

The Atlantic wild salmon is threatened

The great majority of Atlantic salmon belong in Norway – and international conventions have given this country a special obligation to safeguard the pattern of diversity within the species. Knowledge about variations within Norwegian wild salmon strains lays the biological basis for strain-directed management. Many strains of wild salmon have already become extinct for various reasons, and man - of those that remain are to a greater or lesser extent exposed to the influence of man.

Acid precipitation
Industrial effluents
Runoff from agriculture

Regulation of rivers
Extraction of sand and gravel in river beds
Removal of woodland lining rivers

Gyrodactylus salaris
Escaped farmed salmon
Salmon lice

Secondary catches
Illegal fishing
Excessive fishing, or wrong fishing methods



Wild salmon

All salmon produced naturally in rivers, irrespective of the genetic history of their forebears, are defined as wild salmon. Natural selection over thousands of years has created local salmon strains adapted to their own particular river. Wild salmon migrate very far and stay away for a long time, but they find their way be k to the river from whi h they emigrated as smolt.

The wild salmon is vulnerable in all phases of its life, but especially so during the migration periods. A salmon normally stays 3 or 4 years in the river and 1 or 2 years in the sea before becoming sexually mature.

The wild salmon is in a serious situation throughout its range. Norway still has some of the largest and strongest strains that remain, and consequently has a particular obligation for the future of the wild salmon. Wild salmon hold a very important place in the culture and settlement pattern of Norwegians. Sami and people of Finnish stc k in Norway, and provide identity, well-being and income for people in settlements near fjords and rivers.

The condition of the wild salmon strains is an indicator of the state of Nature





Farmed salmon

The basis of farmed salmon was wild salmon from about 40 strains which, a few decades ago, were mixed and used for breeding. In the wild, escaped farmed salmon are strays. The number of escapees has been very high for many years, many times greater than the number of spawning wild salmon in all Norwegian rivers combined. The farmed salmon has become the most important domestic animal in Norway in terms of tonnes an export revenue. The industry represents a great deal of value and ensures settlement on the coast. The diversity of the wild salmon is the foundation for the industry's own future. Escaped farmed salmon are one of several threats which can break down the diversity of the wild salmon strains, an escapee of farmed salmon can therefore ruin the reputation of the industry and bring reactions in the market.



Environmental objectives for the Norwegian aquaculture industry

The environmental objectives for Norwegian aquaculture has been prepared by a working group composed of representatives from the Norwegian Directorate of Fisheries, the Norwegian Animal Health Authority – Centre Unit, the Norwegian Medicines Control Authority, the Norwegian Board of Health, the Norwegian Pollution Control Authority, and the Norwegian Directorate for Nature Management.

Environmental objectives for the Norwegian aquaculture industry are set by many ways of trying to save wild salmon. They are intended to make relevant governing bodies accountable, and the co-operation and particular input of the industry are praiseworthy for their satisfactory attainment. In most cases, the introduction of measures will be controlled by the authorities, while the individual farm owners will implement them and meet any costs. Making the industry more conscious of its own impact on the environment will lead to more environmentally-friendly operation.

Environmental objectives involve:

Escapes
The scale of fish escapes from farms must not pose a threat to Norwegian wild salmon strains.

It must be possible to identify escaped farmed fish and have them back to their place of origin.

Diseases
The risk of infections being passed from farmed fish to wild fish must not pose a threat to wild stocks.

Chemicals
Chemicals (eg culling antifouling agents) employed in the aquaculture industry must be as efficient as possible and not result in unacceptable environmental loads.

Copper pollution deriving from net impregnation must be significantly reduced by no later than 2010 (Report to the Storting no. 58, 1998-99, and cease within one generation (North Sea Declaration, 1995)

Medicines
Medicines employed in the aquaculture industry must have maximum efficacy, good bioavailability for the target species and not have unacceptable environmental effects.

