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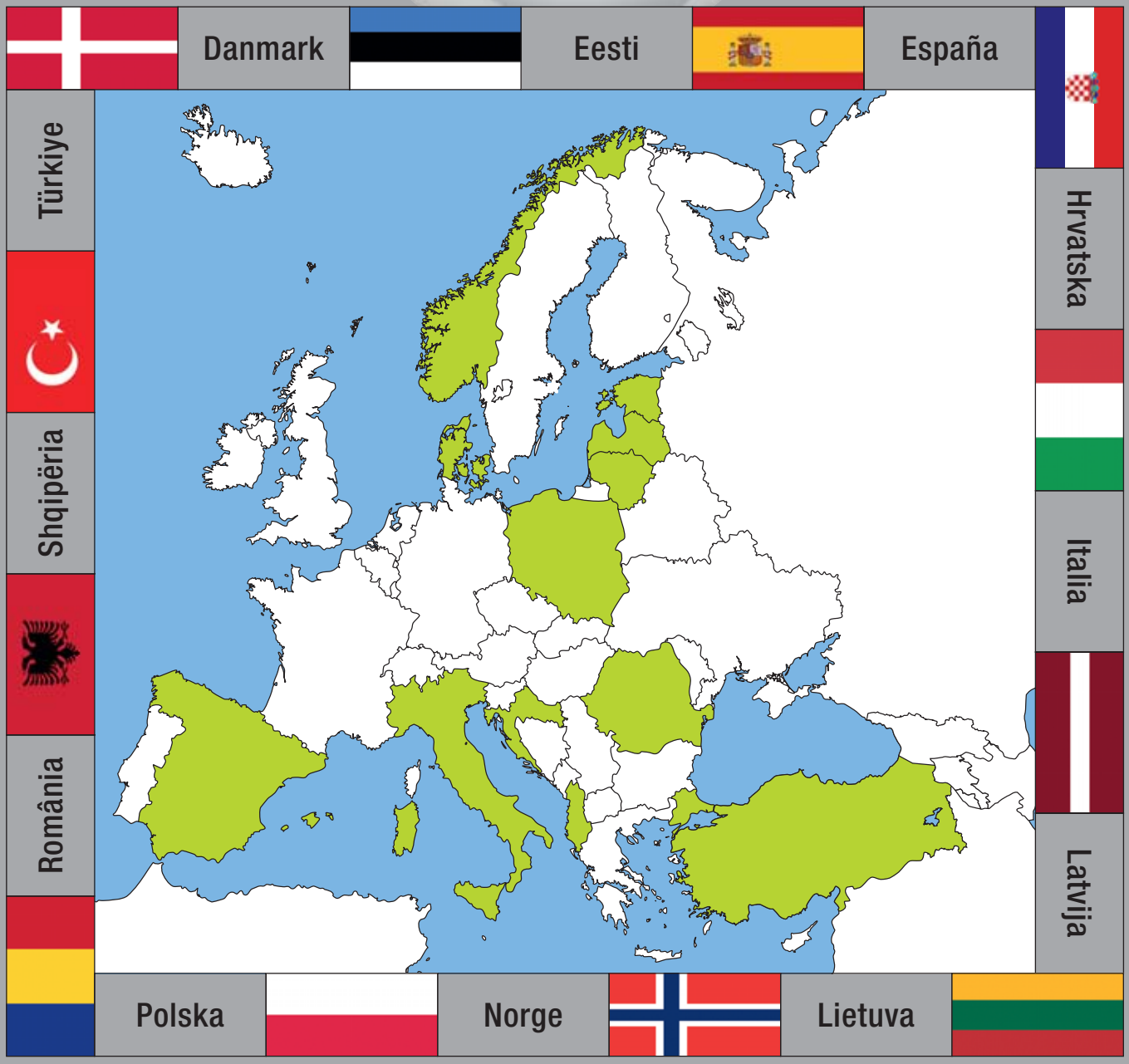

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Eurofish celebrates its tenth anniversary

Dear Reader,

It is with great pleasure that I welcome you to this issue celebrating ten years of the international organization Eurofish, the publisher of the Eurofish Magazine.

Since its establishment in 2002, Eurofish has worked to offer advice to and disseminate information about the fisheries and aquaculture industry in our member countries and beyond. This has taken the form of projects executed in diverse fields both alone and in collaboration with other partners. Our first decade has been both challenging and successful. We have achieved important and encouraging results, which would not have been possible without the trust and support of our member countries and our associates.

I would like to take this opportunity to thank the Eurofish member countries for supporting and helping to make Eurofish the effective organization that it has become today. My gratitude also goes to the Food and Agriculture Organization that facilitated the establishment of this regional organization, our host country Denmark and to all our partners for the good and constructive collaboration we have had over the years.

We remain committed to promoting cooperation and trade relations in the fisheries and aquaculture sectors in the region in line with our mandate and aligning our activities with the real needs and priorities of our member countries and their industries.

I look forward to contributing to Eurofish's development and to helping it thrive in the years to come.

Yours sincerely,

Aina Afanasjeva

Eurofish Director
Managing Editor of the Eurofish Magazine

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Seabass and seabream are collected in a net and doused with a medicine to calm them to facilitate the vaccination procedure.

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Turkey: Booth space at Future Fish Eurasia rapidly selling out

Today Turkey is Europe's largest producer of freshwater trout and second largest producer of seabass and seabream. The country exported over 60,000 tonnes of fish worth USD361m in 2010 to markets all over the world. Fish is exported fresh, frozen, whole, filleted, and smoked, and is also appearing in modified atmosphere packaging and as frozen ready-to-cook meals comprising fish and other ingredients. The domestic market is also important though here demand is mainly for whole round fish. Turkey has also legislated to move cage farms offshore where they do not conflict with other users of the marine environment. Offshore farming is more demanding of people and equipment and Turkey has built up substantial knowhow in this field.

Future Fish Eurasia 2012 will be held at the International Fair Centre in Izmir, Turkey, between 7 and 9 June.

Showcasing this knowhow as well as the Turkish aquaculture and fisheries sector is Future Fish Eurasia. In 2012 the 6th edition of this international fair will be organised at the Izmir International Fair Centre between 7 and 9 June. The fair reaches out to importers, exporters, and processors in aquaculture, mariculture, and capture fisheries. Turkish knowhow is already exported to the Middle East and the Turkic Republics and its fish and seafood products are exported to Europe among other destinations. The country's strategic location, straddling Asia and Europe, and its lack of visa restrictions make it an easy place to access and suppliers hoping to expand in Turkey and its neighbourhood should make the most of this opportunity.

Eurasia Trade Fairs, the organisers of Future Fish Eurasia are planning to build on the 32% increase in visitors that they experienced at the last edition of the event in 2010. Ninety percent of the exhibition space is already booked so customers should decide promptly to ensure they get the booth location and size they desire.

For more information contact Levent Akdogan on +90 212 347 10 54 or levent@eurasiafairs.com

Norway: Using diet to reduce health problems in sterile salmon

The National Institute of Nutrition and Seafood Research (NIFES) is embarking on a project that will look at how nutrition affects triploid salmon, fish that are made sterile as a result of treatment with heat and pressure at the egg stage. Several research institutions are participating in the project which is run by the Institute of Marine Research and financed by the Research Council of Norway. Triploid fish are considered a potential solution to the problem of salmon escapes from cages as they cannot interbreed with wild salmon. However, a number of problems remain to be solved before they can be bred on a commercial scale. At NIFES, previous work has shown that the composition of fish feed has an important role to play in the development of certain pathological conditions. Triploid fish have a high incidence of skeletal deformities and cataracts and NIFES researches are hoping to counter these by modifying the fishes' diet. Research will also be carried out on the temperature ranges that the fish prefer and whether these preferences can also be modified with the help of the diet.

WELCOME TO THE 7th NORTH ATLANTIC SEAFOOD FORUM

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Oslo, Norway March 6-8 2012

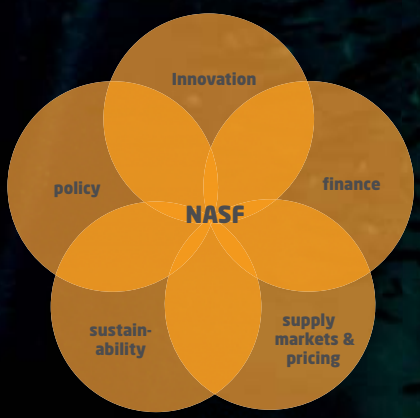
NASF OVERVIEW

- NASF is a leading meeting place for global seafood top executives attracting more than 500 delegates from 300 firms and 30 countries
- 100 speakers from 18 nations will present papers in 10 seminars
- FAO has joined NASF as seminar partner
- NASF is the inter-phase between trade, commercialization, innovation, policy and finance - giving key insights into the future
- NASF is all about business - by the very best

NASF CONFERENCE SEMINARS 2012

1. Pareto Corporate Seafood Finance seminar
2. MSC Sustainability & Communication seminar
3. EU Common Fisheries Policy Reform workshop
4. Global Salmon, Supply & Pricing seminar
5. FAO Pelagic Industry Summit
6. FAO Global Whitefish Summit
7. 1st BioMarine Innovation Pre-Conference workshop
8. Industry Captain`s - "The View from the Bridge"
9. European Seafood Policy Makers - Ministerial outlook
10. FAO Africa Summit - outlook for fisheries and aquaculture

NASF BUSINESS PLATFORM



THIS IS NASF

NASF provides everybody connected to the seafood industry with a unique meeting place to:

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- Learn about the industry´s political and legislative direction;
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NORTH ATLANTIC SEAFOOD

nor-seafood.com

US: High fish consumption among women may prevent colon polyps

The results of a study by researchers at Vanderbilt University published in the American Journal of Clinical Nutrition suggested that women who consume three servings of fish per week or more were less likely to develop colon polyps than women who consumed one serving every two weeks, reports fis.com. The researchers hypothesised that the omega-3 fatty acids in fish may have an anti-inflammatory effect which could inhibit the formation of the polyps. While not all colon polyps are dangerous, some forms called adenomatous polyps can turn malignant leading to cancer of the colon. The study suggested that the beneficial effect of the fish was not seen amongst men perhaps because men were less sensitive to the omega-3s in fish and needed to consume more to get the same effect.

Germany: Multivac wins gold at International FoodTec 2012

Multivac, a multinational provider of packaging solutions, has just been awarded the gold medal at International FoodTec 2012 for developments it has made in high pressure processing (HPP). The technology is used to prolong the shelf life of products without using heat or preserving agents. This allows compliance with official requirements on food safety and also meets consumer desires for products free of preservatives and additives. Together with its partner Uhde High Pressure Technologies Multivac has extended the development of the HPP process including the ability to apply it to Modified Atmosphere packaged (MAP) food. At International FoodTec 2012 the organisers, when presenting the award, spoke of "a remarkable innovation," as their justification for awarding the prize. To assist its customers Multivac has also set up a HPP pilot plant to test the shelf life of various products.

Denmark: New Nordic think tank to raise the quality of the fisheries debate

Thirty participants from the Nordic countries attended the inaugural meeting of the Nordic Marine Think Tank on 30 January 2012 in Copenhagen.

The Nordic countries have unique abilities in the areas of marine environment and management, but, according to a group of Nordic fisheries experts, they are not sufficiently present in the public debate. To redress this imbalance fishery experts from across the Nordic countries, with support from the Nordic Council of Ministers, joined to establish the Nordic Marine Think Tank in Copenhagen on 30 January 2012. The think tank will make qualified contributions to the debate on fisheries policies both in the Nordic region and other areas. The think tank focus will include the mackerel issue in the North Atlantic, the regulation of fisheries in international waters, wind farms and conservation of marine areas, and documentation of the impact of fisheries and other marine activities on the oceans.

The think tank is independent of institutional bodies and economic interests, and the founders look forward to cooperating with other non-governmental organisations that share its profile. For more information write to Victor Hjort at nordiskmarin@gmail.com, or call +45 26246813.

Denmark: AQFood, a new Nordic master's degree programme within aquatic food offers the possibility of a double diploma

Thorkild Arndi Christensen

Launching reception at the DTU for the new master's programme - AQ food. From left: Michael Engelbrecht Nielsen – DTU Food; Guðrún Ólafsdóttir, University of Iceland; Andreas Petterson, Swedish University of Agricultural Sciences; Turid Rustad, Norwegian University of Science and Technology; Caroline P. Baron DTU Food, Paw Dalgaard DTU Food.

AQFood is a new two-year master's degree within production, safety and quality of aquatic food (aquaculture and capture). All classes are taught in English. The education brings expertise from five Nordic universities together to form one high level technical education for production, processing and distribution of aquatic animals.

The degree is designed for students interested in a career within aquatic food production. Whether they want to specialise in aquaculture production, industrial food production or resource management this programme is something for them. The focus in the programme is on the whole chain approach and students will look into important aspects of economics, production management, and environmental challenges. The degree is strongly backed by industry so that students gain practical exposure alongside the theoretical grounding. AQFood is also a unique opportunity for students to obtain a double diploma from two reputed universities at the same time.

The five universities contributing to the education are: DTU, University of Iceland, Norwegian University of Science and Technology, Norwegian University of Life Sciences and Swedish University of Agricultural Sciences. The university cooperation is supported by the Nordic Council of Ministers and students spend the first year at one university and the last year at another. Scholarships are not available. However, some of the partner universities have a limited number of tuition fee waivers to award foreign students. More information is available on the individual university homepages.

Students need a bachelor's degree to qualify for the programme that will start in the autumn 2012. For more information please visit the homepage: www.aqfood.org or contact: Senior researcher Caroline P. Baron, e-mail: carba@food.dtu.dk, tel +45 31 15 91 61

Spain: Vending machine that sells fresh fish

The brothers Ruben and Marga Rios have run a fish retail outlet for 11 years in Mungia near Bilbao in Spain, reports springwise.com. Late last year they installed a vending machine that dispenses fresh fish 24 hours a day allowing them to serve customers even when the shop is closed. The fish and seafood is bought daily from the Mercabilbao wholesale market, cleaned and packaged in individual trays labelled with the expiration date. The machine dispenses cooked food as well, and prices for all products are the same as they are in the store. The machine has proved popular among customers and the brothers are apparently considering adding fish bait to the range to tempt early morning fishers.

Romania: Shipyard builds three vessels for Angolan government

The Angolan Ministry of Agriculture, Rural Development, and Fisheries collaborating with the Dutch government and ING Bank, has placed an order for three vessels with the Dutch shipbuilding company Damen, reports World Fishing and Aquaculture. The vessels are being built at Damens shipyard in Galati, Romania. One of the boats, a 62 m fishery inspection and surveillance vessel, Ngola Kiluange, was recently launched at Galati. Of the other two vessels under construction one is similar to the Ngola Kiluange, while the other is a 28 m long fishery research vessel. Angola's exclusive economic zone in the Atlantic includes rich fishing grounds and the fisheries sector is one of the most important in the country's economy. Angola has a regional collaboration with Namibia and South Africa to survey and protect its grounds.

Germany: Baader to launch new whitefish processing line at SPE

Baader will launch the first phase of a new whitefish processing line at Seafood Processing Europe in Brussels from 24-26 April. The new Baader 582 filleting machine has been designed anew with respect to hygiene, food safety, maintenance, performance, fillet quality and production control, says the company. It offers fewer mis-cuts and stops thanks to the computer-controlled tools and the self adapting fish guides and thereby reduces trimming effort and delivers a high quality fillet. In the loin area the membrane stays intact and the new cutting process prevents any stress on the fillet. The machine can be easily switched between species such as cod, saithe, or haddock using the control panel. The filleting machine can be combined with a new skinner, the Baader 59 skinning machine. This is designed to gently skin fillets of cod, saithe or haddock removing the skin even at the tail tip. The skinning is shallow giving a high yield, and the skinned fillet emerges stretched and separated from the others facilitating inspection and further processing.

Czech Republic: AQUA 2012 to highlight the role of science in aquaculture development

The theme of the European Aquaculture Society's annual conference this year is Global Aquaculture: Securing Our Future. Aquaculture is the world's fastest growing animal food-producing industry in the world today. However, most of this growth is in South East Asia and it is slowing down. According to the FAO the sector is facing an enormous challenge to produce the additional 30-40m tonnes of seafood that will be needed in 2030 to maintain current levels of average consumption. AQUA 2012 will focus on the fundamental role of science in the development of the aquaculture industry, as it is science that will help confront these challenges. The conference will include a workshop on the culture of perch, pike-perch, and other members of the percidae family. It will also include a series of Farmers Days on technology developments and market strategies, which then narrow down to specific species presentations. The conference will be on 1-5 September 2012 in Prague. For more information visit www.easonline.org or www.was.org.

Denmark: Eurofish Governing Council commemorates anniversary

Participants at the Eurofish Governing Council reviewed the organisation's activities over the last year and approved the work programme and budget for 2012.

The Annual Session of the Governing Council of Eurofish took place on 26-27 January 2012 at the Eurofish office in Copenhagen. The meeting was attended by 29 representatives from 18 European countries, of which the Member Countries represented were: Albania, Denmark, Estonia, Italy, Latvia, Lithuania, Norway, Poland, Romania, Spain, and Turkey (Croatia was not present), while the Observer nations were Armenia, the Czech Republic, Finland, Georgia, Russia, Slovenia, and Ukraine. The FAO, the Baltic Sea RAC and the North Atlantic Seafood Forum were also present as Observers.

The meeting reviewed the organisation's activities undertaken over the past year, and decided on the work programme and the budget for 2012. It also marked the tenth Anniversary of Eurofish which is an important milestone in the development of the organisation. Jochen Nierentz and Victor Hjort, the former directors of the FAO EASTFISH project and Eurofish respectively were invited as honoured guests on the occasion.

The next session of the Governing Council will be held on 24-25 January 2013.

Russia: Huge increase in Russian exports of salmon

Russia exported more than 164,000 tonnes of salmon in 2011 an increase of 64% in relation to 2010, says Alexander Savelyov, the head of the Federal Fisheries Agency public relations department, reports the Moscow Times. Russian fishers caught more than 520,000 tonnes of salmon, slightly under the record set in 2009 of 530,000 tonnes. Export destinations were mainly in Asia with China buying 60%, Japan 23%, and Korea 12% of the exported volumes. Almost the entire volume (97.5%) was exported frozen, while the remainder was shipped chilled.

Salmon ShowHow 2012

Marel introduces new fillet marinating machine

This year's salmon show at Marel in Nørresundby Denmark was visited by 200 visitors from 23 different countries and 90 companies. It is the eleventh time this annual event has taken place. Marel invite their customers within the salmon processing business from around the world to show them different types of salmon processing equipment, new inventions, and to give them live demonstrations.

The whole-day programme included an inspiring one hour presentation about the recovery of the Chilean salmon industry by Adolfo Alvial, a consultant from Chile. Due to an ISA virus outbreak the Chilean salmon industry collapsed from a peak production of about 640,000 tonnes in 2008. 2010 was the nadir when only 400,000 tonnes of salmon were harvested. Half the employees in the industry were sacked during that period. The reason it went wrong was a combination of too high a concentration of fish farms and a badly managed public control and monitoring system.

