



ALFA

Development of an automated innovative system for the continuous live feed production in aquaculture hatchery units

The Challenge

The European aquaculture production of marine fish fry from intensive marine hatcheries was around 450 million in 1999 and 2000 and has been one of the fastest growing sectors of food production over the last 20 years. The present production (year 2000) estimate is 500 million fry with an average value of Euro 0.2/piece which has a total value of 100 million euro and will produce around 110,000 tonnes of market-sized fish worth approximately 440 million euro.

The cost of the fry is approximately 20% of the value of the final market sized fish. Of this, the cost of food is around 20% with live food accounting for between 10 and 12% of the total cost of production. Hatchery production of marine fry is set to further increase rapidly following the construction of cod hatcheries in Norway, Scotland and the Shetland Islands. In addition there is an increased production of new species such as turbot and halibut.

The quality of marine fish fry has a far-reaching impact on the aquaculture industry in that poor quality fry cause inefficiency in production and economic loss. Deformed fry, which are ongrown, have to be separated at harvest and have to be thrown away or sold at a much lower price. Fry that have had a poor nutritional history tend to have poor growth rates throughout on-growing resulting in higher production costs.

The phytoplankton (algae) production process is an important component of the hatchery and it is strongly interrelated with the other biomass growing processes of the system. For this reason, the introduction of new technology in the production of algae should be evaluated and optimized with respect to its influence to the overall performance of the hatchery.

Project Objective

The main objective of the ALFA project was the enhancement of the efficient and reliable live feed production in European aquaculture hatcheries through the development of an innovative fully automated system for the continuous production of phytoplankton (algae) = Continuous Algae Production system (CAP system). This system provides optimal micro-climatic and nutritional conditions for the stable growth of algae by using both natural and artificial illumination and controlling the temperature, the nutrient content, the pH and the CO₂ concentration of the water.



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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

Hatcheries, live feed, automation, fry, nutrition, algae, phytoplankton, new technology, efficiency, rotifers

Project Information

Contract number:

512789

Contract type:

SMEs-Co-operative research contracts

Action line:

SME Horizontal research activities involving SMEs

Duration:

30 months (01/06/2005 – 30/11/2007)

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Key Points

- Locally adapted cultures of live feed and local climatic conditions are taken into account for designing such a system. For this reason, three different designs of the CAP system will be developed for cold, temperate and tropic waters respectively.
- A novel optical test based on colour image analysis techniques will be used on-line for continuously assessing the growth rate and the quality of the culture.
- Link the new continuous algae production system to feed batch and high-density rotifer production systems which already exist in the hatcheries. Sensors will be placed in the rotifer culture systems to monitor optimal algal levels and control the supply of algae from the algae bioreactors.
- Develop an automatic harvesting, transferring and packaging system for efficiently managing the continuous algae production = Computerised Harvesting, Transferring and Packaging system (CHTP). In this way, the production will be automatically harvested and transferred to other components of the hatchery according to demand, while surpluses will be stored.
- Development of a concentration and storage unit for short to medium-term storage of the live algae. This will allow excess production to be temporarily stored at the hatchery or allow a large centralized production facility to produce and distribute concentrated algae to small hatcheries that do not have the resources to purchase or construct continuous algae production systems.
- Development of the control hardware and software allowing the hatchery manager to have a complete overview of the production of phytoplankton and its harvesting and transfer.

Output Highlights

- Development of new technologies and enhancement of the competitiveness of European hatcheries by production optimisation and cost reduction
- Improvement of the quality of the final fish products offered in the European market
- Lessening of tedious repetitive work practises of hatchery workers thus improving working conditions at European hatcheries
- Development of know-how through the close co-operation of European research institutions and SMEs, thus increasing their international competitiveness and supporting employment of skilled personnel and training of existing personnel.
- Dissemination of new knowledge to aquaculture units in Europe (training and innovation activities)
- Development of new European SMEs which are directly or indirectly related to aquaculture

Next Steps – Suggested Actions/Follow On



RTD

- One of the three prototype designs did not work. Lack of understanding of the algal biology and aquacultural processes by some of the RTD partners. Further research in this field might be beneficial.



Knowledge Transfer

- Knowledge is the property of the SMEs.



SME

- Prototypes have been further improved and made available in the market. There would be benefits to continue research and development in the area but it is dependent on research funding availability.

Related Publications/Projects

For a complete list of publications please refer to the website:
<http://www.alfa.akvaplan.com/>