Organic effluent
The discharge of organic effluent from aquaculture facilities must not have unacceptable environmental effects, either locally or regionally.

A "gene-bank" for Atlantic salmon

Through natural selection's agonistic makeup of the diff rent salmon stocks has , evolved to either from one river to the n xt. Each salmon stock is adapted to its local environment in the ri ver. To secure the genetic diversity of the Atlantic salmon it is therefore important to protect and preserve each salmon stock.

Many salmon stocks are threatened by ... extinction. Fish from 33 of the most threatened stocks are therefore b ..g in special forms ns called "gene banks". In addition, genetic material from 110 salmon stocks (each stock ... ders are preserved through deepfreezing of sperm.





The river is both the start and finishing post for migrating wild salmon

Many start
Smolt are young salmon fry, going from the rivers to feed in the ocean. A few million ex- ists from Norwegian stock each spri ng. The natural factors have been more than halved by factors created by man. Nature ...selves is responsible for many dan ers, and a lar e number of salmon die a natural death.

Few reach the finishing post
Only a few of those that early rate stay n to the stock.

Escaped farmed fish in the rivers
- spawn with wild salmon and reproduce
- may destroy the spawning ds of the wild salmon,
- may lead to more hybrids of trout and salmon,
- leading to the loss of the salmon's adaptation to its river, evolved over thousands of years.

In Norway, approximately 670 rivers have or used to have, salmon stocks. Salmon stocks in rivers, as of 1 January 1999

Natural stock rivers extinct	44
Stock threatened by pollution	52
Vulnerable stock	103
Originally smolt stock	239
Lax- e stock for a long time	76
Stock made extinct and re-established	11
Uncertain whether a stock exists	13
Status unknown	59

Salmon louse

The salmon louse is a parasite found naturally on salmon in saltwater. It lives on the skin of the salmon. Adult (sexual) salmon lice better than smolt which now are from just a few centimetres.

If farmed salmon in Norway have an average of the female louse with egg strings, the potential infection level will be up to 200 times greater, perhaps 500 to 1000 times greater.





The wild salmon and the farmed salmon - which will win?

The environment of wild salmon and other compared with the vast numbers of farm salmon. Several thousand farms along the coast contain at least 200 million salmon. The quantity of farmed salmon feeds in Norwegian aquaculture of salmon has, and has more probably represents the greatest disease problems the industry. The fish in the cages are dense, but neither escaped nor wild salmon can be trained for salmon lice. This situation increases the pressure on rare wild salmon.

The escape of cultivated fish is a serious environmental problem

Farmed salmon for consumer and salmon, for stock and salmon in the sea, there are about 300 net reared salmon in pens.

The technology now in use by the aquaculture industry results in a large number of fish/cultivated escaping each year through bad weather, poor tests and mistakes in operating routines.





Fish farming sites in Norway pr. 01.01.01



The ecological limit ratio is of wild Atlantic Salmon in norwegian are s was about 600,000 fish in 2000.

The same yea r 33,000,000 fis mad smolts were released into sea cages along the Norwegian coast, and each site (1,2000 m³) could contain as much as 150,000 fish.

The ocean is the wild salmon s larder

The migration to and in the ocean is long and lasts, on a long time, from one to three years.

Conditions in the ocean determine growth and survival. Litte is known about how predators and secondary catches a . salmon in the ocean fishe ries a . ect the wild salmon. To survive the lengthy migration and the struggle according it is fair now, the wild salmon has to grow large and strong, on ever 100-1000 times heavier than when it emigrated.