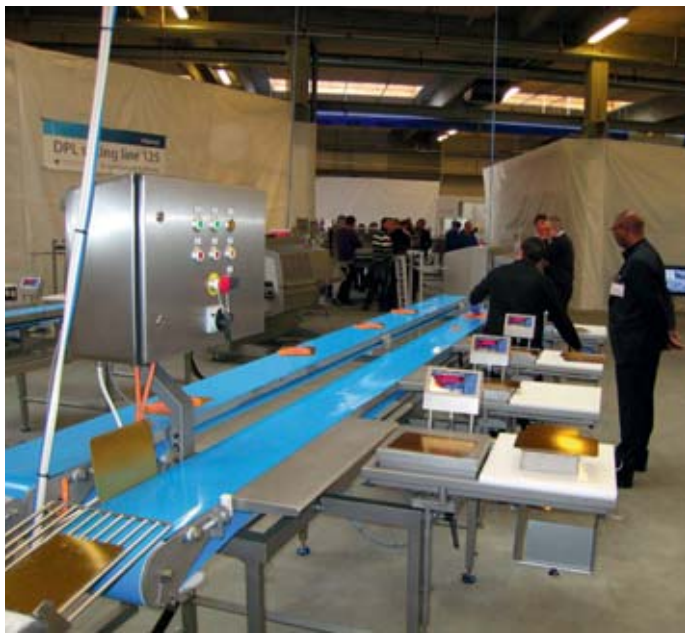
Chilean production to return to previous levels

Today both production and employment are slowly moving back to their former levels again. The public and the industry cooperate on a much better management and monitoring system for the sector. No outbreaks of ISA were registered at the end of 2011 mainly because an effective vaccination programme has been introduced. Also on shore salmon processing companies are now certified to a higher degree and deliver much higher quality. Production is expected to increase in the future as Chile has a 40,000 km coast line well suited to salmon farming. The industry has ample space to grow without running in to the problem of too high farm concentrations.

Marinating salmon fillets

A new machine for adding marinade to fillets "value spray" was displayed this year by Marel Netherlands. Using their extensive experience from the meat industry the machine is able to add marinade to the salmon fillets using nozzles to spray with a speed of 30 m/min. It is possible to add a liquid marinade to the top, bottom, or both sides. This equipment will never be the bottleneck in a production line and the maximum time needed to clean the equipment is 10 minutes (water based marinades are even faster to clean), which fits into a normal production schedule break. A special feature of this equipment compared with other types on the market is that the reservoir of marinade contains only 15 liters of marinade. This makes it easier to start up a small production batch and minimises waste.

A new networking business forum was introduced this year following requests from customers from previous years. It was possible for companies to book a networking table to meet other companies from the all over the world and 30 companies booked a table for the networking event this year.



The DLP 125 slicing machine can make fixed weight slices; e.g. 25 gram salmon slices with very small weight variations based on a previous scan of the fillet. The line employs four operators packing slices on trays.

Innova customised version now available with salmon packing line

A complete slicing line includes four workstations with scales and a check weights weigher hooked up to a special version of the Innova software was displayed this year. For some companies the full version of the software is usually too extensive, but now a lower priced version is bundled with a complete salmon slicing line.

The DLP 125 slicing machine can make fixed weight slices; e.g. 25 gram salmon slices with very small weight variations based on a previous scan of the fillet. Only the head and tail piece will not be sliced within the specifications. The line employs four operators packing slices on trays. Other lines can be used to increase capacity.

The annual salmon show is a unique opportunity for salmon processing companies to meet, network, and contact Marel specialists about the equipment that is displayed there.

Marco Frederiksen, marco.frederiksen@eurofish.dk

Agroprodmash, 8-12 October 2012, Moscow

Fish and seafood processing in focus

Russian fish market goes through a wide-scale renovation stage. The interest of the Russian fish producers in the up-to-date technology and modern equipment reaches its all-time peak. The leading business event, Agroprodmash exhibition, is aimed to solve the vital problems of the industry by offering an excellent opportunity for a wide audience of experts to become familiar with the innovations of the fish processing presented by leaders of the domestic and global industry.

Thanks to its favorable geographical position (the Russian coast is washed by thirteen seas and three oceans) Russia has traditionally had a well-developed fishery industry which, unfortunately, suffered from economic recession and instability in 1992-1998. At present successfully recovering from the combined impact of the internal and global financial crash, Russian fisheries and aquaculture demonstrate a continuing increase in production and remain the fastest growing food sector in the country. According to the latest statistics from RosStat, Russian fish market growth in 2011 was the highest - reaching 12,5%, while the market volumes were exceeding 10 billion US dollars.

One of the themes at Agroprodmash this year will be fish and seafood processing. The topic is expected to attract manufacturers of fishing equipment and fish and seafood processing machinery to exhibit at the show.

The current reforms and renovations implemented in the Russian fishery industry, as well as the challenging development targets to satisfy growing consumer demand for high quality fish and seafood, will have a new impact on the competitiveness and efficiency issues for Russian companies and will result in a considerable raise of demand for the modern equipment and technologies.

Most representative event in Central and Eastern Europe

Launched in 1996, Agroprodmash - the "International Exhibition for Machinery, Equipment and Ingredients for the Food Processing Industry" - for 17 years has been the most representative business event in Russia, CIS countries and Eastern Europe, and the main platform for showcasing all global trends and the best technological solutions for food and beverage production at one venue.

Being the most important trade show for food processing industry professionals, in 2011 the fair brought together more than 700 leading companies representing 35 countries and more than 20 000 industry specialists. Each year the exhibition demonstrates a steady growth both in terms of quantity and quality.

Agroprodmash covers every sector of the food processing industry: from getting raw materials to processing them into products ready for sale - including equipment, technologies, certification, shipping, packaging, and storage.

Each of the fair's 15 thematic sectors is dedicated to a certain area of the food processing industry: meat-, poultry-, fish- processing equipment and technology; flour, bakery and pasta production; confectionary equipment; machinery for fruit, vegetable processing, oil production, ingredients, functional, dietary and baby food production. Other thematic areas include: packaging equipment and materials, control and measuring devices, refrigeration, storage and transportation equipment, sanitation, components and units for food processing.

In 2012 specialized thematic sector "Fish and Seafood Processing" will be in focus, represented by manufacturers of fishing equipment, fish and seafood processing machines and equipment, ingredients, cold storage equipment and

ice-making machinery, measuring and analysis systems, as well as packaging and transportation, logistics, financial and insurance services.

The fair is organized by Expocentre Food Exhibitions Division and is held with the official support from the Ministry of Industry and Trade of the Russian Federation, Ministry of Agriculture of the Russian Federation and under the auspices of the Chamber of Commerce and Industry of the Russian Federation and the Moscow City Government in co-operation with professional unions and associations.

More information is available at www.agroprodmash-expo.ru

Alimentaria Barcelona, 26-29 March 2012

Spanish exports of seafood climb

Alimentaria Barcelona will include three events of interest to the international fish and seafood industry, Interpesca, Congelexpo and Expoconser. Leading fish companies from Spain and other countries including China will be attending Interpesca for the first time.

Interpesca will also host a series of activities organised by FROM, the body responsible for the marketing and promotion of Spanish fish and seafood. The Autonomous Regions Galicia and the Basque Country well know for their fishing and aquaculture industries will be well represented at Interpesca. Companies from these regions are expected to fill the show's 1,700 sq. m of space with a range of seafood products from the capture and culture sectors.

Chinese companies to participate

Among the Spanish companies that will attend the show are Pescaviar and Smarketing. International participation at Interpesca will include interesting new features like the participation for the first time of industry powerhouses such as China, the world's top exporter. Other countries that have confirmed their presence are France (Areco) and Portugal

(Constantino). Interpesca is colocated with Congelexpo (frozen food) and Expoconser (canned products) allowing companies to draw synergies from the proximity of the three events.

Despite the crisis in Europe and more specifically in Spain the seafood industry has reason to celebrate as Spanish exports have increased. During the first quarter of 2011 sales to other countries totalling 239,000 tonnes of fish, according to data from Anfaco (the Spanish National Preserve and Seafood Manufacturers' Association).

Virtually the entire Spanish preserves industry will be exhibiting at the Expoconser pavilion at Alimentaria Barcelona.

"Exports are helping to resolve the crisis and compensating for the weakness of consumption in Spain", says Juan María Vieites, President of Anfaco and of Interpesca, Congelexpo and Expoconser. Sales to the BRIC (Brazil, Russia, India, China) countries in particular have increased. Exports earned 666 million euros in revenue, some 17% more than the same period of the previous year, he says. For international buyers coming to Interpesca makes more sense than ever if they are interested in sourcing from Spain.

The Spanish conserve manufacturing industry under one roof

While this edition of the frozen foods show, Congelexpo, will also be attended by representatives from a large number of countries, including China, Taiwan, Colombia, France, Austria, Benelux, Portugal, Lithuania, and Italy, Expoconser will host virtually the entire national preserves industry once again. Its 2,500 sq. m of exhibition space will include pavilions from Navarre, the Basque Country, and La Rioja, as well as such firms such as Calvo, Pérez Pujol, Nudisco, Mendavia, Conservas Garavilla, Conservas Dani, Cándido Miró, Yurrita e Hijos, Conservas Joan José Jiménez, Alfonso García López (Pescamar), Anchovas de l'Escala and Alcurnia Alimentación, among others. In addition companies from China, Morocco and Portugal have already signalled their participation by reserving space at the exhibition.

The future of Mediterranean aquaculture

Technology fuels growth

The third multi-stakeholder consultation of the Aquainnova project took place in Madrid on 16 and 17 November 2011.

The workshop addressed the future of Mediterranean aquaculture and brought together 40 key stakeholders from eleven countries, mainly representatives of EU but also some non-EU countries (e.g. Israel, Croatia) that surround the Mediterranean Sea. Fish farmers and aquaculture associations, government representatives, research institutions, research funding agencies and other stakeholders in the sector had the opportunity to present and discuss their views during the 1.5 days event. The workshop was organised in several thematic sessions, laying strong emphasis on discussion and consensus building.

Financed by the EU FP7 programme, the objectives of Aquainnova are several: to facilitate the dialogue between the aquaculture industry, the research community and the policy makers; to exploit the potential for innovation and technological development in European aquaculture through active promotion of the exploitation, dissemination and communication of the results of aquaculture Research and Technological Development (RTD); to improve how RTD and innovation knowledge is managed, disseminated and transferred.

Organised by the European Technology and Innovation Platform – EATiP an international non-profit association dedicated to developing, supporting and promoting aquaculture focusing on **technology** and **innovation** in aquaculture in Europe, the consultation provided a lively and open dialogue on European policies and how these affect European aquaculture.

To do the right things right

Through a video presentation the EATiP Chairman, Mr. Gustavo Larrazábal provided a broad picture of European policies and how these affect the sustainable development of European aquaculture. He also reminded the participants on the motivations and goals for creating EATiP as well as the vision for the European aquaculture developed within Aquainnova and how to fit these goals within Mediterranean aquaculture. "I want to contribute to society, to give back on my business success. In Europe we are on the right track to tackle the innovation challenges, but we need to deliver the message, to communicate it properly, we need to do the right things right".

European aquaculture, including the Mediterranean contributions, will be not challenge-free in the next 10-20 years: a rapidly-growing global population will increase the pressure on raw material availability (i.e. for fish and animal feeds), increasing global demand for seafood, combined with the decrease of capture fisheries, and the need

to improve the image of aquaculture among consumers, are just a few of the issues that have to be faced. However, the combination of a strong market for seafood, the history of fish farming, dynamic and advanced research, a qualified and well-trained labour force, and a good position in relation to its increased integration in the reformed Common Fisheries Policies (CFP), there is confidence that the future growth of European aquaculture will be sustainable.

What is your vision for aquaculture in 2030?

This was the first key question that participants had to reflect and comment on, from all possible perspectives: production, consumption, technology, feed, social-economics, knowledge management, environment, etc. After committed work and debates, the general consensus among participants was that Mediterranean aquaculture production will grow by 50% or more by 2030, within the context of global aquaculture growth that was anticipated at 100% or more. A few new robust species will be farmed, customised to suit market demand and the environment. Fish feed will be produced by growing low cost animals and plants and new resources will be utilized. There was a strong belief among scientists in the future of integrated multifunctional farms, based on sea cage aquaculture development. Husbandry will become remote, automated and multi-functional, but there are also challenges here that have not been addressed to date.

Aquaculture will not only be socially acceptable but socially demanded, both for its demonstrated health benefits and food security, as well as to meet the growing seafood demand with improved ethical and environmental standards. These desiderates however, require the continued 'education' of consumers. The public needs unbiased, transparent, and better communicated scientifically-based information, not only from the media, but also from sectoral organisations, administration and politicians. Knowledge and proactive quality communication throughout the value chain are prerequisites.

European aquaculture is so diverse that there is no single opinion or solution. However, most of the participants agreed that European aquaculture may be seen as a 'niche' activity when over seventy percent of aquatic products consumed in the EU are imported. Notwithstanding this, there should be one common communication strategy on key topics such as health, environmental standards, food safety and quality.

An asset for aquaculture development

It is no doubt that the role of aquaculture will be reinforced in the future CFP and there is consensus that European aquaculture, including the Mediterranean, should be driven by key factors – such as innovation, diversification, promotion and communication. However, to maintain sustainable growth and profitability, the sector needs higher cooperation between professionals and scientists, policy makers, with real innovation and effective technology transfer, which are indeed needed for fundamental change.

Mr Alejandro Tiana Mas of INDEMAR, Spain believes that "the EATIP workshop on Mediterranean aquaculture has collected a good deal of wishful thinking from the participants, yet some key actors in the implementation of aquaculture policies were missing. Promoting this kind of

Fundacion OESA

After Madrid (pictured) Aquainnova met in Bordeaux on 15-16 February and will have the wrap-up meeting in Brussels in June 2012.

sector workshop and seminars to exchange points of view and analyse the state of affairs is an asset for aquaculture development, but they must encourage participation of competent authorities, if any of the widely supported proposals to ameliorate the sector is to be incorporated into fisheries and aquaculture regulations."

An open debate and friendly discussions

"Aquaculture activities have a long tradition and give significant social and economic value for the Republic of Croatia. As a participant from a country, whose membership of the European community is expected to be realised in the nearest future, I find more than useful all the information gained and the visions on the aquaculture development perspectives that were discussed. It was a new and really unique experience for me and it was a real pleasure to be a part of this workshop, which successfully managed to gather around the same table the representatives of the industry, research institutions, governmental bodies and other stakeholders in aquaculture sector. We all had the opportunity to express our opinions through an open debate and friendly discussions, aiming at setting up the best possible tools to achieve the goals foreseen under the scope of European aquaculture development in next few decades" is the opinion of Ms. Tatjana Boroša Pecigoš, Ministry of Agriculture – Directorate of Fisheries, Croatia.

The EATiP Chairman, who at the end of the workshop, thanked the participants for their enthusiasm and the quality of their inputs, which have been since incorporated into the Aquainnova documents, has also reminded that the Vision documents as well as the Strategic Research and Innovation Agenda and Action Plans are available for consultation on the EATiP website, www.eatip.eu. The individual workshop reports are also published on these pages.

For further information please contact: secretariat@eatip.eu
Anca Sfetcovici, anca.sfetcovici@eurofish.dk

EcoFishMan to build models for results-based management in Europe

Results-based management for European fisheries

The Norwegian College of Fishery Science, which is part of the University of Tromsø's Faculty of Biosciences, Fisheries and Economics, plays a significant role in the EcoFishMan project. Under Professor Michaela Aschan the College leads Work Package 4, the objective of which is to specify and design a fisheries management system based on the principles of results-based management. In addition, University of Tromsø will participate in almost all the other EcoFishMan work packages.

Dr Kaare Nolde Nielsen has been employed by the Norwegian College of Fishery Science as a post-doctoral research fellow attached to the EcoFishMan project.

From 1 January 2012 Kåre Nolde Nielsen, an expert on fisheries management, will be employed by the Norwegian College of Fishery Science as a post-doctoral research fellow attached to the EcoFishMan project. Dr Nielsen, a Danish national, did an undergraduate degree in biology at the University of Aarhus in Denmark, followed by a master's in international fisheries management and a doctorate in social science, both at the Norwegian College of Fisheries Science.

In Norway, Dr Nielsen's assignment will be to conceptualise results-based management (RBM) and then to look at instances in Europe where RBM has been introduced and to discuss the scope for reforming fisheries management based on RBM. He will first review the use of RBM in New Zealand fisheries during a two months field study. In a second stage of his work he will review fisheries management systems in the EU. Finally, he will contribute to the conceptualisation of a model for RBM in the EU and propose a plan for a feasible transition towards RBM. On a recent trip to Denmark, Dr Nielsen discussed with Eurofish, the EcoFishMan partner responsible for dissemination, the work he would be doing for the EcoFishMan project.

Dr Nielsen, you will be spending the next 30 months working for the EcoFishMan project. What do you hope to achieve during this period?

I am very interested in the concept of RBM, which I think is the most important notion in the EcoFishMan project. RBM can be understood as a type of contract between an authority and, for instance, a group of people who wish to use a particular marine resource. RBM specifies the conditions for the use of the resource in terms of:

1) Defined standards or results to be achieved (e.g. minimum stock levels or operational management targets)
2) Adequate documentation to prove that the standards or results are achieved

The point is that as long as resource users are able to document that the standards or results are achieved, the authorities will not care about how they do it. This means that there is no need for "micro-management, that is, rules specifying every detail in the fishing operations. In contrast, the resource user is granted freedom to invent better ways of doing things – as long it is shown that the outcome is acceptable.

My vision is that RBM can be used generically for European fisheries management. European fisheries are highly complex with many different fisheries, different situations, capacities and possibilities. The advantage of RBM is that it can be implemented in different context, at different levels, and to different extents; it opens up for other ways of doing things differently while maintaining a check on the state of the natural resources and their environmental context. RBM offers flexibility to improve operations and reaches all the way from the technical changes that can be made locally to improve management and the way up to the reform of the system at a more general level.

With European fisheries as diverse as they are, is it realistic to think that results-based systems of management can be introduced here?

I feel that with RBM there is a possibility to gradually reform European fisheries management. New Zealand and Australia are two countries that have a lot of experience with RBM. In New Zealand the use of RBM includes the traditional top-down management, where the fisheries administration is responsible for regulation and monitoring, and the scientists for the data collection and modelling of resource state. The RBM feature of this, however, is that management is about standards and documentation rather than about detailed process regulations. At the other end of the spectrum, there are examples of RBM being implemented by a group of resource users, who have taken over many of the regulatory, data-collecting, and monitoring functions. This shows that RBM in a European context might allow for a gradual transition from top-down management towards co-management.

