production management and planning, including synchronised fallowing, attention to clean nets and maximum stocking densities.

### EFFICIENT USE OF MEDICINES

The salmon farming industry believes it is

“ Norway's Minister of Fisheries and Coastal Affairs Helga Pedersen (Nationen, 14 April 2009):  
Despite the environmental challenges, I believe that aquaculture today – the increased production following this year's new salmon farming licences included – generally keeps within the limits of what nature can sustain. ”

important to maximise the application of non-medicinal tools to control sea lice levels. While such tools have made a major contribution to the control of sea lice populations in recent years, medicinal treatment is still required to maintain control and even the best managed farms require use of medicines from time to time in a co-ordinated and efficient way.

Strategically timed and coordinated delousing within appropriate biological areas, where companies develop their treatment strategies in consultation with others, has proved to be a necessary and successful approach to managing

sea lice in all territories. Strategic and coordinated treatments of sites in zones form an important and integrated approach to lice management. By instigating a series of coordinated, synchronous, strategic treatments during the winter, lice levels are minimised. Results from the synchronised winter delousing campaign in Norway in 2008 showed a substantial decrease in number of sea lice<sup>4</sup>. See illustration 2.2. In Scotland the establishment of Area Management Agreements has helped greatly in this regard. In British Columbia Marine Harvest Canada has been actively managing its farms to address the

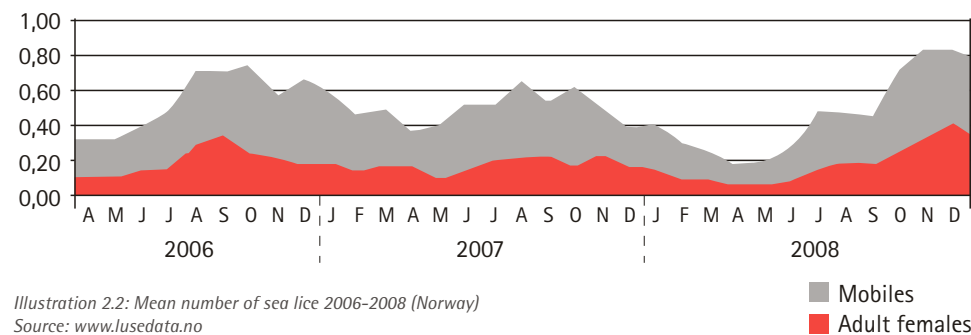


Illustration 2.2: Mean number of sea lice 2006-2008 (Norway)  
Source: [www.lusedata.no](http://www.lusedata.no)

### Facts about sea lice

- Sea louse is an external parasite, living on the skin of marine and anadromous fishes. The most common one is the *Lepeophtheirus salmonis*, a parasite living on salmonid fishes such as salmon and trout, but also *Caligus rogercresseyi* can be a problem in Chile
- High sea lice loads will kill individual wild fish, but the definition of high will depend on sea louse stage, fish size, fish species and developmental stage
- A parasitic infection becomes a disease when the behaviour and physiology are altered or compromised to an exceptional extent. The sea louse may cause slower growth, making the wild fish

more likely to be captured by predators. It may also cause them to take greater risks to feed, with the same end result

- Reduced condition can affect swimming ability, which in turn may lead to reduced competitive ability and delayed migration. Slower migration may again increase risk of infestations by sea lice
- Skin damage caused by the sea lice can increase the physiological cost of osmotic regulation, or provide sites for secondary bacterial or fungal infection.

Source: Salmon Aquaculture Dialogue, Working Group Report on Sea Lice

<sup>2</sup> Sea lice and wild fish (June 2002), Dr. Gordon Ritchie

<sup>3</sup> [Forskning.no, http://www.forskning.no/artikler/2008/juli/188837](http://www.forskning.no/artikler/2008/juli/188837)

<sup>4</sup> [www.lusedata.no](http://www.lusedata.no)

## Qmarine: Environmental responsibility

public concerns around the sea lice issue. These actions have contributed to natural environmental controls with the result that sea lice prevalence during the March to June smolt migration season has been greatly reduced in the Broughton area, see illustration 2.3. The recent Pacific Salmon Forum<sup>5</sup> report acknowledged that this reduction was confirmed in some of the research papers now in press. Recent research by Fisheries and Oceans Canada (DFO) has shown that the proportion of Pink salmon juveniles at risk from sea lice declined from 4.5 % to 0 between 2005 and 2008. This indicates a positive effort from mitigation effects in British Columbia<sup>6</sup>. The pattern of sea lice decline in the Broughton has been publicly available on the Federal Fisheries (DFO) website with wild salmon/sea lice data posted since 2004. In addition to synchronised delousing, minimising the level of sea lice when entering the spring period and systematic monitoring of

delousing efficiency are examples of how to use medicines in a more efficient way and to quality assure performance.