Directorate for Nature Management



Salmon under water
Photo: Anders Lamberg

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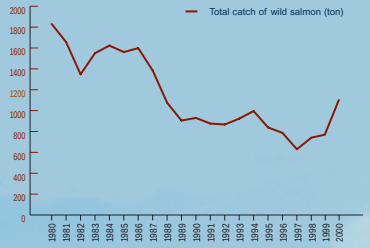
Example of wild salmon catched in river.
Photo Roar Lund

Wild salmon

All salmon produced naturally in rivers, irrespective of the genetic history of their forebears, are defined as wild salmon. Natural selection over thousands of years has created local salmon strains adapted to their own particular river. Wild salmon migrate very far and stay away for a long time, but they find their way back to the river from which they emigrated as smolt. The wild salmon is vulnerable in all phases of its life, but especially so during the migration periods. A salmon normally stays 3 or 4 years in the river and 1 or 2 years in the sea before becoming sexually mature.

The wild salmon is in a serious situation throughout its range. Norway still has some of the largest and strongest strains that remain, and consequently has a particular obligation for the future of the wild salmon. Wild salmon hold a very important place in the culture and settlement pattern of Norwegians, Sami and people of Finnish stock in Norway, and provide identity, well-being and income for people in settlements near fjords and rivers.

The condition of the wild salmon strains is an indicator of the state of Nature.

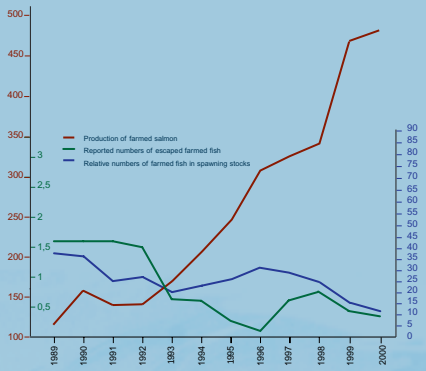




Example of escaped farmed salmon catched in river
Photo: Roar Lund

Farmed salmon

The basis of farmed salmon was wild salmon from about 40 strains which, a few decades ago, were mixed and used for breeding. In the wild, escaped farmed salmon are strays. The number of escapees has been very high for many years, many times greater than the number of spawning wild salmon in all Norwegian rivers combined. The farmed salmon has become the most important domestic animal in Norway, in terms of tonnes and export revenue. The industry represents a great deal of value and ensures settlement on the coast. The diversity of the wild salmon is the foundation for the industry's own future. Escaped farmed salmon are one of several threats which can break down the diversity of the wild salmon strains, and escapes of farmed salmon can therefore ruin the reputation of the industry and bring reactions in the market.



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It must be possible to identify escaped farmed fish and trace them back to their place of origin

Diseases
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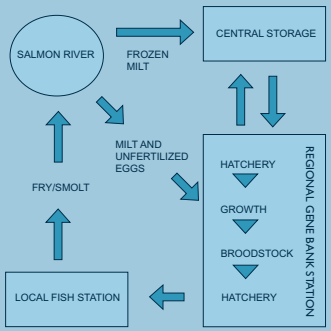
A "gene-bank" for Atlantic salmon

Through natural selectionth egenetic makeup of the different salmon stocks has evolved to differ from one river to the next. Each salmon stock is adapted to its local environment in the river. To secure the genetic diversity of the Atlantic salmon it is therefore important to protect and preserve each salmon stock.

Many salmon stocks are threatened by extinction. Fish from 33 of the most threatened stocks are therefore kept in special fishfarms called “gene-banks”. In addition, genetic material from 172 salmon stocks (6200 individuals) are preserved through deepfreezing of sperm.



The three gene bank centres (squares) are preserving 33 stocks, 5 in Bjerka (green dots), 18 in Haukvik (blue dots) and 10 in Eidfjord (red dots).



The river is both the start and finishing post for migrating wild salmon

Many start
Smolt are young salmon migrating from the rivers to feed in the ocean. A few million migrate from Norwegian rivers each spring. The natural figures have been more than halved by factors created by man. Nature herself is responsible for many dangers, and a large number of salmon die a natural death.

Few reach the finishing post
Only a few of those that emigrate return to the rivers.