Aquaculture in Turkey

A powerhouse in European fish farming

The aquaculture sector in Turkey is relatively young. Rainbow trout production started in the 70s and the first seabass and seabream farms date back to the mid 80s. Today, however, Turkey is Europe's largest producer of trout and the second largest producer of seabass and seabream.

Aquaculture, according to Audun Lem of the FAO, is the fastest growing animal food-producing sector in the world today with global per-capita production increasing from 0.9 kg in 1970 to 8.6 kg in 2011. Over this period global population almost doubled from 3.7bn to 7bn. The increase in aquaculture production has been mainly in South East Asia, but rapid growth aquaculture is also seen in Turkey, where between 2004 and 2010 farmed fish and seafood production grew from 94,010 tonnes to 167,141 tonnes, an increase of 78%.

Seabass, seabream, and trout are the three main farmed species in Turkey.

Three main farmed species

Trout, European seabass, and gilthead seabream dominate farmed production in Turkey accounting for 164,197 tonnes or 98% in 2010. Trout is primarily farmed in freshwater, but there is also some production of trout in the sea. In addition there is a small production of mussels as well as some new species of marine finfish, such as meagre, shi drum, common dentex, sharpsnout seabream, bluespotted seabream, Black Sea turbot etc. The growth in production is chiefly from the three main farmed species. Mussel production peaked at 1,545 tonnes in 2006 and has since fallen to 340 tonnes in 2010, while production of other species seems to have stagnated at a little over 2,000 tonnes. Marine-farmed trout on the other hand has been growing from 1,194 tonnes in 2003 to 7,097 tonnes in 2010. Turkey also has a quota of bluefin tuna for farming or fattening – the difference is whether the fish are kept to increase the fat content (fattening) or the biomass (farming). For the former the fish are kept in captivity for a period of 2-6 months, while in the latter case it is usually more than a year. The Turkish quota for 2011 was 536 tonnes, but companies culturing tuna may import the fish as long as they do not exceed the limits they have been allowed to place in their cages. Tuna is a highly valuable export in terms of the unit price, but the volumes are marginal.

According to Hayri Deniz from the Turkish Ministry of Food, Agriculture, and Livestock (MoFAL), in a presentation made at a WTO workshop in Istanbul in November last year, the aquaculture industry in Turkey is distributed over the entire country with pockets of concentration here and there. There are altogether 1,935 fish farms with a total capacity of 313,799 tonnes. More than half this capacity (56%) belongs to freshwater farms, which can be found in almost all the Turkish provinces, while the rest is marine farms. Twenty-one percent of the marine cage farms are located offshore and hold 60% of the total marine cage capacity. Out on the west coast in the Mugla and Izmir provinces are the heaviest concentrations of marine farming activities, while the provinces of Kayseri in the centre and Elazig in the centre-east have more freshwater farming facilities than other provinces.

Several factors contribute to rapid growth in production

What are the reasons behind the explosive development in the Turkish aquaculture sector? One factor that has played a role is the decision to move the industry offshore. This is a relatively recent

Table 1 Aquaculture of commercially important species: 2003-2010 (mt)

Species	2003	2004	2005	2006	2007	2008	2009	2010
Trout (inland water)	39674	43432	48033	56026	58433	65928	75657	78165
Carp (inland water)	543	683	571	668	600	629	591	403
Trout (marine water)	1194	1650	1249	1633	2740	2721	5229	7079
Sea bass	16735	20435	27634	28463	33500	49270	46554	50796
Sea bream	20982	26297	37290	38408	41900	31670	28362	28157
Mussel	815	1513	1500	1545	1100	196	89	340
Others	-	-	2000	2200	1600	1772	2247	2201
TOTAL	**79943**	**94010**	**118277**	**128943**	**139873**	**152186**	**158729**	**167141**

Source: Ministry of Food, Agriculture, and Livestock, Turkey

development in the history of the Turkish marine farming industry. Initially, in the mid 80s, marine cages were small wooden structures placed close to the shoreline in sheltered bays. As the industry developed the cages became larger and more numerous provoking conflicts with other marine stakeholders particularly the tourism industry, environmentalists, and the maritime recreation sector as the cages were unsightly and intensive fish culture was changing the colour of the water. An attempt to resolve the conflicts was the identification of marine aquaculture zones in 1988 to which the sea farms were moved. But these too could not keep pace with the developments in the industry in cage design, hatchery construction, feed technology, and culture techniques.

The solution was to involve all the stakeholders in defining integrated coastal management plans. The Turkish government's National Marine Aquaculture Development Plan laid down a framework that would minimise conflicts between different sectors and at the same time allow the mariculture industry to grow without constraints. New offshore aquaculture zones were determined in consensus with all stakeholders and all the inshore marine farms were relocated to offshore zones. Initially the industry was opposed to the move as it would mean increased costs. The marine environment offshore is rougher and all offshore equipment has to be able to cope with increased demands being placed on it in terms of higher waves and stronger winds. Cages, ropes, nets etc. have to be more robust, boats need to be stronger and have more powerful engines meaning higher fuel consumption, and the staff has to be better trained and equipped, all of which means more expenses for a company. On the other hand the offshore environment is better for the fish and some in the industry feel that the move to offshore cages has contributed significantly to the rapid increase in Turkey's production of seabass and seabream over the last eight to nine years. It has certainly added to Turkey's expertise in the field of offshore marine farming, knowledge that it can build on and use to assist mariculture industries in other parts of the world.

Number of farming facilities increase each year

Another factor contributing to the growth in the production of farmed fish is the increase in the number of facilities. The number of facilities producing in seas and inland waters was 1,275 in 2002 and 1,935 in 2010. Each year 60-70 new facilities commence operation. Trout is usually farmed in concrete raceways, round ponds, in cages in freshwater reservoirs, or in sea cages. The fish take 12 to 24 months to grow to a market size of 250-300 g in raceways, but may only take seven months to grow from 150-200 g to 900-1,000 g in cages in the Black Sea, according to research carried out at Ege University and Rize University. The freshwater fish is typically grown to 250 g to 300 g and is sold fresh whole on the domestic market, while for sales abroad it is often frozen, either raw or smoked. In the Black Sea region producers grow the fish on land or in freshwater cages in summer and then transfer them to sea-cages in November where they can grow until May before the water gets too hot. This trout is sold in sizes from 0.7 kg to 3 kg. The production of ocean-reared freshwater trout has increased rapidly since 2006 from 1,633 tonnes to 7,079 tonnes in 2010. Interest in trout production has also resulted in companies investing in their own hatcheries such as the Kilic Group, though some producers still import the eyed eggs.

Well developed research structure

In the case of seabass and seabream Turkey has mastered hatchery production techniques and hatchery management and now produces about 220 million fry at 20 hatcheries, of which two are owned by the state. This is enough fry for on-growing in cages not only to meet its own vast needs,

Many trout farming companies have their own hatcheries complete with broodstock, while others import the eyed eggs.

The Turkish Seafood Promotion Committee

The Turkish Seafood Promotion Committee comprises three exporter associations: the Aegean Exporters Association, the Istanbul Exporters Association, and the Mediterranean Exporters Association. The promotion committee's role is to increase foreign and domestic demand for seafood by profiling and promoting Turkish seafood nationally and internationally, developing marketing strategies for new and existing markets, and implementing marketing activities. Partly as a result of these activities exports of seabass and seabream increased from 17,074 tonnes in 2006 to 27,197 tonnes in 2011.

but also for export. Improving hatchery output was assisted by targeted research to improve growth performance and to develop resistance to disease and stress. Research was also conducted into the factors that contribute to malformations in the juveniles in order to identify and eliminate them. Improvements in larval feeds and recirculation technology also helped to produce more robust larvae and reduce mortality rates. Research and development in the aquaculture sector is mainly carried out at 16 fisheries faculties at universities and the ministry's research institutes. In addition, there are five fisheries departments within agricultural faculties that also carry out research at the post-graduate level. Transfering the results of applied research to the field through collaborations between the research establishment and industry is an important prerequisite for the development of the sector. Turkey has in general been able to effect this transfer though there is still scope for improvement. Research at universities is one part of the research effort, the other is the research that is carried out by the individual companies. This involves efforts at the private hatcheries, and the feed plants, as well as with regard to the on-growing of the fish. The research carried out and implemented here has also contributed to the growth of the sector. Feed mills for example are constantly experimenting with the feed composition to find greater efficiencies and today the proportion of fish meal and fish oil that are used in the feed is only a fraction of what it used to be some years ago.

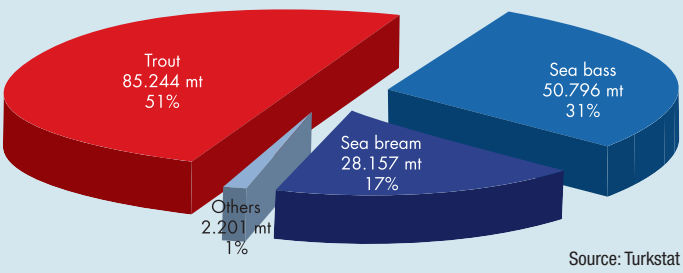


Figure 1 Distribution of aquaculture productions by species in 2010 (mt).

Improved fish health management and husbandry practices

Fish health management has also improved as hatcheries and on-growing facilities usually have a laboratory in place that keeps an eye on the health of the stock. Personnel are well trained, biosecurity is taken seriously, and measures are in place to contain an outbreak of disease. The spread of certification for hatcheries and on-growing facilities such as GLOBALG.A.P, HACCP and ISO have also contributed to healthier environments for the stock and the development of contingency plans should anything go wrong.

Aquaculture growth in Turkey is helped also by official government policy which is to increase the annual per capita consumption of fish in the country from 7 kg. (FAO, 2005) Capture fisheries are unlikely to increase enough to make a significant difference to consumption, so the government is betting on the aquaculture industry.

Other factors that play a role in the increase in Turkish production of farmed fish are the subsidies that are given to exports and the availability of relatively cheap labour. Furthermore, the growth in the market, in ➤

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While fresh, whole trout is largely consumed on the local market, smoked trout is exported to Europe. Here the fish are waiting to enter a smoking chamber.

particular the domestic market in Turkey has also contributed to give production a boost. The general growth in the Turkish economy over the last years has resulted in higher incomes and purchasing power and has increased the domestic demand for fish. Trout is mainly consumed locally while about 25% of the seabass and seabream is sold on the domestic market.

Gradual changes in product forms on local markets

Processing facilities are often owned by companies that also have production facilities for the raw material, whether trout, seabass or seabream or other species. Processors of seabass and seabream who have their own production of these two species will often buy trout from other suppliers to be able to offer their customers a complete range of products from these three major species. Arrangements whereby a producer will supply feed or fingerling and take payment in the form of market sized fish are common. The fish is processed into certain fairly standardised fresh and frozen products, whole round, whole gutted, and fillets of different varieties. More recently processors have been combining fillets with vegetables and other ingredients to give ready-to-cook and ready-to-eat products for the international market. Tastes in Turkey are also changing slowly. From exclusively buying fresh whole fish consumers are showing an interest in vacuum packaged fillets that are slowly being introduced to retail outlets within the country.

The outlook for the Turkish aquaculture sector is certainly bright, but it could be even better with certain improvements. One of the most important, according to Dr Deniz from MoFAL, is the need to have a well defined aquaculture policy, over and above the general government policy to support aquaculture, that could remove uncertainty from the sector. Research should also be better coordinated between industry and universities and research institutes to deliver better and more relevant results. Applications for licenses take a long time to be processed making it necessary to plan years in advance. A more rapid application process would greatly benefit the sector in terms of planning and implementation.

bt

Laboratories and the personnel employed there are responsible for fish health management at fish farms and hatcheries.

Fish feed producers are constantly improving the formula and trying to reduce the amount of fishmeal that goes into the feed.

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Future Fish Eurasia

Agromey used its feed producing activities to move into aquaculture

Rapid transition from trader in cereals to established fish farmer

Agromey was established ten years ago as a trader in raw materials such as corn and soya. From trading in cereals the company entered into feed manufacturing and started supplying fish farmers with feed for their stock. When the financial and economic crisis struck in 2008 some farmers were unable to pay for the feed in cash and offered to pay in fish instead. This was the start of Agromey's aquaculture operations.

Over the course of only a few years Agromey's fish farming operations have grown from scratch to an expected production of 11,000 tonnes of seabass and seabream in 2012, making the company one of the biggest producers of farmed fish in Turkey. Along the way the company has seen some major changes. In 2010, 60% of the company was bought by another, and in 2011 the management team changed as a new Chief Executive Officer (CEO) took over. Agromey today concentrates on the production of fish feed as well as the farming, processing, and trading of fish and has set itself some ambitious targets over the next couple of years. Tolga Uruk, the marketing and sales director, says the plan for 2012 is to reach EUR100m in sales and to enter the list of Turkey's 500 biggest companies.

Tolga Uruk, the marketing and sales director of Agromey.

Ten grow-out facilities for seabass and seabream

Agromey has ten grow-out facilities for seabass and seabream, six in the Izmir area and four further south near Bodrum. In addition, there are two processing plants, one with a 5,000 sq. m built up area close to Aydin, and the other of 2,000 sq. m about 40 km from Izmir. Close to the Aydin processing plant the company also has an aqua feed factory and another feed production unit is located in Torbali. These production facilities ensure that the company controls most of the elements in the production chain. We do not have a hatchery, says Mr Uruk, and we source our trout from external suppliers, but otherwise the production is from Agromey-owned facilities. Trout production depends on the season. We have some contracts with companies for the tailor made supply of trout and we have a smokehouse at the processing facility where we smoke the fish before filleting and packaging. The contracts are based on barter agreements where Agromey supplies the feed and the company delivers fish in exchange. Eighty percent of the trout processed is exported, but it varies from one season to the next.

Seabass and seabream account for the lions share of the production and about 70% of the fish is exported. Over the last five years Mr Uruk has noticed significant changes in the European market for seabass and seabream. For one thing more and more countries are importing the fish. Five years ago the main market for these species ➤

The fish is delivered to retail chains in the Netherlands, Germany, Russia, Spain, and Italy.

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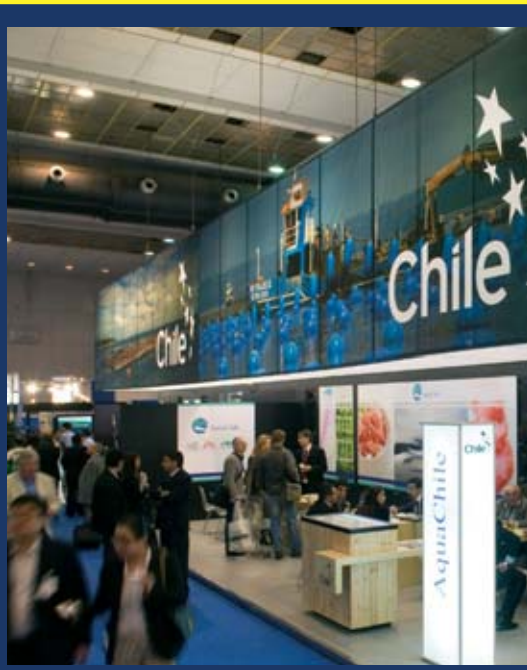

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Seabass and seabream is automatically graded before being sent for further processing.

The fish is descaled by rotating it in a machine that rubs the scales off.

The fillets are weighed and packed in styrofoam boxes on ice.

was in Italy, while now the Netherlands, Germany, Russia, and Spain are all purchasing increasing volumes. In general, says Mr Uruk, the global market for seabass and seabream is expanding as consumers get familiar with the taste and the Turkish industry moves from exporting frozen whole round fish to shipping frozen fillets, ready to cook and ready to eat products, and fresh fish. Apart from Russia, and Ukraine, countries in the Middle East, the US, China, and Hong Kong are all showing an interest in these products.

At Agromey the processing side of the operations is still relatively new. We are learning that requirements in different countries are different, says Mr Uruk. What is standard in the UK and in Germany may not be acceptable in, for example, the Netherlands. As a result Agromey exports fresh fillets to the Netherlands where they are frozen and glazed to different specifications using different machinery, and sold tailor-made in special packaging.

Greek crisis may offer opportunities for Turkish producers

Producing a fish like seabass and seabream, that has now become a commodity, means that companies like Agromey have to be aware not only of what is happening on the neighbouring farm, but also have to keep an eye on what other countries in the region are doing. According to the FAO Greece was still the world's biggest producer of seabass and seabream in 2009, while Turkey was the second largest. In 2008 Turkish production was 94% of the Greek output, however this ratio fell to 80% in 2009 as Turkish production declined by over 6,000 tonnes, while Greek volumes increased by 7,100 tonnes. The crisis in Greece however may be an opportunity for Turkish producers. Mr Uruk is optimistic that buyers in Europe will switch to Turkish suppliers if they are unable to source their fish in Greece.

For Agromey the domestic market is also important, absorbing 30% of the production. Most of this is sold in the form of whole round fish which is the preferred form in Turkey as fish-eaters like to see the fish before they buy it. At fish restaurants the most common way of cooking is to grill it whole. Agromey's customers on the local market include the supermarkets Metro, Tesco, Carrefour, and Real. This too is a change from five years ago when sales on the domestic market were mainly through wholesalers. Today half the fish sold locally is sold through the retail chains. This in turn enables fish farmed on the coast to be sold in the interior, where, historically, meat has been the preferred source of protein. Fish, when consumed, tended to be the locally available trout. Fish consumption per capita in Turkey is still low at 7 kg (2005), so there is much scope for improvement. Mr Uruk feels that in Turkey, with its young population and a growing awareness of the health benefits of fish, consumption could double within five years.

Agromey Company Fact File

Sair Esref Blv. Tuzcuoglu Is Merkezi
No: 48, Kat: 5
Konak
Izmir
Turkey

Tel.: +90 232 446 88 11
Fax: +90 232 446 09 08
tolga.uruk@agromey.com
www.agromey.com

Marketing and Sales Director: Mr Tolga Uruk
Activities: Seabass and seabream farming, fish feed production, fish processing
Facilities: Ten sites with cages, two processing plants
Volumes: 11,000 tonnes of seabass and seabream (2012 estimate)
Products: Fresh and frozen whole round, gutted, filleted seabass and seabream; whole round, gutted trout; smoked trout fillets
Markets: Netherlands, Germany, Russia, Spain, Italy
Employees: 450

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Akua-Dem anticipates an increase in quotas

Optimistic about the results of the next stock assessment

Akua-Dem and its sister company Akua-Kocaman together form the Akua Group, a bluefin tuna fattening and farming enterprise. Each company has a capacity of 800 tonnes and is allowed to put in 480 tonnes of the fish into its cages.

From on board a vessel it is possible to glimpse the shapes in the cages below. Though mostly indistinct, every now and then they rise to just below the surface for a couple of seconds affording a view of a vast bluefin tuna up to 400 kg in weight. The cage, 50 m in diameter and with a depth at the centre of 28 m, has about 75 tonnes of fish in it. Fish sizes vary from 40 to 400 kg and they are being fattened for the Japanese market. In a few months they will be harvested, slaughtered, and superfrozen at minus sixty degrees and transported to the Tsukiji wholesale market in Tokyo.