Further, levels of sea lice on farmed salmon are regulated by country specific treatment trigger levels, see table below.

### CLOSE MONITORING OF SEA LICE LEVELS

Monitoring and openness are key words when it comes to increased focus on the sea lice situation. Lice levels are continuously monitored on all stocked sites starting after transfer to seawater. Monitoring is carried out according to respective territory legal requirements and by trained staff who are capable of diagnosing and distinguishing both species and stages of sea lice and reporting lice numbers as legally required. In Norway industry lice levels are published in a common database which is displayed on [www.lusedata.no](http://www.lusedata.no). In Canada, Marine

Harvest Canada provides information about its sea lice management on the company's website, an initiative which was started in 2006 ([www.marineharvestcanada.com](http://www.marineharvestcanada.com)).

Governments have also taken an active approach toward monitoring sea lice levels on wild salmonids. Both Norway, Ireland, Scotland, Chile and Canada have monitoring programmes in place.

Harvest believes focus should be placed on the following fronts and areas of research;

- Possible development of new therapies and a vaccine against sea lice
- Intensification of wrasse production and use
- Further development and refinement of tools for improved surveillance of resistance development
- Improving synchronised delousing strategies
- Unorthodox and novel technological approaches to control

### SOLVING THE SEA LICE CHALLENGE

To further address the sea lice challenge Marine

“ Director Aquaculture Program WWF, Jose Villalon:  
 Farmed fish is an excellent source of protein and, when produced well, helps protect the environment. I am totally convinced that aquaculture is the most sustainable way to feed the world. ”

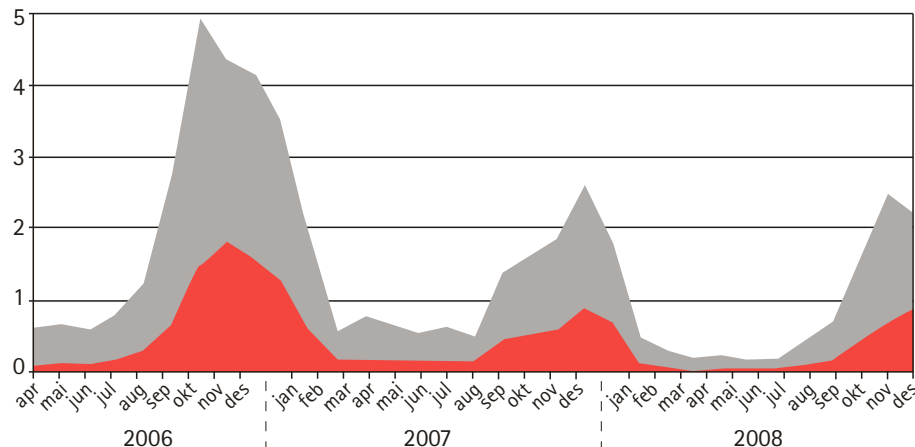


Illustration 2.3: Mean number of sea lice 2006-2008  
 (Marine Harvest Canada, Broughton Archipelago)  
 Source: Marine Harvest Canada

■ Mobiles  
 ■ Adult females

### Regulatory treatment trigger levels worldwide

Country	During period of wild smolt migration	Other times of the year
Canada (W)	3 mobiles per fish	3 mobiles per fish
Chile	Not applicable (no wild salmon)	6 mobiles per fish
Ireland	0.3-0.5 gravid females per fish	2 gravid females per fish
Norway	0.5 adult females, or, 3 mobiles per fish	0.5 adult females, or, 3 mobiles per fish
Scotland	0.5 adult females per fish	1 adult female per fish

Source: Marine Harvest

<sup>4</sup> Lusedata, [www.lusedata.no](http://www.lusedata.no).

