



Will sterile triploid cod save the cod farming industry?

Background photo: Blood celles from cod.

In recent years, the cod farming industry has faced a steep uphill battle on account of poor profitability and, to some extent, a bad reputation due to a large number of escapes. Meanwhile, the biological conditions for successful cod farming are constantly improving, and the market prospects are good if production costs can be kept down.

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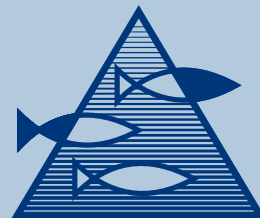
The results of preliminary experiments involving the production of sterile cod are promising: these cod show reduced sexual maturation, but apparently grow at a similar rate to normal cod. If they can be used for commercial production, it will reduce the problem of the genetic impact of fish farming on wild fish populations caused by escapes and by spawning in sea cages.

STERILE COD

It is possible to induce sterility in cod by exposing fertilized eggs to high pressure at the right time. This gives the fish an extra set of chromosomes, making them

what is called triploid. A triploid organism has three sets of chromosomes, as opposed to the two sets of a diploid (normal) organism, but apart from that it has the same genetic properties. Triploid organisms are particularly widely used in agriculture, in order to produce sterile animals and plants. In continental Europe the method is also used in the production of rainbow trout. In Norway and Scotland, meanwhile, exciting new results have been achieved using sterile triploid salmon. Cod can be made triploid by exposing the eggs to high pressure for five minutes immediately after fertilization, which is roughly the same method as for salmonids.





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PRODUCTION OF TRIPLOID JUVENILES

In spring 2010, triploid juvenile cod were produced at the Institute of Marine Research's field station at Parisvatnet in Øygarden near Bergen. This was the first time that this had been done on a large scale anywhere in the world. In July 2010, around 140,000 of these juveniles were transferred to Gulen Marine Farm in the county of Sogn og Fjordane for testing under realistic farm conditions. The testing is being done through a research project part-funded by Innovation Norway, which is comparing triploid and diploid cod in terms of production parameters such as growth, mortality, deformities and sexual maturation.

When those samples were taken in May 2011, the fish were just over one year old and had an average weight of 338 grams. They would probably have

weighed even more had it not been for the cold winter. Almost no deformed fish were observed.

The fish that were released into the cages were a mixture of triploid and diploid fish. The triploid individuals have larger cells than the diploid ones, and by measuring the size of the blood cells, it is possible to distinguish between the two types (see Figure). Although so far the diploid individuals appear to have grown slightly more than the triploid ones, one would expect this difference to narrow when they start to reach sexual maturity.

Overall the results are very promising so far, and further sampling prior to slaughter in summer 2012 will show us whether sterile juvenile cod represent the future of cod farming.