Nedim Anbar, one of the shareholders in the Akua Group, farms tuna for Japanese customers.

Tuna farming driven by Japanese demand

The craze for tuna in Japan, where earlier in January a 269 kg fish was auctioned for a record-shattering USD736,000, has spawned a huge tuna farming or tuna fattening industry in the Mediterranean. Fishermen capture the fish by surrounding them with a net and then guiding them into cages which are towed slowly back to the farm site, where the fish are moved into holding cages. Here they can be kept from two to six months to increase the fat content (fattening) or for more than a year to increase the total biomass (farming). Over this period the fish are typically fed on fresh or frozen pelagic fish including sardine, herring, mackerel, pilchard, or sardinella. Nedim Anbar is a shareholder in the company Akua-Dem, which has two sites with four cages each, holding in total some 800 tonnes of fish. By the time the fish is harvested it will amount to some 900 tonnes. A few miles away another company has its tuna farming site. The distance between Akua-Dem's cages and those of the other company is so small that in 2011 the two companies entered into a cooperation to share facilities and services. The arrangement allows the companies to pool resources – crews, employees, boats etc., and thereby reduce costs.

An international body, ICCAT (the International Commission for the Conservation of Atlantic Tunas), is responsible for managing tuna stocks in the Mediterranean. As stocks of bluefin tuna in the Mediterranean came under increasing pressure, ICCAT introduced a management plan in 2006 that restricted national quotas and catch seasons, set minimum size limits, and introduced several other measures aimed at rebuilding the stock. Today, the fishing for bluefin is restricted to one month from 15 May to 15 June and in the case of Turkey the national quota is 536 tonnes (2010). This does not prevent tuna farmers from importing fish from other countries to stock in their cages.

More bluefin tuna in the sea?

In 2011 Akua-Dem brought fish from Moroccan and Tunisian boats. The Moroccan boats were in the Mediterranean cooperating

Akua Group (Akua-Dem Ltd. and Akua-Kocaman Ltd.) Company Fact File

Ömer Avni Mah., Meclis-i Mebusan Cad.,
Koçarslan Ishahani, No 149, Kat 4,
Findikli, Beyoglu
34427 Istanbul
Turkey

Tel.: +90 212 292 79 00
Fax: +90 212 272 79 04
info@akua-dem.com
www.akua-group.com

Shareholders : Denizer Balikcilik, Mamuli Balikcilik, Kocaman Balikcilik and. Nedim Anbar
Activities: Bluefin tuna fattening and farming
Facilities: Two farm sites with four cages each
Capacity: 800 tonnes, quota 480 tonnes each

with Akua-Dem's vessels, but the Tunisian fish had to be towed 850 miles back to the Akua-Dem site. While the measures implemented by ICCAT are restrictive, Mr Anbar does not deny that many of them were necessary – though some, he feels, were plainly ridiculous. In the first half of the last decade, he says, the stock of bluefin tuna was clearly dropping. Schools were getting smaller, the average individual fish size was falling, and the fish were increasingly hard to find. Since ICCAT stepped in with its management plan the number of fish seems to be increasing, says Mr Anbar, who does not claim to have made a scientific assessment. Previously when we caught the fish we could not catch more than ten or fifteen tonnes, if we caught thirty tonnes

The Akua Group has two sites each with four cages. Each site can hold 800 tonnes of tuna and is allowed to start with 480 tonnes.

we would be happy. But this year we had one catch of 125 tonnes of fish, indicating that the schools are getting bigger and bigger. In addition now we often notice up to 100 tonnes of fish swimming under the cages catching any uneaten feed.

At Akua-Dem the fish is usually held from May or June to January or February the next year. Occasionally the fish will be held for twenty months. When selling the fish the kilo price varies with the size of the fish, with one price for fish up to 60 kg, another, higher, price for fish between 60 and 120 kg, and another price for fish bigger than 120 kg. We prefer to sell the fish when the minimum size exceeds 60 kg, says Mr Anbar. His customers too are from Japan. They arrive at harvest time in January or February and oversee the slaughtering, cutting up, and freezing of the fish on board their vessel. Usually the vessel will sail from farm to farm filling up the hold before heading for a port where the frozen fish can be unloaded, transferred to a container and shipped to Japan. However, if the prices on the Japanese market are right small volumes of fish are harvested and air-freighted there.

The tuna in the cages is fattened on fresh or frozen pelagic fish including sardine, herring, mackerel, pilchard, or sardinella.

Akua-Dem buys 10-15 tonnes of sardines each day to feed the tuna. The feed can be sourced from anywhere in the world depending on where the price quality ratio is best.

Signs of growth in stocks

Mr Anbar is well aware that circumstantial evidence is no substitute for a rigorous scientific study, but he is heartened by the signs and is optimistic about the results of a stock assessment that is due in 2012. Among the ICCAT limitations is a minimum size limit that decrees that individuals may not weigh less than 30 kg when they are caught. This was an important measure to rebuild the stock, says Mr Anbar; since in the Mediterranean bluefin tuna usually spawns at about 25 kg, it gives all the fish a chance to spawn. All in all, I am very, very optimistic about the outcome of the stock assessment in 2012. Although Mr Anbar is aware that ICCAT has an important role to play in stock conservation he also finds some of the restrictions highly inflexible. Today it is easier to deal with drugs that to trade in tuna, he claims. Everything about the industry is monitored either with personnel on board the vessels or by cameras, and there is a lot of documentation that is needed to satisfy the authorities.

Mr Anbar would like ICCAT to take up a proposal that would stop the catch in the spawning season in May and June but would allow the fish to be targeted the rest of the year instead. We would still be bound by quotas and everything would still be monitored, but it would give the fishers more flexibility. However, there is resistance to this idea among other members of ICCAT and Mr Anbar is aware that it will take a significant shift in attitudes before this will be considered.

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Organised in partnership with the University of South Bohemia - Faculty of Fisheries and Protection of Waters

Bagci has been associated with trout for many years

Production caters to domestic and foreign tastes

Bagci is one of the oldest trout farms in Turkey. The company produces 3,000 tonnes of trout per annum from three sites and has a processing plant where the fish is smoked and/or frozen.

The first Bagci farm grow-out facility was established in Aydin in 1981 and had a capacity of 70 tonnes per annum. This was followed by the purchase of a second facility in 1986 at Koycegiz, where a processing plant was also established that conformed to all the relevant European norms and enabled the export of the fish to markets in several European countries. In 1999 the company invested in a third site at Bozdogan-Kemer increasing the total capacity to 3,000 tonnes.

Necip Emre, Fish Production Engineer; Burch Aykurt, Quality Manager; and Giydem Arslan, Production Manager at Bagci.

Trout popular locally as well as abroad

The facility at Koycegiz has 265 concrete raceways where the fish are grown. The raceways are fed with water from a distant spring some five kilometers away from the farm. As the water comes out of the ground the temperature does not fluctuate violently staying at 13-14 degrees in winter and 17-18 degrees in summer. This temperature enables the fish to be produced throughout the year. The volume of water used varies from summer to winter with more water being used in winter than summer. On average the farm uses about 1,500 litres per second. After being used on the farm some of this water is used to generate electricity by piping it down a hill to a turbine. The electricity can then be sold back to the grid. Necip Emre, Fish Production Engineer at Koycegiz, says the volumes produced at the site amount to 900-1,000 tonnes per year. Trout production in Turkey has expanded by 132% from 33,707 tonnes to 78,165 tonnes between 2002 and 2010, according to the Directorate General for Fisheries and Aquaculture in the Ministry of Food, Agriculture, and Livestock. During this period each year has consistently seen an increase in production. The fish is sold on the domestic market usually fresh

Bagci Balık Gıda ve Enerji Ürt. San. Ve Tic. A.Ş. Company Fact File

Zeybek mah. 3. Cadde Külleci
Apt. No : 1 A Blok Kat : 1 D: 2
Aydin
Turkey

Tel.: +90 256 219 9026
Fax: +90 256 219 9036
info@bagci.com.tr
www.bagci.com.tr

Chairman of the Board:
Mr. Mustafa Bagci
Activities: Farmed freshwater trout production, fish feed production
Volumes: 3,000 tonnes of trout
Facilities: 3 farming sites, one processing factory
Products: Fresh and frozen trout
Product forms: Whole, fillets
Markets: Germany, Denmark, Poland, Czech Republic, Slovenia, Austria, England, Belgium, Switzerland, the Netherland, Singapore, Taiwan, Turkey

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Fax: + 49 (0) 73 51 / 45 - 15 01
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Ideas for the future.

In the processing plant smoked trout is skinned and filleted to give the final product.

The smoked trout is vacuum packaged and frozen to give it a longer shelf life.

and whole, while internationally it is frozen fresh fillets or smoked fillets that are demanded.

At the Koycegiz facility there is a hatchery, but no broodstock. Eyed eggs are imported from the United States and brought to the hatchery. About six million eggs are imported a year, 1.5 million each quarter, but mortality is 25-30%. Once they reach about 30 g, which takes four to five months, they are moved to raceways and allowed to grow for a further five to six months, by which time they reach some 300 g which is the preferred market size. The fish are harvested at this stage and brought to the processing plant which lies a few meters away from the raceways.

Fish from external suppliers is processed too

In the processing factory the fish are placed in an ice slurry to knock them out and then the gills are slit using a machine. The factory can process more fish than the farm can supply and up to 30% of the fish that is processed here comes from external suppliers. The main products manufactured are fresh and frozen trout fillets and smoked fish. The factory is certified to different international standards including BRC (British Retail Consortium), and ISO, and the audit for two other certifications, IFS (International Food Standard) and GLOBALG.A.P, is ongoing. For the smoked trout the fish is not smoked in electric ovens, but in wood-fired smoking chambers using oak, giving a special flavour to the final product. The fish is hot-smoked and then cooled for three hours before being vacuum packaged in polyethylene to give the product a shelf life of 21 days when fresh and 18 months when frozen. The smoked fish is available in packages varying in size from 100 g to 500 g per package which are then packed in a cardboard carton. Cartons weigh from 2 kg to 10 kg. The bulk of the production, about 95%, is exported. The main market is in Europe, where Bagci sells to several countries including Germany, Denmark, Poland, Czech Republic, Slovenia, Austria, England, Belgium, Switzerland, Holland, but Singapore, and Taiwan are also destinations. The production includes both smoked and non-smoked products. The fresh trout is sold whole gutted or as fillets which are then packed on ice, block frozen, or vacuum-packed.

The company has a laboratory which is currently located in the building where the processing operations take place, but is being moved to another location to comply with the new certification requirements. Among other things the laboratory checks for coliform bacteria, staphylococcus, and salmonella, in the raw material and the finished products.

Bagci also produces fish feed for trout as well as for marine fish for each stage of the fish growth. The feed is extruded and is available in different pellet sizes from 1 mm for nursery feeds to 12 mm for broodstock. The raw materials in the feed are of fish or plant origin; no blood or bone from terrestrial animals are used. Bagci uses the feed at its own farms but also sells it to other companies.

Fish being carried from the raceway to the transport system that will carry them to the holding tanks preparatory to being processed.

Trout plays an important role in the Kilic Group's range of products

Exports to thirty countries on four continents by road and air

In Kahramanmaras in south central Turkey, the Kilic Group, already Turkey's biggest producer of seabass and seabream, has established a large trout processing facility. A strong believer in vertical integration, the Group has also built a trout hatchery and has three sites with grow-out cages in Sir, Kayseri and Gazantiep, which supply the processing plant with fish.

The processing facility, while currently only dealing with trout, is also licensed to process seabass and seabream as well as shellfish should the need arise. The facility measures 9,000 sq. m and is divided into two levels. The lower level is where the processing actually takes place, while the upper level houses a canteen, changing rooms, management and engineer offices, laboratories, etc. This separation of areas makes it easier to maintain the hygiene levels needed in the processing part of the facility. The factory has a capacity of 12,000 tonnes and actually processes 7,000 tonnes of trout a year. The work is done by some 175 employees who are divided into two eight-hour shifts. They are responsible for processing the raw material into fresh whole round or gutted fish, fresh fillets, as well as smoked fillets. A new product is 500 g or 1 kg of fish in an aluminium tray together with a packet of herbs that can be placed directly in the oven and baked.

Sinan Kiziltan, Vice President of the Executive Board of Kilic Holding, as well as President of the Turkish Exporters' Association displaying seabream packaged in modified atmosphere at the European Seafood Exposition in 2011.

Processing plant and grow-out sites certified to all international standards

Berk Tosun, the financial and administrative manager for trout, was moved by the company to the factory at Kahramanmaras from Izmir in the west of Turkey. At the factory Mr Tosun explains that significant efforts are put into maintaining hygiene and food safety standards: the low risk and high risk products have separate entrances; the entire factory is air-conditioned to avoid breaking the cool chain; as the raw material comes in from the farms, samples are taken to the laboratory for analysis; other measures are in place to ensure that the fish are correctly gutted and cleaned. The plant and the farms are certified to various international standards: ISO9001, ISO22000, BRC (Brititsh Retail Consortium), IFS (International Food Standard), and GLOBALG.A.P. The laboratory is used to check the fish for bacteria and other pathogens as well as the water quality in the factory. As the raw material comes in it is inspected and then graded in a machine that offers a sensitivity of as little as two grams. If the fish are to be sold fresh whole round they are immediately packaged and placed in refrigerated storage. Otherwise they will continue to the gutting machine and then if necessary to the filleting line or to be salted, skewered, and smoked. The smoking is currently done in traditional wood-fired ovens, but the company intends to install electric ovens as well.

Berk Tosun, Manager Finance and Administration of Kilic's trout production.

Adalat Ucal, Manager of the Kilic Guvercinlik Hatchery near Mugla, where much of the research into new species is carried out.

The trout production started three years ago and has grown rapidly since. The area around Kahramanmaras was chosen as the site for producing trout, as water is plentiful. The reservoirs in the area are used for the production of electricity, for irrigation, and for drinking water. As long as a reservoir is not used for drinking water it can be used for aquaculture purposes, says Mr Tosun. Kilic's farming and processing activities are significant contributors to the local economy and it is one of the biggest fish producers in the area. Most of the workers come from the town and the company has organised buses to transport them back and forth between the factory and the town centre. The Sir reservoir is the closest to Kahramanmaras. At the farming site there are altogether 70 cages of which 48 are full of fish. As the water in the Sir reservoir reaches 25-27 degrees in summer which is lethal for the fish, production here is not possible around the year unlike the other two sites in Gazantiep and Kayseri, where the water is between 8 and 21 degrees that is the fish's comfort zone. The juveniles are usually brought from the hatchery to the cages at 2-3 g and allowed to grow until they reach the market size of 250 to 300 g. Occasionally customers will demand bigger sizes, which means the fish has to be grown longer than the 12 months it normally takes to reach market size. Investing in three sites to grow the fish is more sensible than it may appear at first. For one thing the risk of all the stock being attacked simultaneously by disease or any other problem is virtually eliminated. Having three sites allows a degree of flexibility when fulfilling orders. Although production is restricted to nine months in the year at one site, it is round the year at the other two, and finally environmental laws prohibit the use of more than 3% of the surface of a reservoir for the purpose of aquaculture.

Hatchery works on developing its own vaccines

The fish are vaccinated against diseases both in the hatchery

and then again on the farm. These are against vibrio and Yersinia ruckeri (enteric redmouth disease) at the hatchery and streptococcus on the farm. At the hatchery efforts are being carried out to develop in-house vaccines against the strains of bacteria that are present in the hatchery environment. The main idea is to rely more on prevention rather than cures, as treatment with antibiotics is prohibitively expensive.

Trout is a rapidly growing fish – it takes only a few months from the time it is put in the cages to the time it is harvested. As growth rates differ, it is necessary to grade the fish to prevent different-sized fish from being together in the same cage. The harvesting is done around the year and depends very much on the customer. If he needs fish to be supplied weekly or daily these requirements are put into the harvesting plan and carried out accordingly. Production at the Sir reservoir at the moment is 3,800 tonnes, while the total production from all sites is 7,000 tonnes. At Sir the company is implementing a project that will increase production to 4,500 tonnes in the space of a few months. The company keeps a close watch for any potential environmental impact from the production. Regular samples are taken of the water under the cages as well as of the reservoir bed at several points before and after the farm. For the company too it is vital to know that the fish are feeding and that the feed is not accumulating in the environment. The feed is the biggest cost in the production and we cannot afford to waste it, says Mr Tosun. Careful calculations are made based on the biomass in the cages and various other factors such as temperature of the water, the type of feed, and the age of the fish, to compute the volume of feed that is needed. If the fish for some reason are not feeding, then they are not given further feed until the reason for this is established and dealt with. The water quality is monitored by the ministry of environment while the scrutiny of the reservoir bed soil, though not required by law, is carried out by the company as part of its commitment to the GLOBALG.A.P standard.

Seabream and seabass production is fully integrated

The Kilic Group produces substantial quantities of trout, but it is in the production of seabass and seabream where it stands out. The Group farms some 24,000 tonnes of these two species making it Turkey's most prolific producer and indeed one of the biggest in the world. The grow-out operation is supported by Turkey's biggest production of seabass and seabream juveniles spread over four hatcheries, a feed mill, and processing and packaging facilities, sales and marketing for domestic and international distribution, as well as a private distribution channel within Turkey.

The Kilic Guvercinlik Hatchery near Mugla is where the research and development

The butterfly fillet is one of the product forms shipped to western markets.

The vaccinators inject the fish in the gut and drop them into a channel which carries them back into a cage in the water.

Smoked and filleted trout getting ready to be vacuum packaged for export to Europe.

into new species is carried out. Trials of new, commercially valuable, species are conducted here and the problems observed during their production are investigated. While several species have already been researched it was found that the market was not interested in them and further efforts have therefore been shelved. Meagre *(Argyrosomus regius)* and shi drum *(Umbrina cirrosa)* are two exceptions that today are being produced commercially and breeding of greater amberjack *(Seriola dumerili)* will also start soon on a commercial basis. Adalat Ucal, the manager of the facility, points out that the hatchery does not just focus on new species, but that it also produces 20 million seabass and seabream fry, not only for the Kilic Group's production, but also for sale to other producers in Turkey, but also in Greece, Tunisia, Dubai, and Egypt. Before the crisis we were exporting 30% of the hatchery's production, but since then it has increased to about 50%, says Ms Ucal.

Fish air-freighted to destinations in Asia and America

The four Kilic hatcheries together supply some 60% of the demand for seabass and seabream fry in Turkey. About 30% is exported and another 30% is sold on the domestic market, the remaining 40% is used for the Group's own production. From the hatchery the fry move into adaptation units and once the juveniles reach 2 g they are put into the sea in cages to grow until they reach market size. This could be anything from 200 g to 1,500 g depending on the customer's requirements. The fish are harvested and brought to the processing factory where the initial inspection includes a test of the temperature of the fish which should be minus one or minus two degrees. Keeping the fish at this temperature throughout the production chain ensures a longer shelf-life. Some of the fish is packed in styrofoam boxes and sent immediately to be air-freighted to destinations in the US, the Middle East, and Central Asia. We are Turkish Airlines' best customer for perishables with 500 tonnes a year, says Mustafa Sonmez, market development coordinator.

