

AQUAGENOME

European Commission
6th Framework Program- Scientific Support to Policy

Genomics in fish and shellfish: from research to aquaculture

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What is Genomics?

Genomics refers to the **Whole Genome level** and came out of the Human genome project: 1990 - 2000.

It is a **new integrative approach** in biological sciences about identifying the **links between DNA variation and phenotypic outcome** at the individual, population and species level.

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What is Genomics?

Genomics comprises:

- **Functional & Environmental Genomics:** development, physiology, biochemistry at the gene expression level for different environments.
It is really rediscovering the organisms with many surprises about what gene does what. We are now talking about systems biology.
- **Comparative Genomics** – identification of Evolutionary conserved structures and functions => shortcuts in identifying gene to phenotype relationships in one species by use of information of a much more studied species.
It does work! Genetic part of the **Theory of evolution** built from 1920-1970 has been shown to work quite well!

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Genomics: There are emerging qualities in produced information

I. High level of observation – e.g. Action of thousands of genes are “seen” simultaneously at tissue level, group of cells, whole organism (microarrays, new sequencing technology)

II. Offers Integration of approaches: genetics, development and physiology

- It offers **higher quality and scope in already existing approaches** of biological research allowing much deeper and global understanding of organisms.
- As a result, we get to know organisms much better, they are **less of black boxes. They almost talk to us.**

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Genomics facilitates:

Assessing **cause to effect relationships** in gene interactions – Gives a deep insight in organisms functioning in its complexity under different environmental conditions.

As a result, **efficient husbandry** by informed manipulations of the conditions based on the potential of the biological material at hand (e.g. for juveniles, when to start feeding what and how, densities, when the digestive system is mature, optimal O₂ levels, etc.)

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Some potential applications of Genomics in Aquaculture

- Achieve **traceability** of the population **history, origin** (geographic), **broodstock, genetic value for a given trait**
- **Faster** and more **efficient Selective breeding** and domestication (QTL mapping, MAS, etc.)
- Obtain good **Bioindicators** for stress, disease response, egg quality, maturation of physiological processes in early stage (time series analysis), etc.

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AQUAGENOME project

EC call (Concerted Action): January 2007-December 2008
Application of genomics to aquaculture

Objectives: (1) Coordinate the ongoing and future national and international research projects (2) Foster the application of fundamental research results to aquaculture industry.

Expected outputs:

- Bring together research groups in the field of aquaculture genomics for exchanges of knowledge, resources, methodologies.
- Critical appreciation of achievements in genomic research and identification of further research needs to support industrial exploitation
- Transfer of the knowledge to the European aquaculture production sector.

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Partners

- INRA-SCRIBE, Rennes (France), coordination Dr. Patrick Prunet.
- IMR, Bergen (Norway) CSIC, Vigo, Spain
- Genesis Faraday, Scotland, UK University of Göteborg
- SYSAAF, Rennes (France) University of the Algarve
- IMBG, HCMR, Heraklion, Greece. VNIRO, Moscow, Russia.

•+ Aquagenome Associated Partner Network (A2PN)



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Aims to be achieved:

- Inventory of the genomic resources, tools and expertise.
- Identification of new bioinformatic resources and tools vital for the development of European aquaculture
- Identification of specific research domains in which genomic approaches should be developed.
- Exchanges of scientists and genomic resources between partners associated with AQUAGENOME (A2PN).
- Determination of actions to carry in order to apply genomic tools and knowledge in aquaculture.

Instruments:

Working groups, workshops, technical reports, website, grants to support exchanges, development of database and software.

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Links with Institutions and projects related to fish and shellfish genomics

- Aquagenome Associated Partner Network (A²PN): 31 partners.
- Continuity with Aquafunc project (WP1).
- Links with Aquabreeding project (WP4).
- Contacts with other EU-funded project: FABRE, Eadgene, Profet Policy.

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Implementation Plan

WP1: Existing genomic resources and future developments.

- **Inventory of the genomic resources**, tools and associated expertise (condition of access, service provided, analysis of the sustainability of the resource)

- **Tools or organizational structure** to answer requests from research groups:
 - To maintain and update a database on genomic resources, tools, expertise.
 - To develop legal framework and common agreement on use of data and resources.
 - To design a meta-network linking accessible resources.

- **Identify new information** needed on fish and shellfish genomics: genome to be sequenced, meta-analysis of functional genomic data.

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WP2: Analysis of genomic research to be developed for aquaculture.

Objective: Identification of further research needed to fill gap in aquaculture research.

Activities:

- Genomics of host-pathogen interactions in fish and shellfish.
- Genomics in breeding
- Genomics of interactions between rearing environment, husbandry practises and animal welfare.
- Reproductive genomics.
- Genomics in product quality and safety, including nutrigenomics.

→ Mini-symposium with A2PN (September 2007).

Results:

Construction of a foreseeing plan of the prioritized research ('white paper').

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WP3: Exchange program.

Objective: To offer support for scientist exchanges between partners in order to optimize the use of genomic resources available within the network.

- Training
- Exchange program

Activities: Grants for visits (months) distributed through an exchange program (application, evaluation by the MG).

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WP4: knowledge transfer to aquaculture.

Objectives:

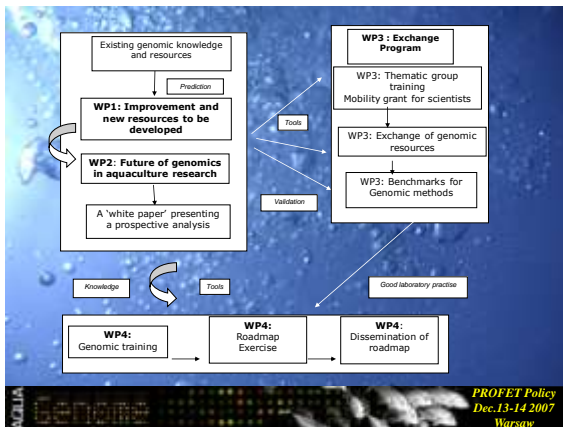
Fostering the application of genomic research results in new techniques developed by aquaculture industry.

Activities:

- Identification of major actors from aquaculture sector.
- Training/information courses for aquaculture professionals on the potentiality of genomic approaches.
- Workshop gathering researchers and aquaculture professionals to construct a roadmap of the major actions to be developed (*to be planned in 2008*).
- identification of technologies that have perspectives for transfer to industries.

Results: Site visit workshops with breeding company, a technology roadmap (workshop and report), training sessions, technology transfer discussions.

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Bergen meeting three workgroups

- Genomic tools and bioinformatic resources.
- Genomics in reproduction and breeding programmes
- Genomics of host-pathogen interaction

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Not yet on the web page:

- AQUAGENOME ROADMAP MEETING
- Scotland, June 17-18 2008

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Thank you for your attention!