

Biotechnology

Scientists at the Matis Biotechnology Division (Prokaria), have a long experience in developing products for the food industry, as well as in the field of biotechnology, genetic engineering and consumer healthcare products. The foundation of the division is the work conducted for many years by the biotechnology company Prokaria, a leader in sequence-based discovery and screening of natural diversity from extreme environments.



Choosing the “right” fish for farming

The most important fish species

Atlantic cod (*Gadus morhua*) is the most abundant and most valuable groundfish stock in the Northern Atlantic Ocean. However, wild stocks have been declining worldwide due to overexploitation. The increasing demand for the fish has pushed up the price of cod and made cod farming a feasible industry.

Fish farming

However, as many in the salmon farming industry have learned, fish farming is a difficult and costly business. One of the ways to minimise risk and maximise profits in cod farming is to choose the “right” cod.

“Fingerprinting” the cod

One of the many interesting projects which scientists at Matis have been working on is the development of new genotyping kits for Atlantic cod, based on microsatellite markers. The goal of the project, was to develop new genotyping kits for Atlantic cod based on microsatellite markers. A total of 118 markers were analyzed. Two 10 microsatellite markers sets were developed (CodPrint10a and CodPrint10b) and used to analyze approximately 300 samples that were collected from the sea Northeast of Iceland and inshore Iceland and offshore Southwest of Iceland. For comparison the samples were also analyzed using nine previously known markers.

A comparison of the new microsatellite loci to the nine previously used showed that the power of individual discrimination was much stronger using the new microsatellite loci. Indeed, the discrimination of the samples was clearer showing much less

overlap of the individual groups. Together, these results suggest that the new microsatellite loci are powerful and suitable for population genetics, genetic monitoring of cod stocks, and kinship as well as pedigree tracing in cod farming. That these microsatellites can be managed in only two large multiplex assays systems is a major advantage. Larger number of samples and smaller DNA quantities can now be genotyped at reasonable costs and time. The manipulation of a large number of samples is also minimized and therefore, the risk of handling errors.

The practical use of the new method

In some countries the import of fresh fish is regulated by import quotas. Local custom services must therefore be able to identify imported fresh cod and cod products to determine whether they are regulated items. The new method could potentially enable authorities to identify the origin of all kinds of regulated species.

Matis has begun offering services, based on the new method. A number of Icelandic and foreign parties, e.g. fish farming companies, research institutes and universities, have already started using this new technology.

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Biotechnology

Choosing the “right” fish for farming continued

Dissemination

The results of the project have already been published in a peer-reviewed journal (Jakobsdottir et al. 2005. Molecular Ecology Notes) and more articles have been submitted.

Atlantic salmon (*Salmo salar*)

Matis has developed multiplexes for running 15 microsatellite markers (SSsp2210, SSspG7, Ssa197, Ssa171, Ssa202, SSsp2201, SsaD157, SSsp3016, SsaF43, SsaD486, SSsp2216, SSsp1605, Ssa289, SsaD144, Ssa14). These were selected at an international workshop on microsatellites and genetic stock identification in Martinsburg, West Virginia, USA, 2004 as being the microsatellites of selection in an international genetic database of Atlantic salmon using a standardized screening method based on the 15 microsatellite markers. The goal of the global project on salmon is to be able to trace the salmon of the Atlantic ocean to its origin. Many countries have started local analyzes of their river stocks using these microsatellite markers. Matis offers services of salmon genotyping using these 15 microsatellite markers.

Red fish (*Sebastes marinus*)

Matis has developed multiplexes for running 13 microsatellite markers (SEB9, SEB25, SEB31, SEB33, SEB45, Smen5, Smen10, Sal1, Spi4, Sal3, Sal4, Spi6, Spi10) for genotyping red fish. The markers have been used internationally for stock analyzes of red fish.

Matis offers services of red fish genotyping using these 13 microsatellite markers.

Halibut (*Hippoglossus hippoglossus*)

Matis has developed multiplexes for running 8 microsatellite markers (Hhi-52, Hhi-56, HhiA44, HhiI129, HhiC17, HhiJ42, HhiD34, Hhi-60). These markers have been used for parental assignment in breeding programs of halibut. They can also be used for wild stocks of halibut.

Matis offers services of halibut genotyping using these 8 microsatellite markers

Fin whale (*Balaenoptera physalus*)

Matis has developed multiplexes for 18 microsatellite markers (GT211, GT310, EV1P, EV37, GATA098, GATA417, GT023F, GT575, GATA028, GT195, GT271, GT307, GATA053, GGAA520, TAA023, GT011, EV094, ZFYX0582) used for stock analyzes of finwhale for the Marine Research Institute of Iceland.

Matis offers services of fin whale genotyping using these 17 microsatellite markers as well as sequencing of the mtDNA D-loop.

Minke whale (*Balaenoptera acutorostrata*)

Matis has developed multiplexes for 17 microsatellite markers ((GT211, GT310, GT509, EV1P, EV37, GATA098, GATA417, GT023F, GT575, GATA028, GT195, GATA053, sam25, EV096, GT011, EV094, ZFYX0582) for genotyping and stock analyzes of minke whale for the Marine Research Institute of Iceland.

Matis offers services of minke whale genotyping using these 17 microsatellite markers as well as sequencing of the mtDNA D-loop.

Other services

- Development of new or better microsatellite markers and multiplexes for a particular species.
- Screening for SNPs in important genes.
- Screening markers associated with genes related to growth, maturity or other important commercial properties.