



FINEFISH

Reduction of malformations of juvenile fish in hatcheries

The Challenge

During 2003-2004, the Federation of European Aquaculture Producers (FEAP) conducted a series of workshops to assess the research needs of Europe's varied fish-farming sectors, better known as the PROFET workshops. In one specialised meeting on fish reproduction, hatchery managers from across Europe reported that high levels of skeletal malformations in fingerlings – juvenile fish about the size of a human finger – were a big sectoral problem. Since malformed fish cannot be sold to consumers, and must to be discarded, they represent a major source of financial losses for both SME hatcheries and growers. These losses have been estimated at more than €50 million/year. In addition to such direct losses, malformed fish also consume more food and thereby decrease production efficiency. Therefore, methods for preventing malformations are seen as one of the most important research tasks for the European aquaculture industry.

Coordinated by FEAP, the FINEFISH project (2005-2009) aimed to accomplish these objectives. It brought together 20 partners, including ten top European fish hatcheries and scientists specialising in fish development, for a long-range study on factors that influence the development and the health of young fish.

Project Objective

The primary objective of the FINEFISH project was to develop practical guidelines on how to avoid malformations in fish. A series of studies covering the main species in European aquaculture production – sea bream, sea bass, salmon, trout, and cod – were initiated to examine possible causes of malformation.

Key Points

Studies were focused on the following factors and their role in the reduction of malformations:

- rearing temperatures, with emphasis on early life stages;
- nutrition, with focus on nutritional quality and impact on bone mineralization of both starter and grower diets, and tank environment, including gas supplementation and hydrodynamics.

All experiments were initially performed in small-scale research facilities but were later tested and validated under commercial conditions within the participating SMEs. The SMEs also designed field trials, with the scientists, which focused on implementation within the specific infrastructure of each hatchery.

During the project, additional focus was given to the difficulties of un-

EATiP Thematic Area of Relevance

TA1: Product Quality, Consumer Safety and Health

TA2: Technology and Systems

TA3: Managing the Biological Lifecycle

TA4: Sustainable Feed Production

TA5: Integration with the Environment

TA6: Knowledge Management

TA7: Aquatic Animal Health and Welfare

TA8: Socio-Economics and Management

Key Words

Malformations, best practice, sea bream, sea bass, salmon, trout, and cod, datamining

Project Information

Contract number:

12451

Contract type:

SMEs-Collective research projects

Action line:

SME-2 Collective Research (all areas of science and technology)

Duration:

48 months (17/10/2005 – 16/10/2009)

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Understanding the interplay of multi-factorial influences and the project developed an innovative web-based monitoring programme that uses data-mining technology. While this component is still under development, it provides a unique opportunity to consolidate and analyse both scientific and operational data so as to improve understanding of malformation incidence and causal factors.

Output Highlights

Analytical methods

Diagnostic manuals on malformations were developed for sea bass, sea bream, salmon, rainbow trout and cod. In addition, recommendations for best hatchery practice were tested and implemented by the SMEs within the project consortium and were prepared for each species. These manuals are based on existing knowledge at the start of the project and consisted of protocols for the morphological classification of the various malformations. The manuals were developed and updated during the course of the project.

New guidelines

The new knowledge gained on strategies to reduce malformations were summarised as guidelines for use in “Best Practice” hatchery operating manuals:

- A general Best Management Practice in Hatcheries
- A Best Management Practice for the reduction of malformations, which were more detailed and species-specific.

In order that the entire European aquaculture industry benefit from these results, the project gave all active members of the European fish farming profession access to the knowledge of the FineFish project.

The Full Report:

For a comprehensive description of the research project and the products of the project, visit www.finefish.info

Next Steps – Suggested Actions/Follow On

During the project, several distinct opportunities were identified for follow-up actions that would extend the advances made in Finefish. These include improvements and updating of the training materials developed and the annual updating of the diagnostic manuals on deformities.

More specific project actions included the following:



RTD

- Improve the understanding the needs for best broodstock handling and preparation, prior to the production of juveniles, was a key point for the marine hatcheries.



SME

- Another action was to extend the use of the hatchery monitoring system – to scientists and to professional hatcheries – so as to build an accessible knowledge base, coupled to advisory services, which would give both individual hatchery analysis and more specific diagnostic capacity on the incidence and causal factors influencing malformations.

Both options are currently under examination with members of the FINEFISH consortium.

Related Publications/Projects

Larvanet (www.larvanet.org)

Darias M.J., Mazurais D., Koumoundouros G., Cahu C.L., Zambonino-Infante J.L., 2009. Dietary vitamins C and D affect the skeletal development of European sea bass (*Dicentrarchus labrax*) larvae. LARVI '09 – Fish & Shellfish Larviculture Symposium, C.I. Hendry, G. Van Stappen, M. Wille and P. Sorgeloos (Eds), European Aquaculture Society, Special Publication No. 38, Oostende, Belgium, pp. 60-61.

Espmark, Å. And Baeverfjord, G. (2009). Effects of hyperoxia on behavioural and physiological variables in farmed Atlantic salmon (*Salmo salar*) parr. *Aquacult. Int.* 17, 341-353.

Fontagné S., Silva N., Bazin D., Ramos A., Aguirre P., Surget A., Abrantes A., Kaushik S.J., Power D.M., 2009.

Effects of dietary phosphorus and calcium level on growth and skeletal development in rainbow trout (*Oncorhynchus mykiss*) fry. *Aquaculture*, accepted.

Koven W.M., Koumoundouros G., Pittman K., Ginzbourg B., Sandel E., Lutzky S., Nixon O., Tandler A., 2009. The effect of larval rearing on juvenile quality. LARVI '09 – Fish & Shellfish Larviculture Symposium, C.I. Hendry, G. Van Stappen, M. Wille and P. Sorgeloos (Eds), European Aquaculture Society, Special Publication No. 38, Oostende, Belgium, pp. 211-212.

Witten, P.E., Gil-Martens, L., Huysseune, A., Takle, H., Hjelde, K. (2009). Towards a classification and an understanding of developmental relationships of vertebral body malformations in Atlantic salmon (*Salmo salar* L.). *Aquaculture* 295, 6-14.

Ytteborg, E., Baeverfjord, G., Hjelde, K., Torgersen, J., Takle, H. (2009) Molecular pathology of vertebral deformities in hyperthermic Atlantic salmon (*Salmo salar*). *BMC Physiology* (Accepted).