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COMPETUS

Genetic improvement of farmed sea bass *Dicentrarchus labrax*: strain testing and response to selection

The Challenge

The European sea bass (Dicentrarchus labrax) is an economically important fish cultivated mostly along the Mediterranean coast. However, during the past several years, overproduction of sea bass in Europe has resulted in a significant decrease in the retail price of commercial size fish, and producers have seen their profit margins decrease dramatically. In such a depressed and saturated market, optimising the production processes is not sufficient to improve on the narrow profit margin of fish farmers. Employing genetic selection strategies should allow them to increase and maintain their competitiveness.

Domestication of sea bass began in the early 80's and at present some fish farmers are developing selective breeding programs designed to improve specific traits of commercial interest. Growth rate is one of the primary traits of interest in such programs as production costs can be significantly lowered by reducing the duration of the rearing cycle. Genetic selection of sea bass could offer the industry the possibility of supplying the market with "seeds" showing improved growth rates.

Despite this progress the Mediterranean sea bass aquaculture industry is not broadly involved in genetic selection programs. Most of the hatcheries still maintain their own broodstocks, rarely recruiting from wild populations or with juveniles bought in the market. Not enough critical information regarding efficiency of breeding programs or the means to set them up, has reached the sector decision makers.

Project Objective

The COMPETUS project aimed to improve on the current knowledge of the genetic base of sea bass and its implications for aquaculture. It did so by comparing two approaches and recording the derived responses;

- A comparative strain testing programme will assess the levels of genetic variation in natural populations of sea bass
- A classical selection scheme for economic traits will be initiated

Key Points

- The performances of three geographically and genetically differentiated wild sea bass populations were compared. All the measured traits (gutted yield, fat in the fillet, fillet yield, sex–ratio) indicated that genetic progress by selection can be achieved quickly.
- In the classical selection scheme (the PROSPER selection strategy) the genetic progress of two first generation sea bass popula-

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

Sea bass, genetic selection, improved performance, SMEs

Project Information

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Coordinator:
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tions selected was assessed and compared to a control.

- The studied selection approaches and their associated costs were described in detail.

Output Highlights

Case studies on strategies to exploit wild seabass resources
SMEs often do not have the resources to access genomic technology and may not be aware of how selective breeding can help their business. All participating SMEs received the information necessary to evaluate the opportunity to implement genetic selection programs in their own facilities.

Technical Handbook
A technical handbook detailing the relative values of the tested strains and their potential for selective breeding was produced. Certain performance traits of wild sea bass populations were investigated to identify the possibility of exploiting natural genetic variability. This can assist SMEs in becoming more profitable through the use of selective breeding programmes.

New manual of breeding values of all fish provided by the project
The project provided SMEs with the necessary fish to start a selective breeding programme. The traits that may be the most efficiently genetically improved through selection in the fish were identified and this will allow for the possibility of exploiting the best genetic variability of the fish. This will have a positive economic impact on SMEs involved in selective breeding programs.

Prototype sperm banks
Semen of the male fish used in the project were cryopreserved. If any genetically interesting individual fish or stains are identified the sperm of the male fish can be used identified and reused. Again this would be of benefit to SMEs involved in selective breeding programmes.

Data base of fish and their traits.
The project established a database of raw data detailing 20 traits measured in 10,700 fish. This provides a databank with the potential to selectively breed other traits of interest.

A prototype of Phenotyped and genotyped fish was established
Approximately 900 adult fish were tagged and genotyped. The genetic origin of these fish can be identified and performances recorded. This will allow for the improvement of selective breeding programmes and will have an economic benefit for SMEs who adopt selective breeding strategies.

Next Steps – Suggested Actions/Follow On

RTD

- More work is needed on selective breeding so that marine fish farms can more accurately control and predict production, and so that sustainable production methods are used.

Knowledge Transfer

- Several SMEs involved in this project adopted selective breeding programmes as a result of their involvement. However, there remain a lot of SMEs who do not have access to new technologies and information on how to adopt selective breeding strategies. There is a need to give SMEs more information on breeding strategies and how their business can develop as a result.