Production trials are currently being carried out in a new and bigger processing plant located a few meters away from the older unit. In another building in the same complex expandable polystyrene (eps) boxes are being produced in different sizes to package the fish. Both the processing units are certified to IFS, BRC, ISO9001, 22000 and 14000 standards and work is ongoing to also meet the GLOBALG.A.P requirements. In addition, the company is certified by the Russian authorities to their standards and exports some of the production there. Kilic also exports fish and fish products to virtually all the European countries. Sinan Kiziltan, vice president of the executive board of Kilic Holding, as well as president of the Turkish Exporters' Association, says the company is moving increasingly into the production of value-added items such as fresh fish or fillets in modified atmosphere packaging and is exploring the possibility of creating ready-to-cook meals based on seabass and seabream.

Kilic Holding Company Fact File

Kemikler Koyu Mevkii
Milas-Bodrum Karayolu 18. km
Mugla
Turkey

Tel.: +90 252 5590283
Fax: +90 252 5590287
info@kilicdeniz.com.tr
www.kilicdeniz.com.tr

Vice President, Executive Board, Kilic Holding: Mr Sinan Kiziltan
Market Development Coordinator: Mr Mustafa Sonmez
Marketing and Communications Manager: Ms Bahar Baykal Jones

Activities: Hatchery, farming, processing, sales and marketing, distribution, feed manufacture
Species: Seabass, seabream, trout, meagre, shi drum, greater amberjack
Volumes: Seabass and seabream 24,000 tonnes; trout 7,000 tonnes, small quantities of the rest
Products: Seabass and seabream, fresh or frozen whole round, gutted, fillets; trout, fresh or frozen whole round, gutted, fillets, smoked
Markets: US, Canada, the Middle East, and Central Asia, Europe, Turkey

More Aquaculture is committed to the environment

Seafarms and processing plant certified to exacting standards

Turkey has a coastline of over 8,000 km and is surrounded by four seas, the Mediterranean, the Black Sea, the Aegean, and the Sea of Marmara. Surrounded by water on three sides, the country has a capture fishery sector that is commensurate with its geography. However, it is the aquaculture industry, both marine and freshwater, that has shown the most dynamic growth in recent years.

Over a 10-year period from 2001 to 2010 production of farmed fish has grown from 67,244 tonnes to 167,141 tonnes, an increase of almost 150%. The dynamism is mirrored in the variety of companies operating in the sector. Some firms are completely integrated with their own hatcheries, grow-out facilities, processing and packaging plants, and sales and marketing departments. Other companies might only process and package, while others only produce. More Aquaculture was established in 2002 as part of the AKG Group that also has interests in the healthcare, construction, mining and tourism industries and Mr. Levent Akgerman is the Executive Director of More Aquaculture. The aquaculture activities started with grow-out cages (that needed maintenance along with old ground facilities) for only 20 tonnes of seabass and seabream at a single farm acquired from entrepreneurs, Ali Dürüst and Nutki Aksoy. Today, three farms with a capacity of 1,550 tonnes are operating in the Aegean Sea off the coast of Izmir and there is a certified additional capacity of 1,750 tonnes. On April 2009, the company added a processing and packaging facility to process the fish for the European market.

Farms and processing plant certified to international standards

The farms for the production of seabass and seabream are certified to the ISO 14001 standard which is a standard for environmental management systems. The International Standards Organization defines the ISO14001 standard as one that requires the company to identify and control the environmental impact of its activities, products or services as well as to continually

Mr Levent Akgerman, Executive Director of More Aquaculture.

improve its environmental performance. The company is also expected to develop a systematic approach from setting environmental targets, to achieving these, and to demonstrating that these have been achieved. In addition to the ISO standard, the farms are also certified to the GLOBALG.A.P standard, which minimises the negative environmental impacts of farming operations, reduces the use of chemical inputs, and considers worker health and safety as well as animal welfare.

For More Aquaculture the commitment to the environment reflects the company's interest in minimising its impact on the surroundings, but also makes good commercial sense. Many of our export customers in the European retail sector demand that their suppliers are certified to various standards including environmental ones, explains Mr Akgerman, without which we would not be able to supply them.

Sophisticated processing equipment combined with manual filleting

Production of seabass and seabream at More Aquaculture's own farms currently amounts to some 1,500 tonnes a year. Further amounts can be sourced from third parties. The company strictly monitors the quality of all the fish that enters the factory, which has a HACCP plan in place and is certified to IFS (International Food Standard) and BRC (British Retail Consortium) standards. In addition to seabass and seabream More Aquaculture also processes and packages freshwater trout. Trout production in Turkey increased significantly between 2002 and 2010, growing from 33,707 tonnes to 78,165 tonnes. More Aquaculture does not farm its own trout, but has agreements with a number of producers who culture the fish and supply it to the company. The production at the processing plant consists of whole round fish and fillets in different cuts. The filleting is all done by hand as it results in higher yields. We use very sophisticated equipment in the factory, says Mr Akgerman, the grading machinery is from an Icelandic manufacturer, the freezing machinery from Denmark, but we still find that when it comes to filleting, it is best done manually. The customers are mainly from the European retail sector which absorbs 80% of More Aquaculture's production including seabass, seabream, and trout products as well as small volumes of wild-caught sardines and anchovies. The fish is sent frozen to the UK and other European countries.

Today More Aquaculture produces mainly frozen whole round fish and frozen fillets, but is ready and able to manufacture other products per customers' request. We can produce to any specifications the customer might have, says Mr Akgerman. We can place his brand on the product, or supply it under our brand or even a third-party label if required. We are completely flexible and the standards to which we are certified ensure that product quality will never be an issue.

Sophisticated equipment is used for most processing operations, but the filleting is all done by hand as it results in higher yields.

More Aquaculture produces mainly frozen whole round fish and frozen fillets.

More Aquaculture Company Fact File

Kemalpasa Cad. 6170/1 Sokak
No: 5/1 Issikent
Izmir
Turkey

Tel.: +90 232 4721300
Fax: +90 232 4723003
asli@moreaquaculture.com
www.moreaquaculture.com

General Manager: Mr Ufuk Atakan Demir
Export Representative: Ms Asli Kahramanoglu
Activities: Seabass and seabream farming, fish processing
Facilities: Three cage farms, processing plant
Volumes: 1,500 tonnes of seabass and seabream (own production), 1,500 tonnes sourced externally in Turkey
Products: Fresh and frozen whole round, gutted, filleted seabass and seabream; whole round, gutted trout; smoked trout fillets; small volumes of wild-caught sardines and anchovies
Markets: UK, Germany, Italy, France, and Russia
Employees: 120

Camli Feed Animal Husbandry uses high tech in its fish farming and processing

Turkish consumers warm to the idea of fillets

Camli Feed Animal Husbandry carries out a wide range of activities in the agriculture sector including cattle, turkey, and fish farming as well as the production of feed. The company's concern for the environmental impact of its activities led it to certify its seafood operations to the ISO14001 Environmental Management System standard back in 2006. In addition it has an agreement with a local university to monitor all the seafood production sites to detect and notify the company of any changes in environmental parameters.

Mrs Yasemin Ozbakkaloglu, Export Team Leader for seafood at Camli Feed Animal Husbandry.

Camli's interest in the environment is also manifested in the desire to start producing organic feeds and, once that is established, to move to the farming of organic fish. Currrently, however, all the fish farming activities are the conventional sort. The company has three hatcheries producing a total of 74 million seabass and seabream fry. The distribution however is not even; 10 million fry are produced in one hatchery that also houses the broodstock and produces the live feed, artemia and rotifers, for all the hatcheries. The broodstock are subject to photoperiodic adaptation which enables them to spawn three times a year instead of one, a common practice in many hatcheries and for many species to increase the production. The remaining 64 million fry are grown at the other two hatcheries.

Experiments continue with several new species

Uzay Senturk, Sea Products Plant Veterinarian, is responsible for production at the hatcheries and in the cages. Camli has cage units in two locations with a production capacity of 5,000 tonnes of fish at one and 2,000 tonnes at the other. The cages are modern and are monitored with underwater and surface cameras and are equipped with automatic feeding systems. The plan is to increase this production to 10,000 tonnes, but this requires a feasibility study and several other documents to be submitted to get the necessary permission from the government and is a process that can take up to three years to complete. In the meanwhile the company is experimenting with a number of species, two-banded bream, red seabream, sharpsnout seabream, striped bream, and meagre, both in terms of production and in terms of market appeal, as it is not enough to be able to produce a fish – it also

has to be accepted by the market. Camli has also devoted resources to the farming of mussels *(Mytilus galloprovincialis)* producing 3,000 tonnes entirely for the local market. A sister company buys the mussels, shucks them, and sells the meat frozen. Camli is also looking at the production of trout. Initially at least, the company will buy the fish from other producers and then smoke it and freeze it for sale in Europe. Freezing the smoked fillet will significantly increase its shelf life from the typical 21 days, which is important for retail buyers. More research needs to be done into the tastes that prevail on the different European markets, but the company aims at achieving sales of some 500 tonnes of fish in 2012 starting early in the year.

A brand new plant has just been-completed in 2011, where the seabass, seabream, and trout, are processed into fillets, ready-to-cook products, and smoked fillets (trout). The factory is certified to BRC (British Retail Consortium) and International Food Standard and has a capacity of 10,000 tonnes a year. Camli has invested in special sensors and software to measure the temperature inside the fish as well as inside the box in which it is packed to ensure that the cold chain is not compromised while the fish is being processed.

Plans to significantly increase exports

Yasemin Ozbakkaloglu, the export team leader, says that Camli farms 4,000 tonnes of seabass and seabream and buys a further 1,500 tonnes from the market. As a hatchery owner and feed producer Camli has arrangements with other fish farmers under which it takes payment in the form of fish for the feed and the fingerlings. Fresh and frozen fillets are the main product, but a significant portion of the raw material is sold as whole round fish as well. Ms Ozbakkaloglu feels that Turkish consumer habits are changing though very slowly. While whole fish is still overwhelmingly the preferred way to buy fish, as Turkish consumers generally gut and grill it whole, some retailers have reported an interest in fillets among their customers and have approached Camli to supply them. Local retail chains are also finding that as they have to deal with increasing numbers of customers it is often easier to sell gutted fish rather than have whole fish which is then gutted at the fish counter when bought. The domestic market is very important for us, says Ms Ozbakkaloglu, since we sell 65% to 70% of our production locally. This means to all the major cities in Turkey: Istanbul, Ankara, Izmir, as well the other Turkish regions. With the new processing plant the objective is to reverse the proportions of domestic and export sales and ultimately achieve a target of 95% export. The fillets and ready-to-cook products are essentially meant to supply Camli's markets abroad, in Spain, Italy, Qatar, USA, and Greece.

One of the problems that producers of seabass and seabream have to cope with is fluctuating prices. At Camli, Yasemin Ozbakkaloglu gets an idea of the price level by contacting other producers, checking with the exporters union, staying in touch with producers who may be buying fish for the local or export market, contacting different potential customers and by using market reports. Camli has long-term contracts with its customers as the fish takes 18-24 months to produce and the production has to be planned well in advance to be able to supply the fish each week. For the buyers too it is convenient as they in turn can lay plans with their customers. But the best made plans can also be undone as the recent financial and economic crisis showed. Camli had to suffer some cancelled contracts as demand collapsed, but fortunately, says Ms Ozbakkaloglu, demand in Turkey held up and the company was able to sell the fish on the local market, helped by the positive image of their brand, Pinar.

Camli Feed Animal Husbandry
Company Fact File

Eski Kemalpasa Asfalti, Pinar Sut Yani
35060 Pinarbasi - Izmir
Turkey

Tel.: +90 232 436 2021 (ext. 627)
Fax: +90 232 436 2022 1371
yasemin.ozgun@camli.com.tr
www.camli.com.tr

Activities: Fish and seafood farming, processing, marketing and sales
Species: Seabass and seabream; trout (purchased from outside); mussels; experiments with two-banded bream, red seabream, sharp-snout seabream, striped bream, and meagre
Facilities: Seabass and seabream hatchery; cages with a capacity of 7,000 tonnes; fish processing plant completed in 2011
Products: Fresh and frozen seabass, seabream and trout
Product forms: Whole fish, fillets, ready-to-cook products, smoked trout
Markets: Spain, Italy, Qatar, USA, and Greece; Turkey

Ms Serap Unal, Aegean Exporters' Associations, and Uzay Senturk, Sea Products Plant Veterinarian, is responsible for production at the hatcheries and in the cages.

The cages are equipped with underwater and surface cameras to monitor the fish at all times.

Quality, traceability and food safety will determine the success of the fish farming industry

Effective communication with the consumer is crucial

Hasan Girenes is President of Agriculture and Fisheries in the Yasar Group, one of Turkey's largest conglomerates. He is also Chairman of the Izmir Fish Producers' Association. In this article he reflects on how the aquaculture industry can capitalise on the growing importance of seafood.

We are currently experiencing a global seafood trend. Demand for fish and seafood is growing, and all prognoses predict it will increase further. As more and more consumers become aware of how they can improve their health by eating seafood, demand will surely keep rising.

I think, compared to other animal proteins, the seafood sector is the most complex and diverse. It is based on more species and it comprises a vast array of different technologies, which tends to complicate the analysis of emerging trends. It is clearly the most international of the food subsectors. Aquaculture is becoming a very big market: nearly half the seafood consumed in the world today is farm-raised. In my opinion, it represents a revolution in the production of fish and seafood. It appears to be the most realistic and feasible way to provide quality fish products to consumers.

Hasan Girenes, President of Agriculture and Fisheries in the Yasar Group, and Chairman of the Izmir Fish Producers' Association.

Fish farming is key to food security

Aquaculture is a unique industry in many ways. And among those, its role in ensuring food security stands out. Most traditional wild fisheries are being overexploited or harvested above a level which is believed to be sustainable in the long term. So fish farming is a key way to meet the demand in a world hungry for protein. Aquaculture has been growing at three times the rate of world meat production since the 1950s.

There is a growing appetite for value-added seafood products and it is mainly fuelled by changing lifestyles. Value-added seafood products are really coming on strong due to their convenience, versatility and different flavor profiles. Improved packaging, product differentiation and the adoption of quality management systems are some of the ways that the industry can add value to production.

Turkey – a wealth of new opportunities

In Turkey, the seafood industry is still immature, allowing many opportunities for new product development and branding. With more than 70 million consumers and 30 million tourist potential annually, Turkey is a huge market for fish consumption. Change in lifestyles and increase in incomes are the main factors accelerating consumption. The industry effectively follows general consumer trends such as the demand for increased health and convenience. People are making more conscious decisions each day to improve the quality of their health and wellness.

In Turkey, processing and packaging plants are modern, equipped with the latest machinery, and their operations comply with all the codes of good hygiene practice.

Pushed by constant innovation in logistics, fish and seafood can be delivered to chain stores any time fresh and frozen today. And this provides easy access to fish for everyone. Thanks to effective distribution networks, fish is currently the fastest growing protein food segment in both Europe and Turkey. Turkey has a great potential to produce all kinds of Mediterranean species as well as seabass, seabream and trout owing to her clean coastal waters and inland water resources.

Seabass and seabream production on the rise

The Mediterranean seabass and seabream farming industry put in a very strong performance in 2011, inspite of the tough economic climate in which it was operating. Global seabass and bream markets have settled into a good price and supply rhythm and have a positive outlook.

In the near future, I believe, Turkey will become one of the most important players in trout, seabass and seabream business globally. Being close to the European market holds a great advantage for fresh product export. Within 2 to 5 days, fresh delivery to every market in Europe is achievable.

New regulations foster greater integration

As a result of the new regulations that came into force recently in Turkey, off-shore fish farming became wide-spread around the country. Fish farming is much more consolidated today than before. The fish companies are growing in scale. There is a major trend towards integration; from feed to production, from processing to packaging. Processing and packaging plants are all modern, equipped with the latest machinery, and their operations comply with the codes of hygiene practices as they are all brand new. I believe, companies focusing more on quality, traceability and food safety principles will achieve sustainable success in the future. These principles, of course, should pay attention to fish health and focus more on natural products.

Fish production is also a water and environmental management business. Fish farms in Turkey act in a very sensitive way regarding the environment. As our fish farming regulations include very strict rules, our fish farming standards are credible and robust. Although the latest technologies and refined methods have made fish farming highly efficient, reducing risk and improving profitability further; aquaculture is still a capital and labor-intensive business running many risks during production. To build a stabilised infrastructure in the industry cooperation, transparency and data-sharing is becoming vitally important. It is not always good to focus on competition. I think we gain more from a balanced mixture of competition and cooperation.

Communicating with the consumer

The industry must realize that the consumers increasingly are interested in quality, safety, environmental impacts of the industry and affects of seafood on health and well-being. In brief, the consumer demands influence on all levels of the value chain, from fork to fish farm or to the sea. Producers should be market and consumer-oriented and meet these expectations.

To leverage the sector and make it grow sustainably, the industry needs the support of society. Here, effective communication holds the key. I think as an industry, we ought to promote seafood and its consumption as a whole. With the rise of social media platforms, we can find new ways to contact consumers. People need assistance to build confidence in seafood. Some still don't know how to cook and eat fish. We need to show the enjoyment and benefits of seafood, and help consumers to be comfortable with seafood.

Healthier eating habits is still the number one consumer trend. Seafood needs to be marketed as the healthier choice. The battle against obesity in the US and Europe will continue to draw attention. And continued interest in eating well will draw consumers to lean proteins such as seafood.

With regard to long-term sustainability, I think the industry needs to work together. We need to join forces and voice one clear message to the consumer. I believe we would be able to move positively quicker if we had some consensus and a shared road map.

A bright future for Turkey

I want to emphasize that there is room in Turkey for a thriving seafood industry, combining both high-level production of standard products and niche production of higher added-value products. There are great opportunities ahead for sustainable growth as well as a lot of work to do. We need to get our seafood industry competing, innovating and growing.

Hasan Girenes

Ugurlu Balik can increase output by 6,000 tonnes

Expanding capacity to reduce dependence on external suppliers

Ugurlu Balik is an integrated company farming and processing seabass, seabream and meagre. It also owns a hatchery and has sales offices for domestic sales and exports. The company deals with 7,000 to 8,000 tonnes of fish annually which it produces and sources from other companies.

The processing unit was established four years ago in 2008 in response to the company's interest in export markets. Prior to that Ugurlu Balik had focused exclusively on domestic sales. Even now some of their products, such as the meagre (*Argyrosomus regius*), are sold only within Turkey. We want to start exporting it, says Ismail Aksoy, the marketing and sales director, but interest within Turkey for this product is so great that we have decided to postpone the launch of the product abroad. The company produces five to six million meagre fingerlings a year and 500 to 600 tonnes of market-sized fish, which it is hoping to expand to 1,000 tonnes in 2012. The fish is sold whole round in Turkey in large sizes, 800 g, 1, 2, and 3 kg, but when we sell abroad we will be exporting fillets, says Mr Aksoy.

