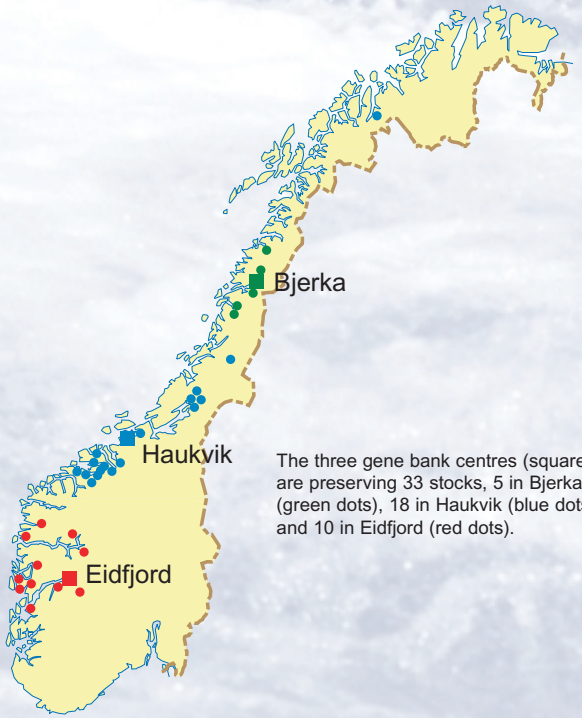
Great emphasis on preventing disease

All the time, a great deal of effort goes into keeping the fish free of disease. The health of all the breeding fish is checked and strict routines have been put into place for how work with the fish shall be carried out, for instance with regard to handling the fish and when eggs and sperms are being transported. All the eggs that are going to be placed in the gene bank are sterilised beforehand. Fresh water is used in the gene bank centres, because sea water is frequently infected with furunculosis bacteria and other organisms that cause diseases in fish. To minimise the risk of spreading fish diseases to the rivers, only disinfected eggs are exported to the hatcheries.

The three gene bank centres are now preserving 33 stocks, 5 in Bjerka, 18 in Haukvik and 10 in Eidfjord.



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).

Milt bank

Deep freezing of sperms enables the preservation of genes for a virtually unlimited period. Two millilitres of sperms are taken from each fish, enough to fertilise about 3 000 eggs.

Emphasis is put on collecting sperms from salmon stocks from different parts of the country as well as different kinds of environment. Stocks that are threatened by extinction, are of special scientific value, or are very valuable for fisheries, are given priority. Salmon from a single river, or from large tributaries, are looked upon as one single stock in this context.

The milt bank now contains material from about 6200 individuals from 172 salmon stocks. There is also material from four trout stocks. The aim is to collect sperms from at least 50 individuals from each stock. Collecting takes place over at least two years to reduce the chance of great overrepresentation of a single year-class.

Partners

Both authorities, organisations and the business sector are actively involved in the gene bank for salmon.

- The Directorate for Nature Management administrates and has scientific responsibility for the gene bank work, which is funded over its operating budget.
- The National Center for Veterinary Contract Research and Commercial Services (VESO) is responsible for the everyday running and practical implementation of the gene bank work on contract from the Directorate. It co-ordinates co-operation between the various participants.
- The building of a live gene bank for West Norway (Eidfjord) was a joint project between the Directorate, the Norwegian Farmers' Union, Eidfjord Borough Council and the State Power Systems.
- The gene bank for North Norway (Bjerka) is run by the State Power Systems, and that for central Norway (Haukvik) is run by a private firm, Haukvik Kraftsmolt A/S, on contract from the Directorate.
- The milt bank material is stored at GENO, Breeding and Artificial Insemination Centre in Trondheim.
- The selection of watercourses to be represented in the live gene bank and the sperm bank is made in co-operation with the various county environmental departments, along with local fishery associations and bodies carrying out cultivation work on the rivers.

Directorate for **Nature Management**

The Norwegian Gene Bank Programme for Atlantic Salmon

Protection of Norwegian wild salmon stocks





The Norwegian Gene Bank Programme for Atlantic Salmon



Photo: Leif Magnus Sættem



Photo: Ketil Skår

Due to the gene bank salmon from the natural stock can be released into the river.

The gene bank centre in Haukvik, Sør-Trøndelag County.

Fish from 33 threatened Norwegian salmon stocks are now swimming around in special facilities called gene bank centres. In addition, genetic material from great many salmon stocks has been secured by freezing sperms. The gene bank is an effective way of preserving the genetic material of Norwegian wild salmon (Salmo salar) for the future.

The national gene bank for salmon was established by the Directorate for Nature Management in 1986 because of the difficult situation for Norwegian wild salmon. In a survey of Norwegian rivers containing salmon as of 1 January 2001, 49 salmon stocks have become extinct and another 55 are severely threatened. The main reasons are acid precipitation, development of water power, the salmon parasite Gyrodactylus salaris and the spread of salmon escaping form fish farms. Characteristics, which have a genetic background, have been found in Norwegian salmon stocks. They have been described as genetic adaptations to local environmental conditions. Interbreeding with escaped farmed fish can lead to a change in these adaptations. It is therefore important to secure the genetic material from the individual stocks.

Live gene bank for seriously threatened stocks

The preservation of live fish is a measure that is used for the most seriously threatened salmon stocks. Stocks, which are no longer capable of surviving in their river, are saved until the danger is over. The gene bank supplies eggs to local hatcheries that produce fish for release.

Gene bank centres for live fish have been established at Eidfjord in Hordaland, Haukvik in Sør-Trøndelag and Bjerka in Nordland. The milt bank is at GENO, Breeding and Artificial Insemination Centre in Trondheim.

How the gene bank is run

Fish that are caught in the rivers are kept in a tank in the vicinity until they are sexually mature and can be milked. Deep-frozen sperms go to a central store, and fresh sperms and unfertilised eggs are taken to a gene bank centre. Eggs from each female fish are fertilised with sperms from one male fish, disinfected and placed in hatching cylinders. The eggs from every individual female are kept separate throughout the process.

After hatching, each family group is kept in separate tanks until the fish are sufficiently large to have their fins clipped, about 7 cm. Families from the same stock are then put together in a tank. During the second year of their life, when they reach smolt size, about 30 individuals from each family group are given individual tags. For the next two years, each generation is kept isolated in separate rooms. This means that each year-class is kept isolated for four years, making it possible to combat any fish diseases which might break out in the facility and simplifying the job of administrating the family groups, year-classes and stocks. After four years, the fish from the oldest year-classes are put together, but the various stocks are still kept apart.

Photo: Arne Nærva and Anders Lamberg TE 1030

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