

Fish farm escapees: Identification with DNA

A DNA-based forensic identification method that enables the identification of farm of origin for unreported escapees has been developed by researchers at IMR. The method has been successfully implemented in several cases and is currently being applied in identification of salmon, rainbow trout and cod escapees. The method is developed in order to assist the Norwegian Directorate of Fisheries.

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Each year, hundreds of thousands of farmed fish escape from net pens into the wild. Farmed escapees may breed with wild fish, and impact the long-term viability of wild stocks. Although fish farmers are legally obliged to report escapement, a significant number of escapees go unreported each year. In order for fish farming to represent a sustainable and environmentally acceptable industry, the number of farmed escapees needs to be reduced.

A range of identification methods, including physical tagging of all farmed fish, have been evaluated by a national committee established by the Directorate of Fisheries in 2004. The standby (i.e. post-escapement) method of identification was outlined as the most feasible, and various methods were evaluated in the project TRACES (2006–2007) funded by the Norwegian Research Council and The Norwegian Seafood Federation.

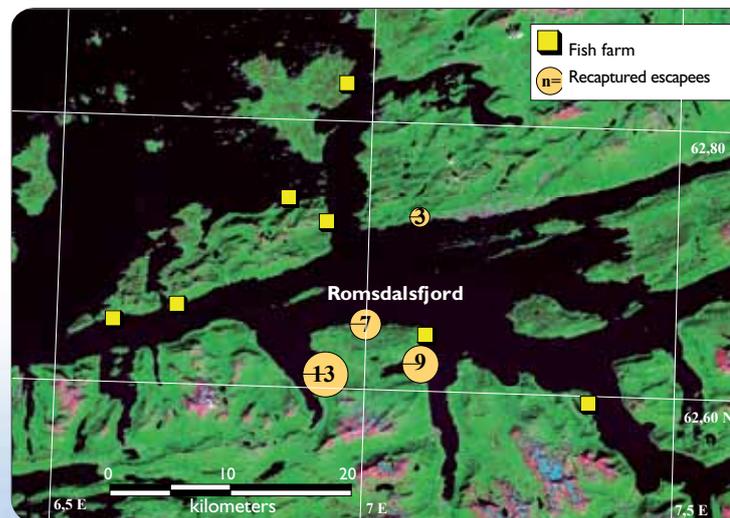
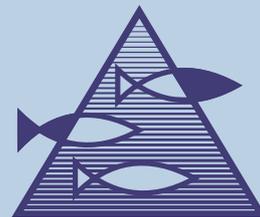


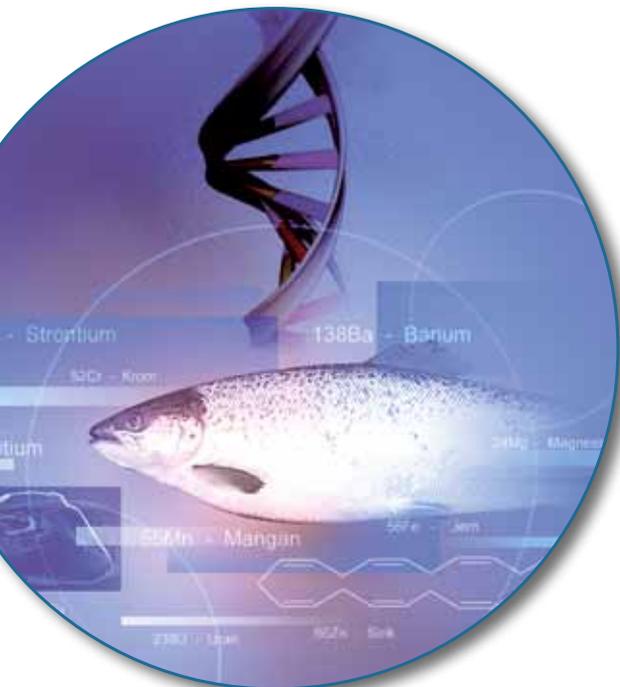
Figure 1
The first test of the DNA identification method established in TRACES was successfully conducted in the Romsdalsfjord in 2006. The map shows locations of salmon farms and the locations where the escapees were captured.





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In short, the method uses a procedure called genetic assignment to match and exclude the genetic profile of individual escaped fish with fish sampled on all farms operating within the region where the escapees were observed and recaptured (Figure 2). The method requires no prior knowledge of the farmed fish, and there is no need for physical tagging of the fish. It rests purely on naturally occurring DNA variation in the fish.

ESTABLISHED FOR SALMON, RAINBOW TROUT AND COD

Through further research projects, the DNA method has been demonstrated to also work for the identification of rainbow trout and cod escapees, and now, this method is established as a routine service for the Norwegian Directorate of Fisheries to investigate unreported escapement events for the three major farmed species. Analysis protocols are continuously being advanced with new statistical methods and genetic markers.

SUCCESSFULLY IMPLEMENTED DNA METHOD

Through the project TRACES, a DNA-based, stand-by method for the identification of Atlantic salmon was established and successfully implemented in a real-life escapement episode in 2006 (Figure 1). This resulted in a fine for the company, imposed by the Norwegian police for investigation of economic and environmental crime, and represents the first time a DNA method has been used to identify the source of fish-farm escapees globally.

INTERNATIONAL INTEREST

In collaboration with researchers at IMR, the method has already been implemented by the Technical University of Denmark in a potential case of fraud between breeder and producer in Denmark. In addition several European fish farm regulatory bodies have shown interest in this technique, and the method is set to be tested in the field in Scotland in 2009.

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Figure 2

Percentage of escapees with a DNA profile that matched the salmon in various sea cages located in the Romsdalfjord. Farm 5I represents the source of escapement.