Turkish preference for whole fish

According to Mr Aksoy the price of the fish in Turkey is not very different from the price for it on European markets, the main difference is that the fish has to be processed into fillets and frozen before it can be sold abroad. The domestic market is not ready to accept fillets and frozen fish as Turkish consumers prefer fresh whole fish. Ninety percent of the export sales are frozen fish in one form or another and demand for these products is increasing. Ugurlu Balik took the decision to establish a processing facility back in 2007. At this time although the company had a good market in Turkey, there was a danger that the competition would soon become too fierce. Production was increasing not only in Turkey, but also in Greece and Spain, and limiting itself to the local market might be short-sighted. The new processing factory was established not only to produce gutted fish and fillets but also a variety of special products like skewers and twin fillets. Demand for these products in Europe has been increasing steadily. In the first part of the last decade seabass and seabream were relatively unknown in the UK. But imports of fresh and chilled seabass and seabream have increased from 1,262 tonnes in 2000 to 7,011 tonnes in 2009, an increase of 456%, according to the FAO.

To meet the demand for its products Ugurlu Balik has entered into contracts with other producers for the raw material. We supply them with the juveniles and the feed and we get the market-sized fish in return, says Mr Aksoy. The company has increased the share of the production that goes to export from 20% the first year the factory was built to 70% today. And the product range has evolved even further. Today the company is experimenting with highly value-added products. These are special fillets with mushrooms or with other vegetables that are ready-to-cook in microwave bags. The products are frozen and require just a few minutes in the microwave or an oven to prepare. Ugurlu Balik firmly believes that it always has to stay ahead of what the competition is doing in order to thrive. We will continue producing frozen fillets, says Ismail Aksoy, but at some point in the near future the competition in the frozen fillet market is going to get brutal and then we have to be ready with something else.

New ready meals to launch soon

The new products are still under trial. To test the response they are first sold through local supermarkets such as Metro and Ikea and samples are also sent to customers in Europe. So far the response has been very positive and the company expects the products to go into commercial production shortly.

Mr Ismail Aksoy, Marketing and Sales Director at Ugurlu Balik.

European consumers have been very enthusiastic about frozen pangasius fillets, but according to Mr Aksoy they do not pose any threat to seabass and sea-

The processing plant was built in 2008 with the aim of manufacturing products for western markets.

Current farming capacity at Ugurlu Balik is 3,500 tonnes per year, but the company has an additional three licenses for 2,000 tonnes each.

bream fillets. They are two different products with different tastes, prices and images. In addition, seabass and seabream are native to Europe and are eaten naturally in Spain and Italy, he explains, so for all these reasons pangasius is not something that can be considered competition. With the number of producers of seabass and seabream in the Mediterranean there is enough direct competition without having to worry about substitutes. Turkey of course has the advantage of a huge domestic market. But in 2009 production far exceeded demand and this combined with the financial and economic crisis resulted in prices crashing and several companies going under. After a wave of consolidation, companies are starting to move forward again, but they are moving cautiously, not taking risks, and waiting to see how things develop.

Rising costs squeeze margins

Turkish consumption of fish and seafood per capita is about 7 kg with marine species being consumed along the coast, and freshwater fish (mainly trout) consumed inland. Consumption is increasing slowly and seabass and seabream is spreading also to the country's interior. Catches in the Black Sea and the Mediterranean have also been declining which may also explain the growing interest in farmed fish. For farming companies the slow season is at the start of the year, but sales start picking up from the middle of February and peak in summer when the tourists come to Turkey. Also if the weather is good people in general tend to eat more seafood, say Mr Aksoy. Towards the end of the year the demand in Europe increases as Christmas approaches so there are usually eight to nine months in the year when sales are good. The problem is that costs are also increasing – raw material, packaging, labour, electricity, freight, everything is going up and it is difficult to increase the sales price, so margins suffer. As an industry we have to increase prices, as an individual producer it is difficult, says Mr Aksoy. If we cannot increase prices we cannot invest and grow, so we hope everybody is thinking the same way and that we can increase the prices slightly.

The Ugurlu Balik processing plant conforms to all the usual standards including British Retail Consortium, International Food Standard, and GLOBALG.A.P. The plant has an operational area of 700 sq. m out of a total of 16,000 sq. m and receives 30-35 tonnes of fish a day. Annually the company currently produces 3,500 tonnes of fish on its own farms and buys another 3,500 to 4,500 tonnes of fish. It has however three more licenses each for 2,000 tonnes of fish and within the course of a few months expects to start production against these licenses. In time this will speed up operations as their own production can be tailored to the customers' requirements in a way that they fish sourced from outside cannot be. The processing factory will also be expanded in 2012 once the contracts with the customers are signed. These are typically year-long arrangements and will determine the business plan as well, which is drawn up one year in advance for seabream and 18 months for seabass.

Seabass being harvested. The company also farms seabream and meagre.

Ugurlu Balik Company Fact File

Atanaj Deresi Mevkii No. 25
Denizkoy, Didim
Aydin
Turkey

Tel.: +90 256 846 2412
Fax: +90 256 846 2453
ismailaksoy@ugurbalik.com
www.ugurlubalik.com

Marketing and Sales Director: Mr Ismail Aksoy
General Manager: Mr Yilmaz Akin

Activities: Farming of seabass, seabream, meagre; fish processing,
Volumes: 3,500 tonnes farmed fish, 7,000-8,000 tonnes processed products
Products: Fresh or frozen whole fish, fillets, specialities
Markets: Europe, Russia, countries in the Middle East, and Turkey

Employees: 200

Armenia seeks to export to the EU

Fish farming potential far from realised

Armenia has extensive water resources in the form of surface and ground water, and a climate that is suitable for the cultivation of fish. The country also has a history of fish farming and can draw on several decades of experience to expand and strengthen its aquaculture industry.

Today fish production in Armenia amounts to some 5,500 tonnes of fish of which the bulk is trout, but the potential volumes are much higher not only of trout, but also of other farmed species such as sturgeon. Pisciculture here started in Soviet times with the cultivation of carp. After the collapse of the Soviet Union carp farming died out and was replaced by trout cultivation. And in 1998 sturgeon was imported to Armenia and the production of sturgeon began.

Armenia's most important water body, Lake Sevan

A lot of work was conducted on the artifical propagation of the Lake Sevan trout. The fish was the mainstay of a commercial fishery in Lake Sevan and to sustain the fishery fish farms were established in Gavar, Karchaghbyur, Sevan and Lichq. Each year the farms released seven million fry of Sevan trout, 100m larvae of Sevan khramuli, and 20m larvae of Sevan whitefish into the Lake Sevan. In the 70s there was a lot of interest from the authorities in industrial fish farming and nine carp farms and one rainbow trout farm were established. Annual production in the 80s from abut 6,000 ha of fish farms was between 4,000 and 5,000 tonnes of fish of which about 300 tonnes were trout. Over the same period capture fishing, which was mostly from the Lake Sevan, averaged 2,726 tonnes a year including trouts, carps, and other freshwater fish.

Armenia is surrounded by Azerbaijan, Georgia, Turkey, and Iran and has access neither to the Black Sea nor the Caspian Sea. Its water resources comprise surface water bodies, rivers, lakes, canals, and reservoirs; and groundwater stocks. There are 9,480 rivers of which about 4% or 380 are more than 10 km in length and there are more than 100 lakes in Armenia of which the Lake Sevan is by far the most significant with an area of 125,600 ha. In comparison the second largest lake, Sisian, has an area of a mere 200 ha. As the rainfall is poor much of the agricultural irrigation is done through a network of canals. The ten main canals have a combined length of 314 km and a water area of 470 ha. Water reservoirs, of which there are 16, are used for irrigation, the generation of electricity, and fishing or some combination of these uses, and they have a total surface area of 10,494 ha.

Trout is the most farmed fish in Armenia today accounting for 67% of the production from the 26 biggest farms.

The groundwater in Armenia is generally of very good quality and in many places can be drunk without further treatment. In the Ararat valley groundwater is used both for irrigation and for aquaculture. The water is found at a depth of 100 to 180 m at a temperature that varies between 13 and 15 degrees centigrade, which is ideal for the cultivation of trout. There are about 233 small, medium and large-scale fish farms in Armenia, which have a total water area of about 2,700 hectares. This is the number of farms that are registered with the Ministry of Agriculture. There may be a discrepancy between the registered and the actual number of fish farms as some farms may not be registered to avoid paying taxes. On the other hand, some of the registered farms may not be active.

Table 1 Fish exports by category (tonnes)

Name	EXPORT			
	2008	2009	2010	2011 - 9 month
Live fish	6	11	11	8
Fresh or chilled fish	50	1	226	351
Frozen fish	22	18	186	362
Total	78	31	423	721

Source: Hrayr Melkonyan, Emy Fish

Artesian water used for fish production

Of the 233 farms registered today the smallest farms are less than 1 ha and these number 158 or almost 68% of all farms. The biggest farms are in the Armavir region where eight farms have a surface area of 690 ha. This is 25% of the area of all the 233 farms in Armenia and corresponds to an average of 86 ha per farm. The fish farms are mainly located in the Ararat and Armavir provinces and the water for the farms is accessed by digging deep wells. In 2009, there were 5,424 deep wells, of which about 3,500 were used by the fish farms, which consume about 800 million cubic meters of water per year (2010).

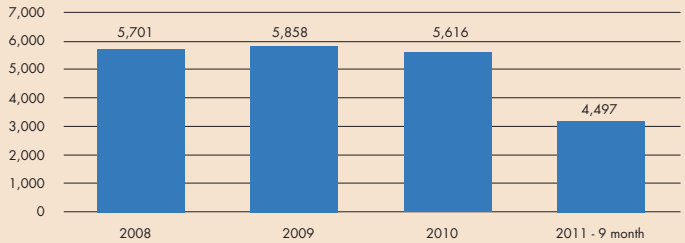
Armenia has 42 species of fish of which two are endemic (evolved and breed naturally only in Armenia), 23 are native (arrived by themselves and have established themselves there, but have also colonised other places), 16 are introduced (have been brought by humans to Armenia), and one is a hybrid. The main fish species produced by the 26 biggest companies in the aquaculture industry are rainbow trout (67%), carps (15%), sturgeon (13%), and catfish (5%). The figures in parantheses represent that fish type's share of the farmed fish production. Small quantities of the endemic Sevan trout are also farmed. Fish are cultured in different environment, mainly earthen ponds and concrete raceways for which the water is drawn from artesian basins. This water has a near-constant temperature of 13 to 15 degrees centigrade enabling fish to be farmed throughout the year. The climatic conditions in Armenia vary with altitude. In the Ararat valley, where many of the fish farms are located, the climate is hot and dry in summer and cold and dry in winter with an annual precipitation of 200 to 300 mm.

Rainbow trout and brown trout are the most widely produced fish in Armenia. Big carps weighing several kilos command a high price, but pond farm production has fallen steeply since before independence when it used to be 5,000 to 6,000 tonnes per year. Many pond farms have fallen into disrepair and are not maintained or are used for other purposes such as growing melons. Trout is produced in intensive systems with the biggest producers using concrete raceways. The fish feed used by the farmer is almost all imported as there is only one local company that produces it. The feed comes from Europe, America and Israel from companies including Coppens, Aller-aqua, Skretting, Biomar, Kraft, Leguasan, and Deepak.

Sturgeon are farmed in Armenia and sold on the domestic market for their meat.

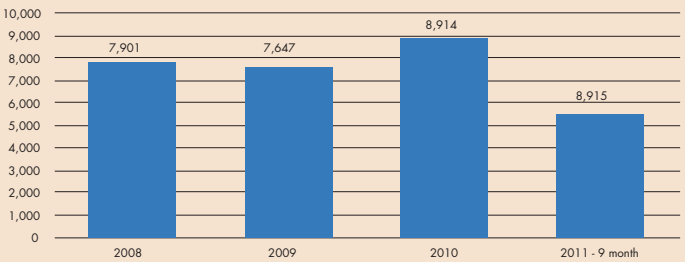
Carps are sometimes produced in ponds surrounding the trout in a kind of polyculture. They are not fed and they live in the effluent water from the trout tanks. This is mainly a measure to prevent poaching as the carp ponds usually surround the trout tanks making them more difficult to access. Interest in cultivating the endemic Sevan trout is also growing. The fish takes longer to grow but is robust and more disease resistant than rainbow trout. On the other hand it is easily excited and tanks must be covered with a net to prevent the fish from jumping out. Another issue is that growth is more uneven and a batch may contain several slow

Graph 1 Fish production (tonnes)



Source: Hrayr Melkonyan, Emy Fish

Graph 2 Fish feed import (tonnes)



Source: Hrayr Melkonyan, Emy Fish

Table 2 Size of fish farms in Armenia, 2009

Category	Fish farms		Average size	Total area	
	no.	%	ha	ha	%
< 1 ha	158	67.8	0.3	47.0	1.7
1–5 ha	36	15.5	1.8	66.3	2.4
5–10 ha	10	4.3	7.2	72.4	2.7
10–20 ha	6	2.6	14.9	89.2	3.3
20–50 ha	12	5.2	32.1	385.4	14.2
50–100 ha	3	1.3	75.4	226.3	8.3
100–150 ha	4	1.7	303.7	522.9	19.2
150–200 ha	1	0.4	196.1	196.1	7.2
200–300 ha	1	0.4	209.6	209.6	7.7
> 300 ha	2	0.9	452.5	905.0	33.3
Overall total	**233**	**100.0**	**11.7**	**2 720.0**	**100.0**

Source: REU/C1055/2 FAO

Emy Fish

Raceways and earth ponds are both used for the cultivation of trout. All the bigger producers tend to use concrete raceways.

growers that have to be separated from the faster growing fish to avoid conflicts.

Widespread unrecorded capture fisheries

Capture fishing in Armenia plays an important role in providing the poorer rural population with a healthy form of protein. Many villagers fish in the rivers, lakes, canals, and reservoirs to supplement their diets. None of this fishing is recorded, so these catches must be estimated in the official statistics. As a result of this subsistence fishing the only way fish populations in these water bodies increase is by natural propagation. Programmes to restock water bodies are doomed to failure due to the lack of control over fishing activities. The most popular fish are the crucian carp, common carp, and grass carp. Subsistence fishing is rife in the Lake Sevan too as it has traditionally been accepted that the local people living around the lake fish in it for their own use. But poaching for domestic purposes is not the reason behind the worsening fishery in the lake. That is more likely due to commercial poaching. Currently there is a ban on fishing in the Lake Sevan to allow the fish to propagate. Lake Sevan is also the site of a valuable crayfish fishery much of which is exported to the EU among other countries. Crayfish catches in Armenia amount to about 1,000 tonnes per year of which 800 tonnes are from Lake Sevan. Some 600 tonnes are exported.

Local consumers prefer big-sized fish

The market structure in Armenia is fairly straightforward; farmers supply live or freshly slaughtered fish to local markets, where they often have their own retail outlets. Fish seem to be sold in bigger sizes than is common in Western Europe. Trout starts at 500 g but is also readily available at sizes of 1 kg and above. The average weight of sturgeon is 2 kg, while for carps (grass carp, silver carp, common carp) the most favoured size starts at 3 kg. Fish is not eaten regularly by the vast majority of the population except at Christmas and New Year. However, fish shops in and around

Emy Fish

The company Emy Fish specialises in the production of sturgeons. Volumes in 2012 are expected to be 100 tonnes increasing to 350 tonnes in 2013.

the capital Yerevan testify to its greater popularity there. Annual per capita consumption in 2008 was approximately 2 kg.

Until 2008 5-7% of the fish was exported mainly to Russia, but also to neighbouring countries. But in 2009 Russia and Ukraine stopped importing Armenian fish, because of the swine flu epidemic and the economic crisis. Exports to Moscow resumed in 2010 and volumes are growing. In 2010 fish exports amounted to more than 400 tonnes, in the first half of 2011 exports amounted to more than 262 tonnes, and by the end of the year it will be more than 1,000 tonnes. Crayfish is the only product that is currently exported to the EU, but exporting trout and sturgeon is a possibility if producers can be approved for export.

Armenia's rich water resources could be further exploited to increase the production of fish in the country. The government is becoming aware of the possibilities and is starting to show an interest in the sector. New technology and improved culture techniques could go a long way in increasing productivity on fish farms. However, administration of the sector is split among ministries and the lack of rules and regulations regarding the exploitation of water bodies makes fisheries management difficult. More interest from the government in the form of administrative and financial support could improve fisheries and aquaculture management encourage restocking, prevent illegal fishing, and significantly increase the yields from the various water bodies.

Hrayr Melkonyan, Emy Fish
This report also draws on information from the FAO Fisheries and Aquaculture Circular No. 1055/2 from 2011.

Table 3 Production breakdown at the biggest farms in Armenia

Name of farm	Proportion of produced species (%)				
	Acipenseridae	Salmonidae	Cyprinidae	Siluridae	Total
Akvateque - avtomatika Ltd.	30	60	–	10	100
Akvatik Ltd.	–	100	–	–	100
Armashi karpi tntesutun Ltd.	–	–	70	30	100
Armavir farmer Ltd.	–	60	20	20	100
Baks Ltd.	40	60	–	10	110
Bigma Frut	–	100	–	–	100
Draxt Ltd.	20	80	–	–	100
Ecofish Trade Ltd.	50	50	–	–	100
Garbush Ltd.	10	20	50	20	100
Hakobyan Gurgen farmer	–	100	–	–	100
Hamlet Khachatryan farmer	–	100	–	–	100
Ishkhanoc Ltd.	20	80	–	–	100
Ishxan Ararat Ltd.	–	100	–	–	100
Ishxan Ltd.	–	100	–	–	100
Jermuk Fish Ltd.	20	80	–	–	100
Lichqi thknabucaran CJSC	–	100	–	–	100
Rabs Ltd.	20	80	–	–	100
Sazan Ltd.	5	5	70	20	100
Sevani thknabucaran CJSC	–	100	–	–	100
Spitak delfin Ltd.	30	70	–	–	100
Unifish Ltd.	50	50	–	–	100
Vana tarekh Ltd.	30	70	–	–	100
Varag shushanc	–	–	70	30	100
Xayc ishxan Ltd.	20	80	–	–	100
Yerevanshin CJSC	–	100	–	–	100
Zovasar Ltd.	–	–	100	–	100

Source: REU/C1055/2 FAO

Guide to Recirculation Aquaculture

Chapter Six: Waste water treatment

Farming fish in a recirculation system where the water is constantly reused does not make the waste from the fish production disappear. Dirt or excretions from the fish still have to end somewhere. The biological processes in the system will to a certain extent reduce the amount of organic compounds, because of simple biological degradation or mineralisation within the system. However, a significant load of organic sludge from the farm will still have to be dealt with.