<sup>5</sup> [www.pacificsalmonforum.ca](http://www.pacificsalmonforum.ca)

<sup>6</sup> "Mortality risk to juvenile pink salmon caused by the salmon louse *Lepeophtheirus salmonis*", Simon Jones, Pacific Biological Station, May 2009

### Some milestones in sea lice management

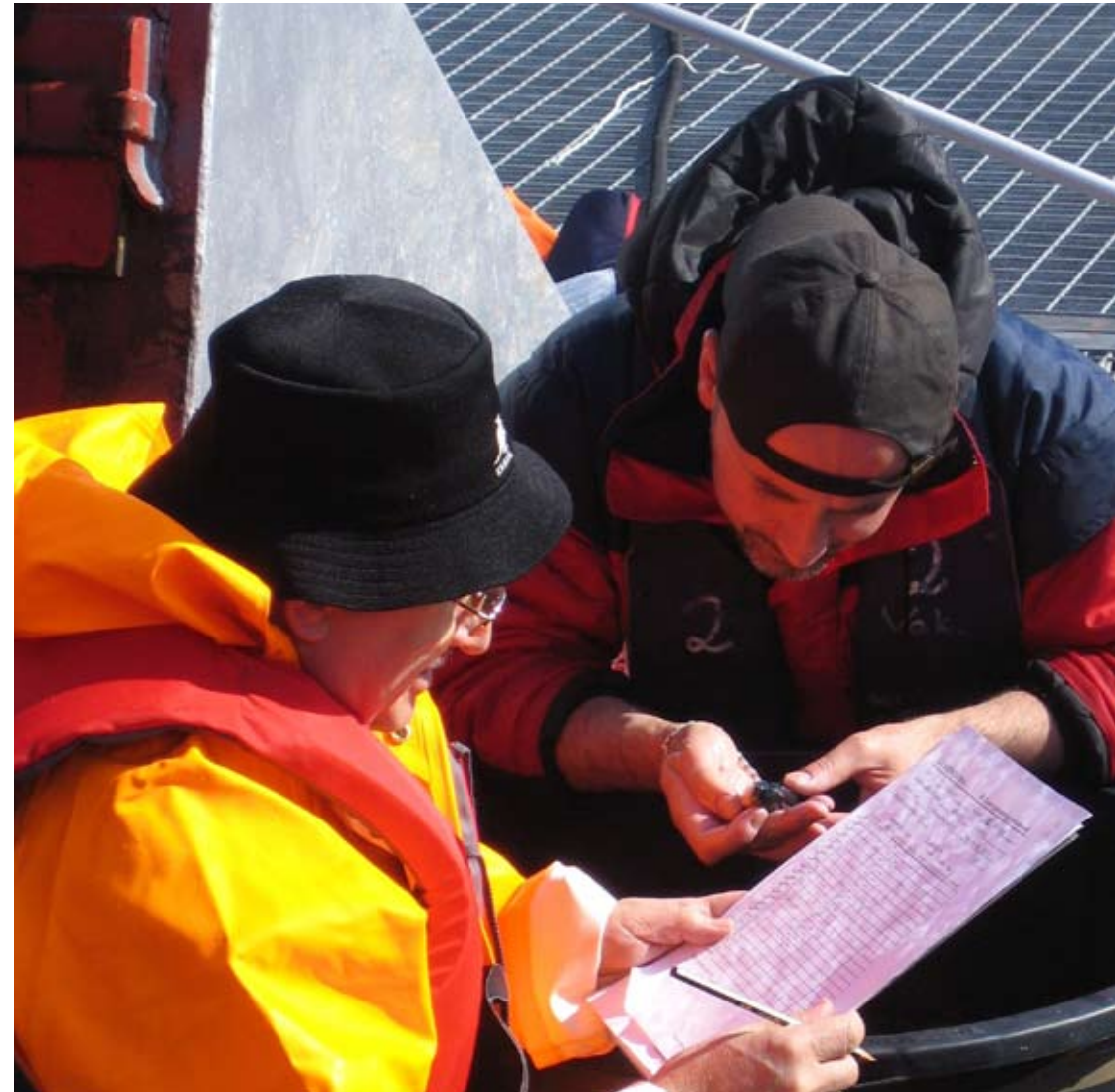
- Biological control with wrasse developed early 1990's (P. Kvenseth and more)
- National and regional action plans against sea lice introduced in Norway (1996), Ireland (2000) and Scotland (2000)
- Documentation on the importance of strategic and synchronised lice treatments in Scotland (1996)
- Development of more effective delousing agents
- The Norwegian industry acknowledges that lice on Norwegian farming sites can affect lice on wild salmonids (2002-2005)
- Area Management Agreements (AMA) introduced in Scotland based on industry best practice comprising wild fisheries interests, the Scottish Government and the salmon farming industry. A key feature of the AMA is to assure that farms are virtually lice free annually during the period from January to June which is believed to safeguard the passage of wild smolts to sea. The primary aim of the AMA's is to develop practical measures to facilitate the promotion and maintenance of healthy wild salmonid fish and farmed salmon stocks at local levels. There are currently 18 AMA's ( ref. The Scottish Government) (2003-2004)
- Establishment of [www.lusedata.no](http://www.lusedata.no) in Norway, and thereby contributing to full openness about sea lice status (2005)
- Information about sea lice management in Marine Harvest Canada posted on company's website, starting in 2006. No other company provides this much details about sea lice management to the public
- Establishment of the first Fish Health Network in Norway – with principle focus on lice control (2003)

