# Special chip provides better picture of salmon health

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How do you tell if a fish is fit and well? This is a question which has troubled farmers and biologists for years, but now scientists may have come up with the answer - using DNA chips. By studying the genes of Atlantic salmon scientists from three UK universities are developing a DNA chip to monitor the health and performance of salmon, a tool which could both save the salmon industry thousands and also help conserve dwindling wild salmon populations.

Atlantic salmon are the most important farmed fish in the UK and a disappearing species in the wild. They are particularly vulnerable to infection because of the dramatic physical and chemical changes they go through, known as smoltification, which enable them to live in both fresh and salt water. Assessing their health and performance is very difficult as conventional measures used in other animals, such as temperature, blood protein levels and general demeanour, are not relevant or are difficult to assess in fish.

Farmers and conservationists currently have to rely on the general appearance of salmon as an indicator of their health, which is far from ideal. The new DNA chip will help farmers assess the state of their stock more accurately and also enable conservationists to sample wild populations to ascertain their health and wellbeing.

The development of the chip is the culmination of a four-year study known as Salmon TRAITS (Transcription Analysis of Important Traits in Salmon) being carried out by scientists at the Universities of Stirling,

Aberdeen and Cardiff, together with ARK Genomics at the Roslin Institute and researchers at the Norwegian School of Veterinary Science. Funding for the project is from the Biotechnology and Biological Sciences Research Council's (BBSRC) Exploiting Genomics initiative.

To develop a more effective method of monitoring salmon health and performance the scientists have been studying salmon gene expression. By doing this, they have identified genes which play different roles in the lifecycle of salmon, for example immune response.

Professor Chris Secombes lead researcher from the University of Aberdeen explained: "We have identified hundreds of genes which are increased or decreased following infection, many of which may be indicators of disease. We have also looked at what other factors impact on these genes, such as nutrition. We are now working to encode this information onto a chip which could help farmers monitor the health and performance of their stocks through methods such as changing their nutritional intake."

So far the scientists have identified the genes and metabolic pathways which influence the most commercially important traits for the production of salmon. These are; the supply of contaminant-free highly unsaturated oils, including omega-3s, for the salmon diet, their long and complex lifecycle, infectious disease, and protein growth efficiency.

Professor Alan Teale, lead researcher at the Institute of Aquaculture at the University of Stirling and Co-ordinator of TRAITS explained: "What we are working on is precision aquaculture, where we use very sensitive measures – gene expression – to pre-empt any adverse production changes in farmed fish populations as well as to maximise their health and wellbeing. This in turn will increase competitiveness and profitability for the salmon farmer.

"We have identified genes involved in polyunsaturated fatty acid metabolism, protein metabolism, bacterial and viral infection, and freshwater to seawater adaptation. The DNA chip will be able to identify changes in the activity of these genes and so alert us to any potential problems. It is too early to tell whether this chip will be a commercial success, but it certainly has the potential to be extremely useful to industry," Professor Teale said.

Professor Julia Goodfellow, BBSRC Chief Executive, said: "This is another important step forward in genomics research, not only does it further our knowledge base, it also offers tangible benefits for the aquaculture industry and for the conservation of wild salmon, offering the chance to reverse the decline in Britain's salmon population."

Source: Biotechnology and Biological Sciences Research Council