Waste leaving the recirculation process typically comes from the mechanical filter, where faeces and other organic matters are separated into the sludge outlet of the filter. Cleaning and flushing biofilters also adds to the total discharge volume from the recirculation cycle.

Different ways to treat waste

Treating the waste leaving the recirculation system can be accomplished in different ways. Quite often a secondary mechanical water treatment is installed in order to concentrate the sludge in the waste water. The sludge fraction will go on to a sludge accumulation facility for sedimentation or further mechanical dewatering, before it is spread on land, typically as fertiliser on agricultural farms. Mechanical dewatering also makes the sludge easier to handle, and minimises the volume whereby disposal or possible fees becomes cheaper. On the downside, mechanical dewatering is associated with higher investment and running costs.

The cleaned waste water from the secondary treatment will usually have a high concentration of nitrogen and phosphorous. This so-called overflow or reject-water, can be discharged to the surroundings, river, etc., or it can be returned into the recirculation system. The content of nutrients in this overflow water can be removed by directing it to a plant lagoon, a root zone or seepage system, where phosphorous and nitrogenous compounds are absorbed. The content of nitrogen in the overflow water can also be removed by denitrification. As described in chapter 2, methanol is most commonly used as the carbon source for this anaerobic process. The reason for using denitrification inside the recirculation system is to reduce the amount of nitrate in the process water in order to minimize the need for new water in the system. The reason for using denitrification outside the recirculation system is to reduce the discharge of nitrogen into the environment. As an alternative to the use of methanol, sludge from, for example, mechanical filters can be used as the carbon source. Using sludge

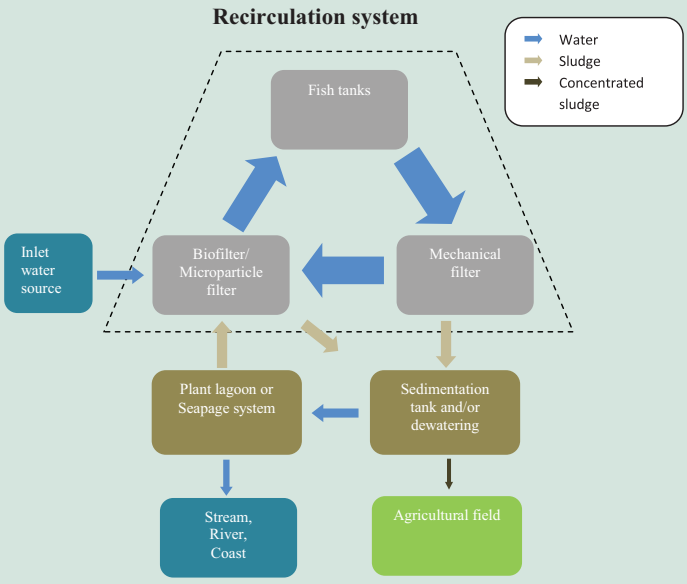


Figure 6.1 The pathways of sludge and water inside and outside a recirculation system. The higher the rate of recirculation, the lower the amount of water let out from the system (dotted line), and the lower the amount of waste water to be treated.

Figure 6.2 Hydrotech belt filter used for dewatering the sludge. Source: Hydrotech.

requires tight management of the denitrification chamber, and back-washing and cleaning the chamber becomes more difficult. In any case, an efficient denitrification chamber can reduce the nitrogen content in the effluent water to a minimum.

Understanding how fish excrete

It is important to notice that fish excrete waste in a different way than other animals such as pigs or cows. Nitrogen is mainly excreted as urine via the gills, while a smaller part is excreted with faeces from the anus. Phosphorous is excreted with the faeces only. The main fraction of the nitrogen is therefore dissolved completely in the water and cannot be removed in the mechanical filter. The removal of faeces in the mechanical filter will catch a smaller part of the nitrogen fixed in the faeces, and to a larger extent the amount of phosphorous. The remaining dissolved nitrogen in the water will be converted in the biofilter mainly to nitrate. In this form nitrogen is readily taken up by plants and can be used as fertilizer in agriculture or simply be removed in plant lagoons or root zone systems.

It is important that faeces from the fish tanks are carried immediately to the mechanical filter

Figure 6.3 A plant lagoon placed after a recirculation trout farm in Denmark – before and after overgrowing. Source: Per Bovbjerg, DTU Aqua.

Guide to Recirculation Aquaculture

The **Guide to Recirculation Aquaculture** is the result of a collaboration between EUROFISH, Thomas Moth-Poulsen, FAO Fisheries Officer for Central and Eastern Europe, and Jacob Bregnballe, Akva Group, who authored the book.

The stringent environmental restrictions to minimize pollution from hatcheries and aquaculture plants in northern European countries have sparked the rapid technological development of recirculation systems. However, recirculation also secures a higher and more stable aquaculture production with less diseases and better ways to control the parameters that influence growth. State-of-the-art of the recirculation methods use far less water than conventional flow-through farms and sophisticated filtering technologies are used to treat the water. Recirculation systems thereby offer two immediate advantages: cost effectiveness and reduced environmental impact. However, running these systems calls for additional skills and training and the hope is that the Guide to Recirculation Aquaculture will provide readers with some useful insights into the workings of recirculation systems.

The Guide is being serialised in the Eurofish Magazine. It is also available as a hard copy from the shop on the EUROFISH website, www.eurofish.dk, for EUR35.

Serialisation in the Eurofish Magazine (EM)

Chapter 1: Introduction to recirculation aquaculture (EM5 2010)
Chapter 2: The recirculation system step by step
Components in a recirculation system
-Fish tanks (EM6 2010)
-Mechanical filtration (EM1 2011)
-Biological treatment (" ")
-Degassing, aeration, and stripping (EM3 2011)
-Oxygenation (" ")
-Utraviolet light (" ")
-Ozone (" ")
-PH regulation (" ")
-Heat exchange (" ")
-Pumps (" ")
-Monitoring, control and alarms (" ")
-Emergency system (" ")
-Intake water (" ")
Chapter 3: Fish species in recirculation (EM4 2011)
Chapter 4: Project planning and implementation (EM5 2011)
Chapter 5: Running a recirculation system (EM6 2011)

Chapter 6: Waste water treatment
Chapter 7: Disease
Chapter 8: Case story examples
Salmon smolt production in Chile
Turbot farming in China
Model trout farms in Denmark
Recirculation and re-stocking
Mega farms
References
Appendix -Checklist when implementing a recirculation system

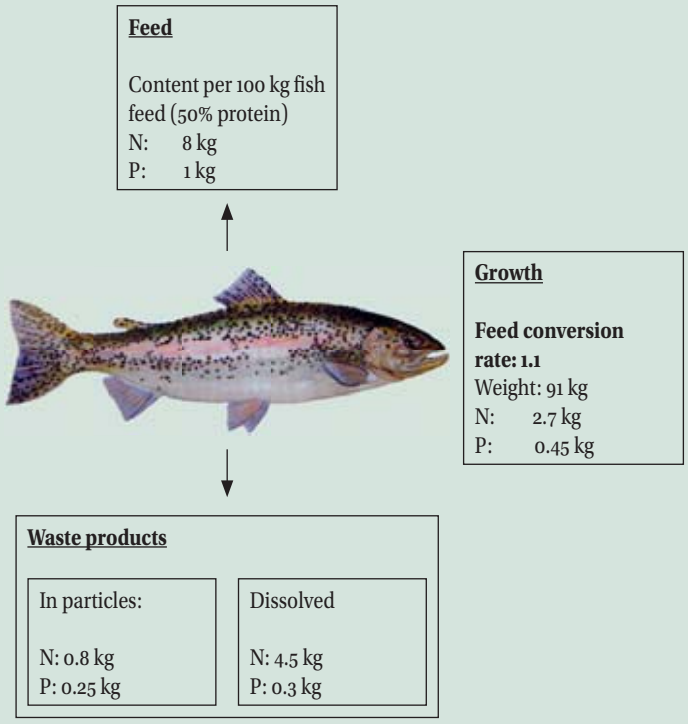


Figure 6.4 Excretion of Nitrogen (N) and Phosphorus (P) from farmed fish. Note the amount of N excreted as dissolved matter. Source: Environmental Protection Agency, Denmark.

Discharge from different types of fish farms at 1,000 tonnes production per year	Nitrogen discharge kg/year	Water consumption m^3/day
Traditional flow-through	38,000	250,000
Semi-recirculation	2,000	10,000
Full recirculation	250	1,500

Figure 6.6 Example of discharge from traditional flow-through, semi-recirculation, and full recirculation model farming. Source: Danish Aquaculture.

Combining intensive with extensive production can help deal with waste

Recirculation is an efficient way of reducing the impact from fish farming on the surroundings, but the waste water treatment requires tight management on a daily basis to make the treatment system work efficiently. Combining intensive fish farming, whether recirculation or traditional, with extensive aquaculture systems, such as for example traditional carp culture, can be an easy way to handle biological waste. The nutrients from the intensive system are used as fertilizer in the extensive ponds when the excess water from the intensive farm flows to the carp pond area. Water from the extensive pond area can be reused as process water in the intensive farm. Growth of algae and water plants in the extensive ponds will be eaten by the herbivorous carp, which in the end are harvested and used for consumption. Efficient rearing conditions are obtained in the intensive system and the environmental impact has been accounted for in combination with the extensive pond area.

For the innovative entrepreneur there are several opportunities in this kind of recycled aquaculture. The example of combining different farming systems can be developed further into recreational businesses, where sport fishing for carp or put & take fishing for trout can be part of a larger tourist attraction including hotels, fish restaurants and other facilities.

Parameter	Race-way	Race-way	Race-way	Self cleaning tank	Self cleaning tank	Self cleaning tank
	40 µ	60 µ	90 µ	40 µ	60 µ	90 µ
	Efficiency, %	Efficiency, %	Efficiency, %	Efficiency, %	Efficiency, %	Efficiency, %
Tot-P	50-75	40-70	35-65	65-84	50-80	45-75
Tot-N	20-25	15-25	10-20	25-32	20-27	15-22
TSS	50-80	45-75	35-70	60-91	55-85	50-80

Figure 6.5 Removal of Nitrogen (N), Phosphorous (P) and Suspended Solids (SS) from mechanical filter. Source: Fisheries Research Station of Baden-Württemberg, Germany.

Figure 6.7 Combined intensive-extensive fish farming systems in Hungary. The number of opportunities seems unlimited. Source: Lazlo Varadi, Research Institute for Fisheries, Aquaculture and Irrigation (HAKI), Szarvas, Hungary.

without being crushed on the way. The more intact and solid the faeces are, the higher the level of removed solids and other compounds. Figure 6.5 shows the estimated removal of nitrogen, phosphorous and suspended solids (organic matter) in a mechanical filter of 50 micron.

The higher the rate of recirculation the less new water will be used, and the less discharge water will need to be treated. In a growing number of cases, no water at all will return to the surrounding environment such as a nearby river. After a first step waste water treatment, the small amount of water remaining can simply be allowed to seep into the ground in a nearby area. In any case, the total volume discharge water will be significantly lower than that from a traditional fish farming system – see Figure 6.6.

Product labelling: Information, security, and an attractive appearance

Labels are a product's "shop window"

In the past, labels served only as a means of informing customers on the type, ingredients and price of a product. Today, however, they have to fulfil many more functions. They help streamline stock-keeping and enable product traceability within the supply chain, they protect against theft and simplify payment at the checkout. New technical developments are making labels increasingly efficient and attractive.

What is a label and what tasks does it have to perform? There is today no easy, generally applicable answer to this seemingly simple question. The days of the "traditional label" that was printed on paper and provided customers with everything they needed to know about the product are long gone. Although labels are still important as a means of conveying information to the customer, the scope of possibilities they offer has grown considerably. Labels enable the unambiguous identification of a product (name, quantity, composition, additives, price), as well as informing the customer about its shelf-life and origins. Sometimes they provide a warning in relation to possible allergen substances the product may contain. Nearly all the information provided on a label is in the meantime regulated by law. Within the EU, in addition to Council Regulation (EC) 104/2000 on the common organisation of the markets in fishery and aquaculture products it is primarily Commission Regulation (EC) 2065/2011 that stipulates in detail which information has to be on fresh, cooled, frozen, smoked, salted or dried seafood products. In international seafood trade regulations such as the United Nations GHS (Globally Harmonised System of Classification and Labelling of Chemicals) are important. Uniform use of quality seals and eco labels is also an important topic in global trade, as was emphasized at the WTO conference in Doha in 2001. Some participants had feared that labelling might develop into a "technical barrier to trade". They were not only concerned about what information should be included on a label but also about some very basic issues, for example the lack of agreement between Peru and the EU concerning which fish species could be called (and traded) as "sardines".

The data contained in the labels give an idea of the carton's contents without having to open the packaging.

Self-adhesive labels on a roll are particularly user-friendly because they can be removed quickly and easily as required.

But today labels do much more than simply inform consumers about the products they are buying, particularly when they have digital printing. For example, digital labels with integrated RFID chips or other security elements – usually multi-layer "sandwich" elements – allow continuous tracking and documentation of product movements, simplify traceability, and offer better protection against theft.

The days are gone in which labels were made solely of paper. Paper labels do still exist but there are now also labels made of many other materials, for example natural or synthetic polymers or other plastics. Colour printing is possible on PVC or PE film, which is also robust and resistant to moisture – an advantage particularly where fish products are concerned. Attractive, striking coloured labels create a brand image and support high-quality market presence. In today's saturated markets a product's appearance can have a decisive effect on its success. In the meantime there are even 12-colour printing machines that are capable of printing directly onto certain products, including canned fish. If this is for some reason or other not possible producers can achieve similar optical effects with "no-label-look" labels where the information is printed on a highly transparent, flexible PE film that is then stuck onto the product.

Gains on both sides

Marking products is however only one of numerous applications for which labels are used within industry and trade. Depending on the application concerned labels are differentiated between documentation labels, where after being attached parts of the basic label can be removed and stuck onto a different surface, and non-tear inventory labels that cannot be removed from the surface without damage to the label. There are labels with embossed braille, holograms or high-quality labels with metallic effects and spot varnishes where certain areas stand out due to gloss or matt paints for a particular optic or haptic effect. In this way, seals, logos or quality stamps can be made to stand out as eye-catchers.

Booklet labels are becoming increasingly popular in the food industry, i.e. small folded brochures that are stuck directly onto the product. They are particularly useful where the amount of information to be provided is in excess of the space normally available on a label. Booklet labels can be used to supply additional explanations (e.g. about MSC standards), recipe ideas, instructions for use, etc. Labels are also used for sales promotion, e.g. stickers (promotion labels) that draw attention to discounts or competitions, or personalised or numbered labels that address the final customer individ-

ually. These labels are a particularly good means of emphasizing a product's value.

Packaging industry offers labels for every possible application

Anyone who wants to produce their own labels does not only have to design them themselves but also needs access to labelling systems for printing, embossing and sticking. These investments are only worthwhile, however, if a company is big and its product range changes frequently. Otherwise it usually makes more sense to use the services of the packaging industry which can produce and supply nearly any label in accordance with their customers' requirements. Here, too, the spectrum of possible solutions is impressive. Labels can be supplied separately, on a roll, or on sheets. They can be pre-printed by the manufacturer or only partly printed for completion later on when used, for example by adding the batch number and the sell by date. But of course the company has to have the necessary hardware to do this, e.g. scanner, thermo transfer printer and ink ribbon. Anyone who wants labels with special embossing, coatings or other special effects is usually well advised to call in a packaging specialist to meet their requirements.

Although the demands made on design and appearance of labels are rising, a lot of companies can no longer get by without producing their own labels, for example for controlling in-company product movements or track & trace systems. Since the introduction of scanner checkouts retailers have been very familiar with this problem because any product purchased at their service counters has to be equipped with a label containing a customer and product specific barcode. Although these labels offer numerous benefits (among them cost reductions) they can be quite a challenge to their users. The software that generates the labels and barcodes has, for example, to be integrated into the existing materials and commodities flow. It has to be so fast that processes are not impeded or even brought to a halt. The printing of labels and barcodes also has to be in such a high resolution that scanners will be able to read them without difficulty or errors. This applies in particular to the 2D barcodes in postage stamp size (QR-codes) which are meanwhile appearing on more and more products. Anyone who scans this mark with a smart phone can access additional information on the product or instructions.

Industrial label printers are particularly useful when labels have to be attached to large numbers of different products in a short time. These printers usually give a high-resolution image and reliable coding (i.e. bar and space widths of barcodes are reproduced precisely which guarantees good legibility). They are efficient, durable and can usually be fitted into in-company computer

Labels for products that are traded internationally do not only have to meet the legal requirements of the countries of origin but also in the target countries.

EAN128 barcodes can contain up to 40 different data elements.

environments without any major problems, and they are mostly easy and convenient to use. The range of label printers is no smaller than the range of label designs. Printers are available in all price categories, types and with various extras. They include inkjet printers, single sheet and endless label laser printers, as well as matrix printers and line matrix printers. Thermo direct and thermo transfer printers are particularly frequent in industrial use. With thermo direct printers the image can be put directly onto the thermo label without an ink ribbon. This technique is relatively inexpensive but has the disadvantage that the label remains temperature-sensitive after printing so that the printing on the label can become illegible if exposed to direct intensive sunlight. For certain applications such as retail service counters where the label is generally scanned at the checkout and has thus fulfilled its purpose just a short time after printing, thermo direct printers are extremely interesting. Thermo transfer printers can also print directly onto thermo sensitive labels without an ink ribbon. As an alternative to direct printing these printers also offer the possibility of transfer printing with an ink ribbon to achieve permanent labels.

RFID smart labels, security labels and other special labels

Smart labels, i.e. labels into which Radio Frequency ID (RFID) chips are integrated have a promising future. The small mobile data storage devices have enormous rationalisation potential because they allow the linking of products to an abundance of information. Radio frequency technology makes it possible to track the location of product deliveries within the warehouse or the path of individual products within the logistics chain. This enables companies to optimise internal processes and make more efficient use of storage space and working hours. Capturing the data stored in a smart label requires neither direct contact nor eye contact. The data can be read through plastics, through glass, cardboard, and often even through metallic packaging. This differentiates electronic labels from traditional labelling systems such as barcodes that have to be visible for the scanner to pick them up. Modern RFID Read and Write tags are tiny data storage devices which allow the user to change, erase or add information at any time. This does not only save printing and labelling costs but also makes it easier to capture and add product related data, for example in the context of traceability systems. RFID smart labels are usually purchased ready to use since own production would be much too complex and is only worthwhile for very big companies. Anyone who uses this technology, however, will need some electronic devices to be able to read and write on these memory chips.

Security labels are a special type of label that, for example, as freshness seals, might make the opening of a pack externally visible or, by means of holograms, embossing or signatures, prevent brand fakes and product piracy. Security labels can have overt or covert features. This also applies to security labels that are intended to hinder theft at retail stores. They are often fitted with simple, inexpensive RFID chips that have to be deactivated at the checkout when the customer pays for the product because they would otherwise trigger an acoustic signal when the customer passes through the induction barrier on leaving the store.

