Project Coordinator:

DIVERSIFY

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DIVERSIFY

New species for EU aquaculture

Socioeconomics

Market research identified market potential in cross-cultural consumer segments, with increased-to-strong interest in new products in the main EU fish markets. Especially involved consumers are open to try new species.

From the 40 new product ideas, six new end-product concepts have been developed on a pilot scale. Most products were positively perceived in terms of healthiness, convenience and overall quality, and were characterized by high nutritional value (protein and omega-3). Nearly all of them are very promising for industrial production and can increase the species' market potential.

Buyers and consumers would welcome new species, if they are:
a) sustainably farmed, ideally in domestic or EU waters;
b) fresh (especially southern-EU) or mildly processed (northern-EU);
c) easy to prepare and/or ready to eat; and
d) competitively priced.

In Europe, the **greater amberjack** shows the most promising market opportunities, given its large size, processing potential and superior sensory characteristics. The **grey mullet** is a very interesting species due to the higher sustainability of its production methods. No specific preference region has been identified for this species. The **wreckfish** has very firm flesh that discriminates it readily from other fish. The remaining species (**Atlantic halibut**, **pikeperch** and **meagre**) have certain advantages due to their biological and physical characteristic and are of interest to specific regions in Europe.

Partners

Aarhus Universitet (AU), Denmark

Aquaculture Forkys SA (FORKYS), Greece

Aquaculture Technological Center of Andalucia (CTAQUA), Spain

Argosaronikos Fish Farms SA (ARGO), Greece

Asociación Empresarial de Productores de Cultivos Marinos (APROMAR), Spain

Asociación Nacional de Fabricantes de Conservas de Pescados y Mariscos-Centro Técnico Nacional de Conservación de Productos de la Pesca (ANFACO), Spain

Ayuntamiento de A Coruña (MC2), Spain

Bundesverband der Deutschen Fischindustrie und des Fischgrosshandels E.V. (BVFi), Germany

Canarias Explotaciones Marinas SL (CANEXMAR), Spain

Conselleria do Mar - Xunta de Galicia (CMRM), Spain

Danmarks Tekniske Universitet (DTU), Denmark

Dor Dgey Yam LTD (DOR), Israel

European Food Information Council (EUFIC), Belgium

Federation of Greek Maricultures (FGM), Greece

Fish 2 BE, NV (F2B), Belgium

Fundación Canaria Parque Científico Tecnológico de la Universidad de Las Palmas de Gran Canaria (FCPCT), Spain

Galaxidi Marine Farms SA (GMF), Greece

Hellenic Center for Marine Research (HCMR), Greece

Hellenic Research House (HRH), Greece

Hungarian Aquaculture and Fisheries Inter-branch Organization (MA-HAL), Hungary

Institut de Recerca i Tecnologia Agralimentàries (IRTA), Spain

Instituto Español de Oceanografía (IEO), Spain

Institut Francais de Recherche pour l'Exploitation de la Mer (IFREMER), France

Institute of Marine Research (IMR), Norway

IOLR-National Center for Mariculture (IOLR), Israel

Irida SA (IRIDA), Greece

Skretting Aquaculture Research Center (SARC), Norway

Sterling White Halibut (SWH), Norway

Stichting Wageningen Research (SWR/DLO), the Netherlands

Technische Universiteit Eindhoven (TU/e), the Netherlands

The University of Aberdeen (UNIABDN), United Kingdom

Universidad de La Laguna (ULL), Spain

Universitá degli Studi di Bari Aldo Moro (UNIBA), Italy

Université de Lorraine (UL), France

Université de Namur ASBL (FUNDP), Belgium

Vas. Geitonas & Co LTD EE (GEI), Greece

Exploring the biological and socio-economic potential of new-emerging candidate fish species for the expansion of the European aquaculture industry

Aim

Expand the European aquaculture industry by diversifying its production with new/emerging species that have important advantages over the ones cultured currently, such as fast growth, large size or low requirement for fishmeal and fish oil.

Determine the drivers for market acceptance of the new food prototypes in order to position the EU aquaculture sector as a leader in aquatic food production.

Impact

The acquired knowledge and developed methods will enhance the production of the selected emerging species by the European aquaculture industry and will enable the incorporation of some new species, such as the grey mullet and greater amberjack.

diversifyfish.eu

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Meagre

Argyrosomus regius

Three different populations and a sufficient genetic variation was confirmed in a number of broodstocks around Europe; if managed properly there is sufficient genetic variation for breeding programs.

Protocols for meagre paired spawning and for the acquisition of gametes for in vitro fertilization have been developed, as methods to implement breeding programs.

A protocol for early weaning was developed and the role of essential fatty acids and vitamins C, E and K in weaning diets was identified.

