

## “AQUAFIRST”

### Selective breeding to improve disease and stress resistance in fish and shellfish

*Under intensive aquaculture conditions, fish are exposed to various stressors which are unavoidable in the breeding environment. These stressful conditions lead to an overall reduction in performance, including poor acclimatization and growth performance, impaired reproduction and increased susceptibility to disease, causing growers to use antibiotics and drugs. In shellfishery, significant mortality occurs during the summer months among Pacific oysters in several countries.*

*The causes of this are complex and physiological, environment and pathology are at the origin of the troubles.*

All these factors have a significant effect on the performance of the fish-farming sector, which would be improved if the risk of disease and stress could be reduced through targeted, selective breeding.

In this context, the **AQUAFIRST** project seeks to **identify genes associated with stress and disease resistance** in fish (sea bream, sea bass and rainbow trout) and molluscs (oyster) to provide a physiological and genetic **basis for marker-assisted selective breeding of disease and/or stress resistant individuals.**



STRIPPING EGGS. SOURCE: AQUATOUR.

an organism's known genes and/or markers, will contribute to more efficient choice of markers and candidate genes for population screens. The **STRESSGENES** project focused on trout and identified candidate genes associated with resistance to different stress conditions. During this project, a microarray was developed that will be used to build the **AQUAFIRST** one.

Up to this moment, experiments have been performed whereby all species under study have been exposed to pathogens or to stress conditions, and RNA has been extracted from the most relevant tissues per stressor and per species (e.g. trout was exposed to the VHS virus and fin and spleen tissues were tested). Based on this, a relevant expressed sequence tag (EST) collection is being constructed of cloned genes that are implicated in either confinement stress or pathogen exposure.

A certain type of marker, known as SNP markers, is also being developed, so as to improve the density of the available linkage maps. These maps will then be used to increase the probability of detecting the desired Qualitative Trait Loci (QTL) - regions of DNA of which the expression is associated with

**AQUAFIRST** builds on three earlier EU-funded projects: **BASSMAP**, **BRIDGEMAP** and **STRESSGENES**. In **BASSMAP** and **BRIDGEMAP** genetic linkage maps were developed for sea bass and sea bream respectively; these maps, which are detailed “DNA road maps” that show the position of



**Project acronym:**

AQUAFIRST

**Full title of Project:**

Combined genetic and functional genomic approaches for stress and disease resistance marker-assisted selection in fish and shellfish

**EU contract number:**

513692

**Web-site:**

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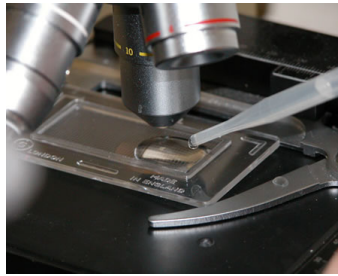
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disease and stress resistance, and the QTL will be analysed to identify genes that are associated with stress specific traits and disease resistance traits. Finally, operational **genetic protocols** will be outlined, incorporating identified QTL and traditional breeding approaches in oyster, sea bream and sea bass.

An aquaculture sector that relies on selective breeding, rather than pharmaceutical intervention, will reduce public reservations towards a key sector of the European seafood industry.



SOURCE: AQUATOUR.

Genetic selection can be a very effective tool in stress and disease management of farmed animals. By identifying stress related genes in farmed fish and shellfish, AQUAFIRST hopes to contribute to a more efficient production and improved profit margins through lower cost and increased added value whilst maintaining the welfare of the fish. In addition, the development of 'targeted' selective breeding methods will reduce the need for antibiotics and help the EU meet targets for reducing residues in foodstuffs and the environment.

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