



FASTFISH

On farm assessment of stress level in fish

The Challenge

The performance of farmed fish during rearing, and the resultant profitability of the industry, can be highly dependent on the general well-being of fish. In sub-optimal conditions, fish are subject to stress which affects behaviour and feeding and can have adverse consequences for growth and health. On fish farms, observations of fish behaviour are the most common indicators used to assess stress or well-being. However, these indicators are subjective and based on the fish farmers experiences and not on empirical scientific data.

Guidelines for avoiding stress in fish that is based on a standardized system and which identifies and quantifies significant causes of stress are needed.

Atlantic salmon and European sea bass were the chosen model species and included larval stages of sea bass. Feeding motivation and behavioural control mechanisms were the main focus areas of the search for potential stress indicators. Feeding motivation depends on the metabolic state of the fish and is known to be sensitive to stress, and can be readily assessed through quantifying anticipatory behaviour before feeding/feed intake. Swimming behaviour is an indicator of a behaviour control mechanism, and should be sensitive to stress level and physiological state. Rearing information (past and present) is essential in order to correctly interpret the indicators and identify the stressors.

Project Objective

The main goal of this project was to develop the first database and expert system for farm welfare and stress level assessment in farmed fish at all ontogenetic stages. At the centre of this assessment were validated behavioural stress level indicators.

Output Highlights

New technology

An internet based database and expert system for monitoring behaviour and environment in salmon cage farms was developed. FAST TOOL registers fish behaviour, rearing environment and production parameters. FAST TOOL can be used for both day to day monitoring of environmental conditions, and the stress level indicators identified. It can also be used for less frequent monitoring of growth performance and health data. Based on these data the program was able to assess the stress level and give early warnings. These early warnings advised management when harmful conditions were indicated. The system was Internet-based, and was tested and evaluated. The expert system also included forecasts based on artificial neural networks. FASTFISH tailored the FAST-TOOL to commercial production by testing it on selected hatch-

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

Fish, welfare, ethics, husbandry

Project Information

Contract number:

22720

Contract type:

Specific Targeted Research Project

Action line:

POLICIES-1.3 The modernisation and sustainability of fisheries policies

Duration:

36 months (01/01/2006 – 31/12/2008)

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eries and farms in periods with potentially high and low stress levels. Finally, FASTFISH evaluated which market-factors and governance mechanisms enhanced the implementation of FAST-TOOL in the industry, and estimated the industry costs and benefits of implementing FAST-TOOL.

Identification of behavioural ontogeny in sea bass

The behavioural ontogeny from hatching to juvenile stage was described for the first time. There were marked differences in growth rate, swimming performance, swimming speed, and feeding behaviour, between fish reared with different methods. Intensively reared fish had a delayed behavioural ontogeny and growth compared to mesocosm reared fish. This information can increase larval quality and survival rates and improve the profitability of the fish farm.

Stress indicators in sea bass

The velocity, swimming pattern, group structure, and the vertical distribution of the sea bass larvae were behavioural indicators that can be used to determine stress level. The fish reared in mesocosms were responding more intensively during stress events. In cages the mean position of the shoal, the displacement of mean position and the spatial distribution during and after stress, measured by echo sounder, are behavioural indices that can be used to assess stress level and latency of stress reactions. This information is of use to hatcheries managers, cage farmers, scientists.

New technology

The project developed methods and equipment for monitoring of larval behaviour in sea bass by image analysis. Development of video image analysis methods to study larval behaviour (swimming speed and direction and depth distribution)

New knowledge

Several positive (low stress) and negative (moderate/high stress) behavioural indicators have been identified in Atlantic salmon, which can be used to increase survival rates and ultimately increase profitability.

New Knowledge

A publication on “Cortisol release in water from sea bass - a reliable indicator of stress in sea bass”. Results provide strong evidence that cortisol release rate into the water can be used as a non-invasive method for the assessment of the stress response and that although sea bass presents a high blood stress response after exposure to acute husbandry stressors; sea bass release less cortisol into the water compared to other species previously examined. The identified indicators were cross-validated as “proxy” measures for stress, using immunological and physiological (plasma cortisol and cortisol released in water) methods.

The Full Report:

For a comprehensive description of the research project, visit <http://fastfish.imr.no/>

Next Steps – Suggested Actions/Follow On



RTD

- More information on the relationship between rearing environment and fish performance and welfare is needed. Very few data sets exist from fish farms whole production circles. We are now developing technology and database and expert system to collect and analyse data based on the FASTFISH results.
- More cooperation with industry is needed. More resources need to be put into research and research should be a more important element of the fish farming industry. By doing so more of the problems related to diseases, welfare and sustainability would be addressed.
- Basic research on how fish appreciate and cope with their environment is needed and how this is related to earlier experience and coping success. Research on how to increase coping ability in fish is required, this would improve fish welfare.



Policy

- The FASTFISH project provided a scientific basis for developing farmed fish welfare policies that underpin a profitable industry. Moreover it informed policy makers on a wide range of fish farm management issues from site selection and stocking densities to feed quality and diets and can assist environmental policies that aim to limit the use of pharmaceutical products on fish farms.

Related Publications/Projects

For a full list of publications visit the project website, <http://fastfish.imr.no/>

A National project Welfare tools and Salmowa- will continue to work of WELLFISH and will further develop welfare meters and develop formalized overall assessment of welfare.

The BENEFISH project is concerned with the economic implications of introducing a fish welfare standard.