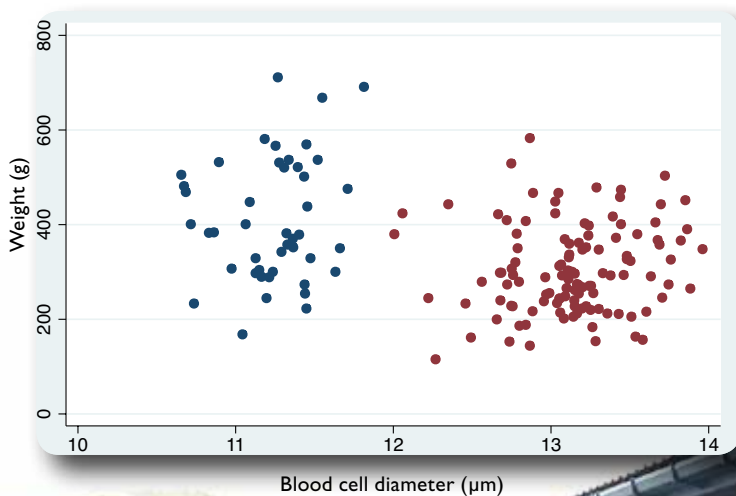
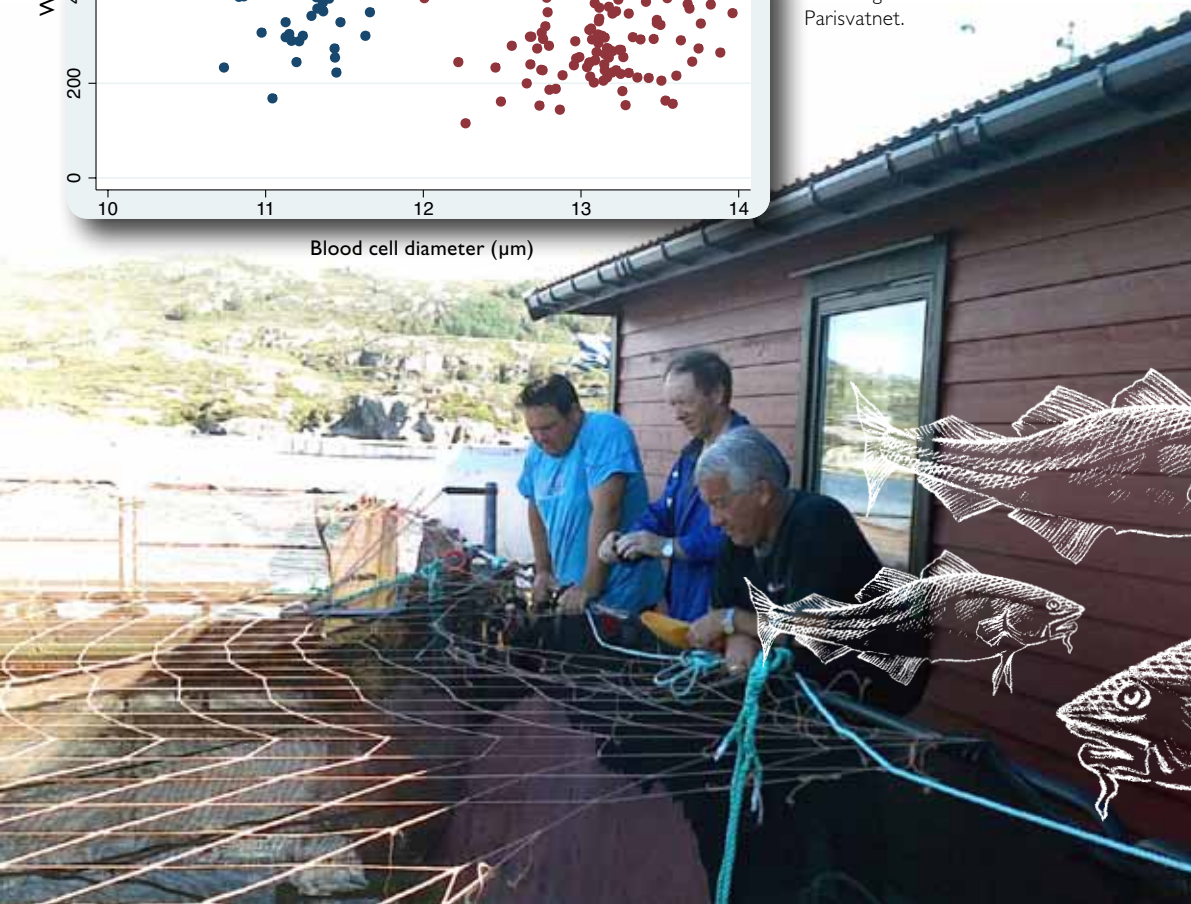


Figure: Here you can see the diameter of the red blood cells plotted against the growth of the fish in May 2011. Red dots represent triploid individuals and blue dots represent diploid ones.

Photo: The triploid fish have been released into sea cages at Gulen Marine Farm together with normal cod from Parisvatnet.



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