Source: Marine Harvest

### Current Marine Harvest projects

- Norway, Hardangerfjord project: Since 2005 Marine Harvest (a co-founder of the project) has supported and been a partner of this Norwegian project to reduce sea lice numbers in Hardanger fjord. For more information, please see [www.fom-as.no/no/sider/FISKEHELSENETTVERK/HFN/](http://www.fom-as.no/no/sider/FISKEHELSENETTVERK/HFN/)
- Norway, Vossolaks project: Marine Harvest Norway is leading a project in order to save the "Vossolaks", the world's largest Atlantic salmon strain. The project was initiated in 2008 and will continue till 2012. See page 22 for more information.
- Norway, Wrasse production: Marine Harvest initiates a research project in Norway on development of wrasse production
- Canada: Cooperation with research scientists 2004 – 2009; partnerships with organisations to protect wild salmon and dialogue with NGOs to share information and find solutions
- Scotland: Project on use of active feed-supplements. For more information, please see article published in Fishfarming Xpert April 2009
- Ireland: Marine Harvest Ireland has demonstrated its commitment to apply the authorities' lice control targets by acquiring additional farms so as to raise fallowing and year-class separation. The farms concerned are in the South West of Ireland, in the bays of Bantry and Kenmare. The company has also brought a large full time well-boat charter to Ireland to assist in delousing and has made this boat available to others in the local Irish industry
- Chile: Marine Harvest Chile partner in and funding several projects investigating reduced drug sensitivity, lice monitoring and novel approaches to lice control in Chile

Source: Marine Harvest



Monitoring of sea lice levels is carried out by trained staff who are capable of diagnosing and distinguishing both species and stages of sea lice and reporting lice numbers as legally required.

Qmarine:

# Social responsibility

In Marine Harvest's quality program, social responsibility is addressed under three headings. These are responsibility towards employees of Marine Harvest, responsibility towards local communities that are affected by the activities of Marine Harvest and responsibility towards wider society, which is demonstrated through the ethos and contents of this report.

## Employees

At the end of 2008 the number of employees (FTE) in Marine Harvest was 7,071. At this point the gender ratio was 4,716 male and 2,355 female. There is, however, a majority of women in the harvesting and processing plants. Marine Harvest continues to work actively to have more women in senior management positions globally. In 2008, the group had female managers in the senior management teams of most subsidiaries. Marine Harvest's group management team has seven members, two of whom are women including the CEO. Of the 10 board members in the Marine Harvest ASA Board five are women. All employees are paid at or above the minimum wage and the majority of businesses pay blue collar workers above the industry average wage.

In 2008, there was an incident of a dispute with employees about employment conditions within the Kritsen companies of Marine Harvest VAP Europe over changes in the social security arrangements. In Chile Marine Harvest Chile applied for judicial authorisation to terminate the employment of four employees who had the legal protection of fixed term contracts.

All Marine Harvest businesses have equal opportunity policies in place, with reference to aspects such as gender, race, religion and disability. There were no instances of discrimination reported in 2008. All employees have the right to join a trade union.

No businesses had employees below the minimum working age. Marine Harvest considers that the minimum age for admission to employment or work cannot be less than the age of completion of compulsory schooling as set by national law and, in any case, shall not be less than 15 years.