Escaped farmed fish in the rivers
- spawn with wild salmon and reproduce
- may destroy the spawning pits of the wild salmon
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- leading to the loss of the salmon's adaptation to its river, evolved over thousands of years

In Norway, approximately 670 rivers have, or used to have, salmon stocks. Salmon stocks in rivers, as of 1 January 1999

Natural stock made extinct	49
Stock threatened by extinction	55
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Large stock for a long time	76
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Salmon louse

The salmon louse is a parasite found naturally on salmon in saltwater. It lives on the skin of the salmon. Adult salmon tolerate salmon lice better than smolt, which may die from just a few parasites.

If farmed salmon in Norway have on average one female louse with egg-strings, the potential infection level will be up to 200 times greater compared to no fish farming.



Wounds caused by salmon lice Photo: Bengt Finstad



Salmon lice Photo: RoarLund

The wild salmon and the farmed salmon - which will win?

The occurrences of wild salmon are small compared with the vast numbers in farm pens. Several thousand farms along the coast contain at least 200 million salmon. The quantity of farmed salmon leads to increased reproduction of salmon lice, and the louse probably represents the greatest disease problem in the industry. The fish in the pens are treated, but neither escaped nor wild salmon can be treated for salmon lice. This situation increases the pressure on the wild salmon.

The escape of cultivated fish is a serious environmental problem

Farmed salmon far outnumber wild salmon. For each wild salmon in the sea, there are about 300 cultivated salmon in pens.

The technology now used by the aquaculture industry results in a large number of farmed salmon escaping each year through bad weather, accidents and mishaps in operating routines.

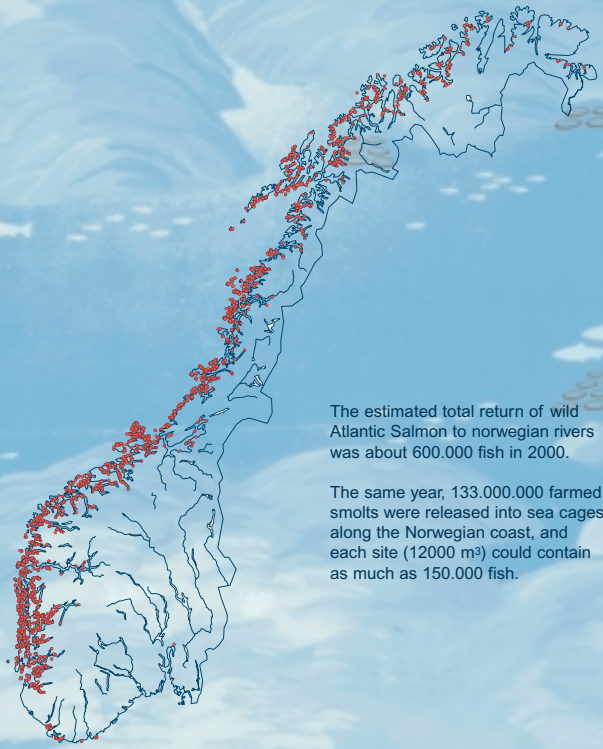


Photo: Arne Nærva



Photo: Vidar Vassvik

Fish farming sites in Norway pr. 01.01.01



The estimated total return of wild Atlantic Salmon to norwegian rivers was about 600.000 fish in 2000.

The same year, 133.000.000 farmed smolts were released into sea cages along the Norwegian coast, and each site (12000 m^3) could contain as much as 150.000 fish.

The ocean is the wild salmon's larder

The migration to feed in the ocean is long and lasts for a long time, from one to three years.

Conditions in the ocean determine growth and survival. Little is known about how predators and secondary catches of salmon in the ocean fisheries affect the wild salmon. To survive the return migration and the struggles awaiting it in the river, the wild salmon has to grow large and strong, at least 100-1000 times heavier than when it emigrated.



Directorate for
Nature Management

Background illustration: Pål Sundhell • Photographed by Leif Hauge • Design og lay-out: Fabel Form AS