For the first time, scientists have managed to quantify how much escaped salmon have interbred with wild salmon in Norwegian rivers. These results provide a basis for reassessing the impact that escapees from fish farms have on Norway's wild salmon.

Escapees are considered to be one of the most serious environmental problems facing the fish farming industry. Ever since the Atlantic salmon farming industry was established in the early 1970s, there has been debate over the genetic impact of farmed escapees on native salmon populations.

"Methodological limitations have created uncertainty as to how big the problem is. However, we have now developed a stronger tool that can measure the percentage of farmed fish that has interbred," says Kevin Glover, senior scientist at the Institute of Marine Research in Norway.

Surveyed 20 rivers

Scientists investigated 20 rivers along the Norwegian coast for this latest study. These rivers had been studied before and genetic changes in the native populations were discovered then. These previous studies hypothesized that interbreeding by escaped farmed fish was the reason for the change. Now scientists can actually confirm that farmed escapees were the cause.

This new knowledge provides a far better basis for measuring genetic changes taking place over generations because of farmed escapees, and should be a useful tool for managers.

"The new results show significant changes in five of the 20 native populations we studied. We found the highest level of changes in rivers Loneelva, Vosso and Opo, where the introgression rates vary from 31 to 47 percent," says Glover. Introgression is the movement of a gene from one species into the gene pool of another species.

Less interbreeding then expected

The models that have been used to quantify this interbreeding have so far revealed higher genetic impact on native populations than the empirical estimates from this study. Despite the fact that strong interbreeding has been observed in some of the rivers, the results show that Norway still has a number of populations of wild salmon that show low or moderate signs of change.

Earlier studies of spawning behaviour and survival of juveniles show that farmed salmon often lose in the competition with wild salmon out in the wild. The result is that there is less interbreeding than would be expected from the sheer number of escapees in the rivers.

"We see less interbreeding in rivers with big, robust stocks of wild salmon than in rivers with less wild fish.
Probably, farmed fish lose the battle on the spawning grounds when there are large numbers of wild fish present, while they have more success in rivers with low numbers of wild fish,” says Glover.

New method

Norwegian scientists developed a new kind of genetic and statistical method to generate these results. The method requires access to both new samples and old control samples from the same populations.

"For the first time in the international scientific world, someone has been able to establish a method where it is possible to quantify the genetic changes that happen over time and that are caused by the interbreeding of farmed salmon," says Glover.

Biological consequences?

The new method makes it possible to determine the extent of interbreeding by escaped farmed salmon. The next step is to develop methods to quantify the biological consequences of different levels of interbreeding.

"Several national and international projects have this as their topic. However, it’s work that takes time, which means that it might be years before we see results," Glover says.

Read the Norwegian version of this article at forskning.no [8]