One incident of improper payment was discovered in 2008 (in Marine Harvest VAP Europe). Only Marine Harvest Norway and Marine Har-

vest VAP Europe have whistleblower protection programmes in place.

All Marine Harvest operations support further education of employees. In 2008 3,632 blue collar employees and 990 sales, administration and management staff attended training (these figures may include multiple counts for people that attended more than one training event).

Training and/or assistance in connection with Health & Safety systems is offered to sub-contractors by Marine Harvest farming companies in Canada, Chile, Norway (including Sterling White Halibut), Ireland and Scotland. Similar training and/or assistance is offered by Marine Harvest VAP Europe plants in Belgium, France and Poland.

### Building competence in Marine Harvest Norway

Marine Harvest Norway and the University College Bodø have established a study programme for aquaculture management. 14 employees have completed the full course since it began in 2006 and a further 21 have participated in sections of the programme. By 2012, around 100 Marine Harvest employees will have finished post-graduate studies in Bodø.



## Local community

Marine Harvest is aware of the significant economic and social role of aquaculture in many local communities and takes initiatives to develop positive relationships, including nature conservation programmes, environmental initiatives, community projects and the sponsorship of local sports and cultural events.

Aquaculture farms are usually located in remote coastal areas. Many Marine Harvest production employees in Europe and the Americas therefore live in these areas where employment opportunities are limited.

Local management is encouraged to give attention to the views of local communities and engage in dialogues to find mutually beneficial or acceptable solutions to any concerns that are raised with respect to the activities of Marine Harvest.

In 2008, Marine Harvest businesses donated NOK 5,215,333 (ca EUR 600,000) to local community activities and to charities (2007 ca EUR 500,000). In addition, there were donations of fish to local organisations such as schools and homes for the elderly. A further NOK 1,524,000 (EUR 175,000) was invested in the development of local infrastructure, for example in the provision of utilities and salmon enhancement facilities (2007 EUR 50,000).

### Canada

One of the ways in which Marine Harvest

Canada provides local community support is through the donation of unused walkway sections from salmon farms. These are converted into effective wharves in remote locations where local communities cannot afford to build a wharf. They also serve as durable bridges and walking trails through the local countryside, for example on the Puntledge Park walking trail.

Hatchery equipment that is no longer needed, such as rearing tanks and raceways, is donated to wild salmon hatcheries. Additionally, Marine Harvest Canada made financial contributions to wild salmon organisations such as the Campbell River Salmon Foundation.

### Chile

Marine Harvest Chile supports the Prensa-Educación training programme for children and teachers at five rural schools in Region 10, the main salmon farming region of Chile. The programme provides daily newspapers to the schools and gives guidance to the teachers on how to use them in classroom activities. In this way the children become familiar with gathering information from newspapers and learn about the outside world.

For the past 16 years, including 2008, Marine Harvest Chile has sponsored the classical music festival in Frutillar (close to Puerto Montt) called Semanas Musicales de Frutillar.

### Scotland

Marine Harvest Scotland in 2008 recorded its 20th year of sponsorship of shinty, which is a

traditional Gaelic sport that is popular in the regions where Marine Harvest is active. Events included the Marine Harvest Festival of Shinty, which featured a match between the North and South of the country.

Four Marine Harvest Scotland employees agreed to participate in Macmillan's Longest Day Golf Challenge. Taking advantage of long hours of daylight in June, the challenge for the golfers is to complete four 18-hole rounds of golf within the day and raise money for the charity through sponsorship. Macmillan Cancer Support helps to improve the lives of people suffering from cancer. The four were aiming to raise GBP 7,500 but were able to make a final donation of GBP 12,000 (ca NOK 120,000).

### Complaints

Local community relationships are about more than providing donations and support. They include being a good neighbour and not causing nuisance through noise, odour or visual intrusion.

In 2008 two complaints were received by Marine Harvest businesses in connection with noise, one each in Chile and Norway. Nine complaints were received concerning odour; one each in Canada, Ireland and Scotland, four in Norway and three complaints came into locations of Marine Harvest VAP Europe. There were 12 complaints about visual intrusion; one in Canada, six in Chile, three in Norway and two in Scotland.

In 2007 a total of ten complaints were recorded by Marine Harvest businesses from local residents. Four related to noise and six to odour. Complaints about visual intrusion were not recorded.