Feeding in sea cages can be carried out during the day or at night using programmed feeders with good results. Optical and mechanical stimuli can be used to improve feeding behaviour of meagre.

Immune markers have been established for the innate, adaptive and inflammatory responses of the immune system of meagre in order to develop vaccines in the future.

Methods to prevent Chronic Ulcerative Dermatopathy, to ameliorate the extend of Systematic Granulomatosis and to address parasitic and bacterial infections have been developed.

Atlantic halibut

Hippoglossus hippoglossus

Use of GnRHa implants advanced and synchronized spawning, resulting in improved egg production in F1 females, though egg quality remains highly variable.

Larvae fed well and had good survival when dry feed was introduced 28 days post first feeding in small systems. Full scale systems are needed to evaluate and improve these results in an industrial context.

First feeding of larvae in RAS systems resulted in improved growth and development compared to flow through systems. Metagenomic analyses of the microbial communities in the water and larvae of the two systems revealed interesting differences, which will be useful in industrial applications.

A range of systems for expression of a capsid protein from nodavirus were tested for use in the development of a vaccine against VNN.

Greater amberjack

Seriola dumerili

Spontaneous reproduction in captivity is still problematic, but hormonal induction methods have been developed to induce spawning in fish maintained in tanks and sea cages, producing large numbers of eggs of good quality for commercial larval rearing purposes. Hatchery-produced (F1) individuals were shown to undergo reproductive maturation in captivity.

Significant breakthroughs were achieved in larval rearing, allowing the production of large numbers of juveniles adequate for commercial production. Husbandry practices were developed for successful transfer of juveniles to sea cages.

On growing trials until commercialization resulted in important information on feeding patterns and stocking densities, while the species' temperature tolerance has been determined.

Identification of immune markers and health management tools under aquaculture conditions were developed, including probes for the early detection of epitheliocystis, and methods to control infestations of the parasites *Zeuxapta seriolae* and *Neobenedenia gireliae*.

Pikeperch

Sander lucioperca

A genetic map comparing captive and wild broodstock was developed using microsatellite markers, to be used for breeding programs.

Studies have identified optimal combinations of environmental, feeding and population factors to improve survival and growth during larval rearing in RAS.

Essential fatty acids must be supplied in larval diets for normal development and to reduce stress sensitivity.

Low light intensity and red-light spectrum is less stressful and the effect was confirmed in RAS farm conditions. Domestication level was shown to influence stress responsiveness and immune response.

Grey mullet

Mugil cephalus

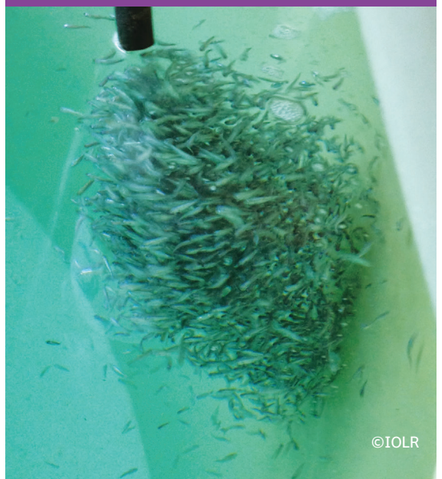
Spontaneous reproduction in captivity remains a problem, but spawning was achieved using GnRHa and metoclopramide therapies, producing millions of fertilized eggs. Optimization of the hormone-based reproduction control protocol is still necessary.

Algal addition during larval rearing provides beneficial effects in terms of rotifer consumption, and larval survival and growth.

After metamorphosis, commercial feeds for juveniles should be designed for the omnivorous feeding of this species and include higher levels of starch or other low cost amylolytic energetic compounds.

Larvae have a high taurine requirement during rotifer feeding, and the benefit of this nutrient during early feeding was still apparent during juvenile growth. Taurine is essential not only for promoting growth in larvae, but also for other physiological pathways such as muscle function.

Diets with low fishmeal content can be used successfully for on growing without any detrimental effect on growth performance.



Wreckfish

Polyprion americanus

The reproductive cycle of wild-caught wreckfish was completed in captivity. Spontaneous spawning takes place in the Spring, with a periodicity of 3-5 days. Males may be in full spermiation throughout the year.

Based on evaluation of mature fish from the fishery, the nutrient requirements for an appropriate broodstock diet have been determined. The commercial broodstock diet produced, resulted in successful maturation and production of high-quality eggs.

The ontogeny of the digestive and vision system have been described. Successful larval rearing was implemented in the last year of the project, resulting in the production of a small number of hatchery-produced juveniles, which is very encouraging for the efforts to incorporate this species in the aquaculture industry.