# The impact of the ISA virus in Chile

Marine Harvest Chile underwent major changes in 2008 as a consequence of the continuing presence of the disease known as Infectious Salmon Anaemia (ISA), caused by the ISA virus.

## SOCIAL IMPACT

The disease led to a substantial restructuring of the business in Chile. Six freshwater sites, 21 sea sites and two processing plants, Teupa (primary) and Chinquihue (secondary), were closed. That is two of the five plants in operation at the beginning of the year. As a result, 1,866 employees were made redundant. Where possible, employees were offered alternative employment at other Marine Harvest locations.

Redundant employees were given one month's severance pay and 30 days notice. The legal requirement is either the pay or the notice. Programmes were set up to help redundant employees find new employment and a list has been kept of those employees that wish to return to Marine Harvest if the plants are brought back into action. Marine Harvest also paid more than the legal minimum of one month salary for each year of seniority by waving the 11-year limit and the US \$3,148 cap on this amount.

Marine Harvest instigated several redeployment initiatives to help redundant employees find other employment. These began with a social characterisation study in which people could identify their interests, abilities, ambitions and their needs. It then led to three possible actions.

- People were relocated to other companies in the region. The high level of competence of Marine Harvest employees is recognised and over 25 companies offered a total of 714 job positions.
- Alliances were formed with government institutions to provide training in new skills.
- More than 70 ex-employees were interested in forming their own small business and a programme called The Beginning of an Entrepreneur was created to help them, including training in business planning and finance. As a result, there are now 14 companies employing 35 ex-employees that are providing services to Marine Harvest Chile.

Additionally, Marine Harvest has moved the smokery from Santiago to Puerto Montt in

Region X, making Puerto Montt the centre for all its activities in Chile. The relocation has created almost 300 additional workplaces in Puerto Montt.

## THE DEVELOPMENT OF ISA IN CHILE IN 2008

ISA was first declared in salmon farming in Chile in 2007, with a few notified outbreaks in

July and August. These were in Region X, the main salmon farming region of Chile. After a brief respite, further outbreaks were declared in the final months of the year. Outbreaks continued in 2008 at a relatively low level until mid year. At that time, Marine Harvest Chile had four farms on the official ISA outbreak list, as published by Sernapesca, Chile's national

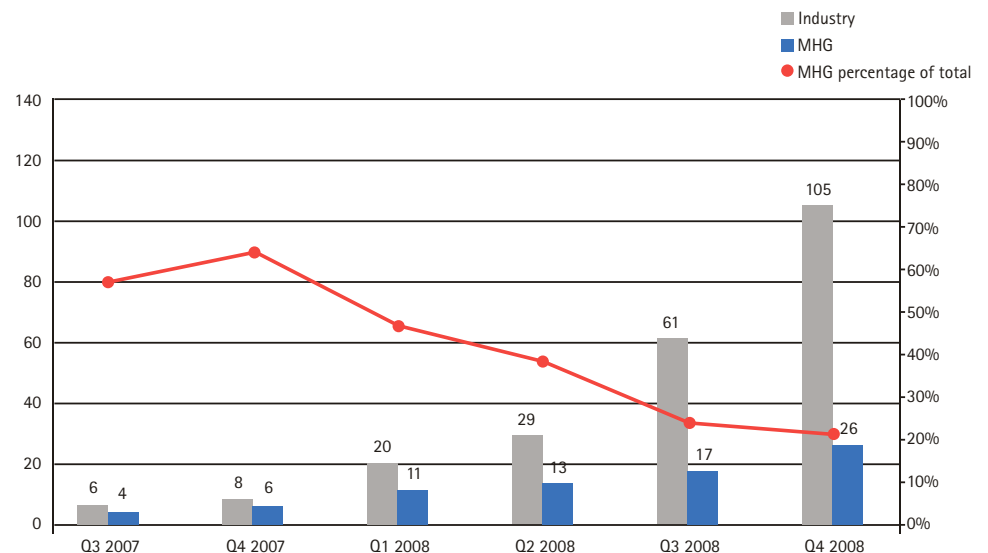


Illustration 2.4 Accumulated number of ISA declarations in Chile from mid 2007 to mid 2009. The chart shows the accumulated number of outbreaks in each quarter; combining existing outbreaks with those that occurred during the quarter. Source: Sernapesca, Marine Harvest

## Qmarine: Social responsibility

fishing service. In addition, there were six Marine Harvest farms on the official suspect list. In Q3 2008 there were 32 confirmed outbreaks in the industry and by end-Q4 there were confirmed another 44 cases for that quarter. In Q3 the disease also appeared in Region XI, to the south of Region X. Region XI was seen as a potentially ISAV-free zone and the Marine Harvest strategy to expand in Region XI was partly halted as a consequence of the disease spread.

At the end of the year the total number of sites in Chile officially confirmed with ISA was 105 and 26 (25%) belonged to Marine Harvest.

There were 44 suspect sites, five of which were Marine Harvest (11%).

As a consequence of the legal measures applied, the disease led to early harvesting, reduced production and a downscaling of activities by Marine Harvest. These measures included the closure of the farm sites and processing plants, as described above, to bring capacity in line with the reduced production.

Marine Harvest believes that the elimination of ISA as a threat to production in Chile can only be finally achieved through full cooperation be-

tween all salmon producers, together with the authorities and relevant legislation. Therefore Marine Harvest openly shares its knowledge and experience with all parties. To that end, Marine Harvest organised and held several open seminars in 2008 with the rest of the industry to present its scientific findings, experiences, and practices to mitigate ISA in other territories

In 2008 the authorities in Chile developed new laws and regulations to bring the outbreak under control. These include a proposal for introduction of zones in which all production is coordinated to reduce the risk of infection

between generations of fish and between zones, synchronised fallowing and stocking, along with continued surveillance of all sites. Additionally, and throughout 2008, Marine Harvest continued to apply the strict vigilance, monitoring, contagion and risk management tools at its disposal. Marine Harvest's cautious approach, together with the new controls and regulations, should eventually lead to a profitable future for salmon production in Chile.



### Infectious Salmon Anaemia

Infectious Salmon Anaemia (ISA) is a highly contagious disease that principally affects Atlantic salmon and is caused by the Infectious Salmon Anaemia virus (ISAV). ISAV is an orthomyxovirus (genus Isavirus) that is closely related to the human influenza viruses. It was first diagnosed in Norway in 1984 and the disease has since been identified in Scotland, Canada, US, Ireland (Rainbow trout) and the Faroe Islands. The outbreak in July 2007 was the first declared outbreak in Chile. However the ISAV was identified in Coho salmon in 1999.

Clinical signs generally appear 2-4 weeks after initial infection. Most commonly, disease appears after one year in seawater. Infected fish become lethargic and can exhibit pop-eye, pale

gills, swollen dark livers, swollen or enlarged spleens, extensive pinpoint haemorrhages, fluid (ascites) in the abdominal cavity and around the heart, and severe anaemia. The presence of virus does not necessarily lead to expression of disease. Severity of mortality is related to virus strain and dose, stocking density, lice levels, fish species, strain, age class and water temperature. In freshwater, the virus can be detected without clinical expression of disease.

ISAV is most commonly transmitted horizontally by contact with infected live salmon or biological materials such as animal wastes or discharges from normal operations, slaughter facilities and contaminated well boats. Fish that survive may become carriers and can continue to shed virus. Sea lice can probably also

be vectors of the virus. The spread of disease over long distances can be caused by well boats contaminated with ISAV (transport of infected fish, or through intake water from areas with diseased farms, or through processing plants releasing contaminated water).

Geographical proximity (<5 km) to farms with ISAV, untreated waste water from processing plants, multiple smolt deliveries, use of well boats, sharing of staff and equipment, and general health status are all considered significant risk factors. The efficiency of spread to neighbouring sites and areas is low when outbreak cages are harvested. ISAV is not zoonotic and there is no risk to humans from contact with or consumption of infected fish.

# Health and safety at work

All Marine Harvest businesses endeavour to provide a safe and healthy working environment and take steps to prevent work-related accidents and injuries.

Production and processing businesses have occupational Health, Safety and Working Environment officers that in cooperation with the company health service focus on developing competence, job satisfaction, working environment, safety awareness and reporting. The target is to operate in a way that ensures no detrimental effect on people. All these businesses have health and safety training programmes in place. In addition, they have integrated health and safety into line management and, except the Faroes, all have set targets for goal achievement and improvement.

There were no fatal accidents on Marine Harvest premises in 2008, but the number of minor incidents remains high and requires further attention in 2009.

Absence due to sickness and injuries is an indicator of the quality of the work environment. For Marine Harvest, the highest sick leave and

injury rates are in the harvesting and processing plants in the form of cuts and strains. Strains are also the main cause of long-term sick leave in the company. Marine Harvest is working proactively to prevent such injuries and to provide for alternative work in cases where that is necessary. Various measures and awareness schemes such as job rotation, competence development and restrictions in the use of overtime, appear to have a positive effect on the statistics. Local management follows the development closely in these areas.

## STATUS IN 2008

In 2008, 94,120 days were registered lost due to long/short term sickleave. There is substantial variation in the absentee rates within the Group. The overall absentee rate for 2008 was 4.7 percent. Marine Harvest VAP Europe experienced a decline compared to 2007, while all other units experienced a slight increase in absenteeism.



## Qmarine: Social responsibility

### AMBITIONS IN 2009

Health and safety at work is a management focus point in 2009 with three key objectives. First, awareness of the importance of safety will be raised and a safety-conscious culture engendered. Second, all accident reporting systems in Marine Harvest will be re-evaluated, and a group infrastructure to address safety issues will be created. Third, group policies and procedures relating to health and safety will be improved and implemented as part of the Qmarine global quality management system. The objective is to lead the industry toward the ultimate goal of zero injury performance.

### Focus reduces accidents

Eggesbøneset is the largest processing plant of Marine Harvest Norway. Approximately 100 permanent employees there prepare gutted whole fish and fillets. The number of employees is boosted at peak times by temporary employees, to a maximum of around 150.

In 2006, when Ken Schønningsen was appointed general manager at the plant, Eggesbøneset was recording a high rate of lost time incidents and absenteeism, amounting to 14 percent of the available man-hours at the plant.

"I quickly introduced a health and safety programme to bring this number down," ex-

plains Ken as he describes excellent progress achieved in the past three years.

"I met with the unions, supervisors and other managers to discuss the importance of health and safety and the costs relating to accidents. These were not just the financial costs but also costs in terms of reputation locally and in the industry, and costs in terms of impact on personal and family life. We conducted safety inspections around the plant and all accidents were recorded in formal accident reports. This built up an overview of when, where and how accidents happened. A strict safety regime was introduced. Gloves, goggles and other safety equipment became obligatory – there were no options. All employees,

whether permanent or temporary, receive training in safety at work," he says.

"Health & Safety was made a routine agenda item at all meetings and all decisions were followed up. Additionally, we introduced an incentive scheme to reward employees after periods such as 100 and 200 days free of lost-time incidents. We display the current status on screens in the break rooms so that everyone is continuously aware."

The result of this campaign was a rapid fall in the number of incidents. At the time of writing, Eggesbøneset is approaching 1,000 incident-free days. Celebrations are optimistically planned.



Qmarine:

# Quality assurance

Marine Harvest quality assurance is founded on a global quality management database, MQM, that holds the Qmarine standard operating procedures (SOPs).

SOPs provide guidance for actions and decisions in each of the Qmarine strategic areas of Food safety, Food quality, Fish welfare, Environmental responsibility and Social responsibility. Topics

range from process certification as described in the Food quality chapter, to farming practices and crisis management.

Having SOPs in one database, accessible by all Marine Harvest businesses, enables them to apply the same high standards throughout the company.

## Global Reporting Initiative

This report was prepared using the guidelines of the Global Reporting Initiative and the report team considers it to qualify for Level C of the

guidelines. A GRI index will be published on the Marine Harvest website in the Corporate Responsibility section.

Region	C	B	A
Self declared	✓		
Third party checked			
GRI checked			



# Contact information

---



This report is made by Marine Harvest Corporate in cooperation with the company's Business Units. In order to publish more detailed information on specific issues, some Business Units will publish additional local reports. For further information about local reports, please contact Marine Harvest Corporate or the respective Business Unit.

Marine Harvest ASA  
Pb 1086 Sentrum  
0104 Oslo  
Norway  
Tel: +47 21 56 20 00  
Fax: +47 21 56 20 01

For contact information worldwide, please see company website [www.marineharvest.com](http://www.marineharvest.com)

Design and layout: [www.creato.no](http://www.creato.no)

Photos: Page 1, 2, 9, 12, 17, 39: Norwegian Seafood Export Council/Laksefakta/Kimm Saatvedt/Fred Jonny Hammerø  
Other: Marine Harvest