The right adhesive

Of course, labels can only fulfil their purpose if they are attached securely and reliably to the products. To achieve this, there is a broad range of adhesives that can be divided into three groups. The first group is peelable or ultra peelable adhesives that allow the label to be removed from the surface again easily and without damage or residues. The second group is repositionable adhesives. Here a label that is already attached to a product can be easily removed from the surface and afterwards restuck in a different place. The third group is permanent adhesives which, as the name suggests, mean that labels that were attached using such adhesives can hardly be removed. Any attempt to do this will usually end with the destruction of the label or the surface to which it was attached. Today "dry" adhesives that are produced on acryl or silicon basis are often preferred for fixing labels. But traditional dextrine-based adhesives and adhesives that have to be moistened (with which we are all familiar from postage stamps) are still used.

Most adhesives only require slight pressure to fix a label firmly (pressure sensitive label adhesives, for short PSA). Heat activated adhesives develop their adhesion properties only when heat is applied. In the case of seafood products it is thus necessary to pay attention to the upper and lower temperature limits of the adhesives. Nearly all permanent and peelable adhesives maintain their adhesion down to at least -10°C. Freezer or frost-fix adhesives are particularly suited to applications in frozen environments since they can as a rule cope with temperatures as low as -40°C.

Manfred Klinkhardt

This label provides information on the composition of the fish feed and, using the batch number, it is possible to trace the origins of the raw materials quickly.

In this vacuum packed fresh cod loin the position of the fillet in the fish's body is outlined to give the customer detailed product information.

Sustainability of the tuna fishery has improved further

World catches stagnate at a high level

A lot of people still believe that tuna is just one single species. Hardly anyone knows that there are more than half a dozen "genuine" tuna species which differ in their biological properties and are fished to varying degrees. Not every tuna species is as threatened as bluefin tuna – the stock situation has to be considered separately for every marine region and every individual species.

Every year at the new year auction of the Tsukiji fish market in Tokyo a selected tuna is sold at an extremely high price. This year's result broke all previous records: A magnificent bluefin tuna (Thunnus thynnus) weighing 269 kilograms was sold to the sushi restaurateur Kiyoshi Kimura for 566,350 EUR. The year before a fish weighing 342 kg had been sold for just 296,790 EUR. Of course, this kind of news excites both the media and consumers. Quite a lot of people see such exorbitant prices as a sure sign of how rare "tuna" has in the meantime become. Many of them believe that all tuna cost that much now and fear that this fish species' days are nearly over, on the grounds that the thought of such excessive profits will be enough to make any fisherman take even the very last tuna out of the sea.

But tuna is not a single species. There are at least seven fish species that go under the name of "tuna" and they all differ with regard to certain features and characteristics as well as to catch volume, stock situation and market value. Tuna belongs to the Scombridae family which comprises 49 fish species, classified in 15 genera. Mackerel dominates the global fishery in volume terms but in value terms Katsuwonus (bonito) and Thunnus (genuine tuna) are of considerably greater significance. The most important species of tuna from a commercial standpoint are:

- Yellowfin tuna (Thunnus albacares). The relatively pale meat (light tuna) of this tuna species is the preferred choice for canning. Maximum length is 2 m.
- Albacore (Thunnus alalunga). This fish can reach a length of up to 1.30 m and a weight of 15 kg and is the only tuna from which preserves can be produced with nearly white meat which is seen as a sign of particularly good quality.
- Bigeye tuna (Thunnus obesus). This high-quality tuna is mainly traded fresh as sashimi, or frozen, and rarely used for canning (maximum length 2.36 m, max. weight 197 kg).
- Atlantic bluefin tuna (Thunnus thynnus). The biggest tuna species (fishing record is just under 3 m in length and 679 kg). The dark red meat is only sold fresh or frozen.
- Southern bluefin tuna (Thunnus maccoyii). Of considerable commercial significance. Measures up to 2 m and can weigh up to 158 kg. Mainly sold fresh to Japan where the species is popular on the sashimi market. Quality and price depend on fat content.

The sixth Thunnus tuna species, longtail tuna or Northern bluefin tuna (Thunnus tonggol), is of little significance to fisheries and only a few states record catches separately in their statistics. The meat of this tuna species which can grow to a length of 136 cm and a weight of 136 kg is paler than that of yellowfin tuna and its flavour can be compared to albacore. The tuna "species" with the highest catch volume in international trade is not a "genuine" tuna, since bonito or skipjack (Katsuwonus pelamis) does not belong to the genus Thunnus. With a maximum length of 1.08 m and maximum weight of 18.9 kg bonito is relatively small and is usually already caught at a length of 45 to 80 cm and a weight of 3 to 7 kg. Its dark-coloured, comparatively inexpensive meat is the preferred choice for the canning industry.

Albacore

Yellowfin tuna

Random samples are taken before the cans are sealed to check that the fish weight meets the specifications.

Wide range of fishing methods in the industrial and artisanal fisheries

All tuna species are eagerly targeted by the fishing industry. In the six decades since 1950 the catches of the commercially most important six species yellowfin, albacore, bigeye, Atlantic and Southern bluefin, and skipjack tuna have increased nearly tenfold. According to FAO fishing statistics. 412,394 t were caught worldwide in 1950. In 2009 the total catch amounted to more than 4.385,064 t, of which 71.4% were caught in the Pacific. 19.1% in the Indian Ocean, and 9.5% in the Atlantic including the Mediterranean. Skipjack tuna (2,599,681 t) accounted for more than half of the total catch volume of these six species, followed by yellowfin tuna with 1,092,596 t. Catches of bigeye tuna (404,873 t), albacore (256,479 t), Atlantic bluefin tuna (23,204 t) and Pacific bluefin tuna (21,761 t) were considerably lower but this is at least partially compensated for by the very high market value of bluefin tuna.

There are several methods for catching tuna. Purse seines, longlines or handlines are used in the industrial fishery. Purse

Bigeye tuna

Skipjack tuna

Atlantic bluefin tuna

Longtail tuna

seines are mainly used for catching smaller tuna that swim in schools close to the water surface Troll lines or pole and line are used for older fishes that tend to be found at a greater depth. Pole and line fishing gear consists of a two to three metre long pole from which a relatively short line with artificial feathered bait and a barbless hook hangs into the water. When pole and line fishing is used 20 or more fishermen can be found standing at the side of a fishing vessel trying to get a catch. Usually each of them holds a pole but when very large tuna are located two fishermen will sometimes work together with the line hanging between two poles. This fishing method is used worldwide and is one of the classic fishing methods for tuna. In a lot of places it can only be used seasonally, however, when the tuna are to be found locally during their long migration routes. In Japan, for example, the fishing season for albacore and skipjack tuna usually begins at the end of July. The catch is heavily dependent on climatic occurrences and biological rhythms. The fishery requires a lot of manpower and is thus expensive and so is often only worthwhile when demand and prices are high. Industrial fishing fleets that operate a long way from the coast thus have to be very flexible and react quickly to changes in the stock and market situation.

The spectrum of fishing methods within the artisanal fishery is even broader, comprising gill nets, beach seines, fish traps (e.g. mattanza in the Mediterranean region) and regionally even today still harpoons, spears and other archaic gear. The artisanal fishery is one of the reasons why it is so difficult to get accurate statistics for tuna fishing. The fishes are sometimes landed locally in small harbours or simply on the beach and only occasionally registered. This is also true of fishing statistics in the big game fishery. Catching a big tuna is a real trophy and so sportsmen will track them anywhere in the tropics and temperate regions. How many fishes are actually caught in the big game fishery can only be roughly estimated.

The meat of the different tuna species varies considerably. Yellowfin tuna and albacore is relatively pale, whereas skipjack tuna and bluefin tuna are much darker.

FADs – effective but controversial in the tuna fishing industry

The boundaries that divide industrial and artisanal fishing often overlap for there are convergent developments in both sectors. In the artisanal fishery for example there is an unmistakable trend towards more intensive fishing. In China and Taiwan as well as in several other countries small-scale fishermen even occasionally use longlines for tuna fishing. In contrast, in the industrial fishery artisanal methods are being used more strongly with the aim of fulfilling the high quality requirements of the global sushi and sashimi markets. Both fisheries also use FADs (Fish Aggregation Devices) to lure and concentrate the tuna in the wide expanse of the sea. The use of FADs developed from the observation that fishes in the open sea like to swim close to boats or flotsam. This does not only apply to tuna and young fishes of many marine species but also to shark, marlin and dolphinfish. In order to make use of this behaviour within the fishery the fishermen give the fishes artificial floats or FADs. These can vary considerably. In the traditional artisanal fishery often just a few palm fronds are tied together so that they drift on the water's surface, or old ropes are hung down from plastic containers floating in the water. In the industrial fishery on the other hand FADs can be more sophisticated and sometimes even equipped with GPS and sonar to enable determination of the concentration of the fish schools swimming beneath the FAD.

FADs can be anchored in shallow water or they can drift freely in the sea. Usually they float directly on the surface but they can also be a few metres below the surface so prevent them causing an obstruction to shipping. The first fish usually arrive soon after an FAD has been put into the water. Juveniles often prefer to be right underneath the FAD, larger fishes swim around it in concentric circles whose radius can be anything up to 500 metres.

FADs have in the meantime been in use in the industrial fishery for over 30 years to increase the productivity of the purse seiners. The main target species are skipjack, bigeye and yellowfin tuna. Based on rough estimations, about 1.5 m t or one third of the global tuna catch is currently caught using this fishing method. Environmentalists criticise the method, however, because during purse seining with FADs it is mainly young tuna that are caught and there is a lot of bycatch. FADs do not only attract tuna but also other fishes, among them threatened shark species. The longline fishery is also criticised for using as bait valuable fish species that could themselves be marketed as consumer fish. As "top carnivores", tuna are among the species at the top of the marine food chains and are demanding with regard to their potential prey. Finding bait of the required quality and quantity is becoming more and more difficult and increasingly expensive. In some regions where tuna is caught in large quantities

bait fishes are not only caught in the open sea but also produced for this purpose in aquaculture.

EU recovery plan to strengthen the Atlantic bluefin tuna stock

The biggest problem in the tuna sector, however, is the overfishing of individual stocks. In the case of Atlantic bluefin tuna, overfishing is said to date back to the end of the 1960s. Since then in the opinion of the International Commission for the Conservation of Atlantic Tuna (ICCAT) the stock has diminished by more than 70%. The stock situation of several tuna populations in the East Pacific is apparently also difficult. The bigeye tuna stock is at a low level, the average size of yellowfin tuna in the catch has fallen, and a lot of small fishes get into the nets unintentionally, as pointed out by the Inter-American Tropical Tuna Commission (IATTC) which is responsible for the protection and management of tuna stocks in this region. In the Coral Triangle, the marine region between Indonesia, Malaysia, the Philippines, Papua New Guinea and East Timor, several stocks are showing signs of overfishing.

Most strongly threatened are the bluefin tuna species in the Atlantic and Pacific. There are some hopeful signs at present for the stocks in the Atlantic, due to the fact that after years of waiting the responsible parties at last seem to be taking more decisive action. In 2006 at the ICCAT meeting in Dubrovnik an ambitious recovery plan was concluded that provides for reduced fishing quotas, higher minimum landing sizes and stricter controls and penalties. Two years later this plan was revised at the meeting in Marrakesh and translated into EU law in 2009. This means there are now better chances of ensuring adherence to the fishing quotas allocated by the ICCAT in the East Atlantic and Mediterranean. In June 2010 the EU Commission closed the fishery prematurely to protect the tuna and prevent endangering stock recovery. The fishing quota for the year 2011 was reduced to 12,900 t, compared to 13,500 the previous year. This is not enough for environmentalists, however, who demand a total fishing ban.

And there is more positive news. According to IATTC the Pacific albacore stocks are apparently in a good condition, showing no signs of overfishing. Certification by Friends of the Sea confirms that several tuna fisheries are sustainable. After the Irish albacore troll fishery and the pole and line fisheries of the Azores, Brazil and Senegal, the line fisheries of Sri Lanka and the yellowfin tuna handline fisheries of the Philippines were awarded the sustainability certificate. Just recently fisheries of the eight PNA states (Parties to the Nauru Agreement, i.e. Micronesia, Kiribati, the Marshall Islands, Nauru, Palau, Papua New Guinea, the Solomon Islands and Tuvalu) received the MSC certificate for the purse seine fishery on free skipjack tuna schools. This means that 30 per cent of bonito catches from the PNA fishery and 16% of bonito catches from the western and central Pacific now bear the blue and white MSC seal. Other tuna fisheries are currently undergoing auditing. The problem of overfishing is admittedly not solved by certification but the efforts made within the tuna fisheries show that the concept of sustainability is finding increasing support there.

Worldwide popularity of tuna products

Tuna is traded on the global market both fresh (chilled), frozen (recently super frozen, too) and canned. The

The individual product segments within the marketing landscape have undergone shifts but canned tuna is still the most important product.

export share of fresh tuna rose hugely during the last three decades. In 2008 114,345 t of tuna were exported fresh compared to only 3,513 t in 1978. The export volume in 2008 was actually lower than in the previous years – possibly under the impression of the global financial crisis – because from 2000 to 2007 exports remained fairly stable between 140,000 and 150,000 tonnes. Exports of frozen tuna amounted to just over 600,000 t in 2008. Unfortunately statistics do not say how high the share of super frozen tuna was but the worldwide rise in demand from sushi and sashimi restaurants probably led to a rise of exports in this product segment, too. It is still, however, canned tuna that tops the list of tuna exports. Statistics name an export volume of 1.2 million tonnes for this product category in 2008.

The biggest producer and main exporter of canned tuna is Thailand, whose canning industry processes between 700,000 and 800,000 t of raw materials per year. The most important tuna species is skipjack, followed by yellowfin tuna and albacore. Although there are about 20 canneries that process tuna in Thailand most of them are relatively small. The three big players in the industry – next to market leader Thai Union Frozen Products with its subsidiaries Thai Union Manufacturing and Songla Canning, Narong Canning and Chitiwat Manufacturing – together control nearly three quarters of the export sector. They offer all the typical products that are popular in this segment: solid pack, chunks and flakes (shredded) tuna in various broths, marinades, sauces or vegetable oils (sunflower, soy, olive oil), in water or brine. The size of the cans ranges from small units as commonly found on supermarket shelves to large cans for caterers and other bulk users. Over 98% of the canned tuna produced in Thailand goes into export.

Competition is growing elsewhere, however. In the middle of 2011 four new canning factories for tuna went into operation on Papua New Guinea, overtaking the Philippines who had until then been the second largest canned tuna producer after Thailand. In the coming years the four companies are expected to produce up to 1,330 t of products per day. The chance of success for Papua New Guinea is favourable for the country is located next to the world's major tuna fishing grounds and can export its products duty-free into the EU provided they fulfil all hygiene and IUU requirements. In Spain a lot of Galician canned tuna producers are already worrying about these developments because they are likely to put price pressure on producers.

Manfred Klinkhardt

European sprat *(Sprattus sprattus)*

Herring's little sister

The European sprat, also known as brisling or simply sprat, is a short-lived, salt-tolerant fish that is found in large numbers in brackish waters like the Baltic. In Germany, sprats are mainly smoked to produce "Kieler Sprotten" (Kiel sprats) but they are also used for the production of many other products. Sprats are sold smoked, dried, marinated, salted or canned, and they are also very good for frying in the frying pan or deep fryer. And sprats are an important raw material for the production of fish meal.

Due to the high content of omega-3 fatty acids, iodine and vitamins D and B12, "La Saraghina" can contribute to a healthy diet.

Yes, the sprat belongs to the family of herrings (Clupeidae), but no, it is not a young herring, as some people still believe, but a completely separate species. The safest way to distinguish between herring and sprat is by the position of the ventral fin. In sprat it begins before or approximately level with the front edge of the dorsal fin, in herring it is located clearly behind it. The second distinguishing feature is the keel scales on the belly edge between the abdominal and anal fins. Whereas the keel scales of herring feel relatively smooth if stroked with a finger from back to front, sprat have hard, almost sawtooth-like peaks.

Some scientists distinguish between three sub-species in the area of distribution of sprat, basing their differentiation on the fishes' keel scales. However, this differentiation requires the examination of a larger number of animals because it is difficult to assign individual fishes to a species. In the case of the subspecies *Sprattus sprattus sprattus*, which occurs in the Northeast Atlantic between Portugal and Norway (about on a level with the Lofoten), the average number of keel scales is said to be above 11.5. The subspecies Sp. *Sprattus phalericus*, which lives in the Mediterranean, the Adriatic and the Black Sea, has a maximum average of 11.3 keel scales, and sprat in the Baltic, Sp. *Sprattus balticus*, have an average of less than 11.5 keel scales. Whether these subtypes really exist and whether they can be identified in this way is disputable, however.

In general, one should always be on the alert where sprats are concerned because in some countries other schooling fish of sprat size are also named sprat. For example, despite the fact that there are "real" sprats in the Black Sea this name is sooner used for the small herring species *Clupeonella cultriventris*. And a popular product in Thailand is dried sprat although sprats are actually not found in Southeast Asia. The name sprat is sometimes little more than a collective name for various small fishes whose species are difficult to define. The sprat shares this fate with the sardine, which is also treated liberally where its name is concerned. Sprats are even sometimes sold as sardines. This is not new, as can be seen in Max von dem Borne's "Handbook of Fish Farming and Fisheries" from 1886. Already at that time he warned that sprats were preserved with very hot spices and traded as Russian sardines. And even today, the producer King Oscar puts some of its canned sprat products onto the market as sardines or brisling sardines, claiming on its website that "... sardines aren't actually a fish species – sardines become sardines through a traditional processing method."

Of course, processing will not change a sprat into a sardine and

The Italian sprat product is not only traded in traditional 4 or 10 kg wooden barrels but also as 100 and 500 gram vacuum packs.

there is absolutely no reason to deny the sprat its own species status. Like herring, sprats also form big schools which mostly keep near to the seabed during the day at depths of 150 meters. At nightfall, however, the sprats rise to the surface to feed on tiny planktonic crustaceans, which temporarily dissolves the swarm structure. Like many school fish sprats have the characteristic colouring often found in deep sea species: a dark, blue-grey back and a bright silvery white belly. That makes it harder for predators to see them from above and, when viewed from below, they disappear completely against the light shimmering sea. Sprats are nutritious and are part of the diet of many predators from mackerel to cod. Seabirds and marine mammals also appreciate this high-fat prey. Sprats can reach lengths of up to 16 cm, but usually they will not be more than 12 cm long.

Sprat stock in the Baltic currently decreasing

Unlike the herring, which attaches its eggs to plants, stones and other substrates, the sprat is a pelagic spawner whose eggs float in the water. Their spawning grounds are usually located near to the coast, but may also lie farther away in the open sea. To get from the feeding to the spawning grounds sprat schools often have to undertake journeys over hundreds of kilometers. Spawning usually takes place in spring or summer. Since spawning times vary regionally, however, sprats can actually be found reproducing all year round in some region within the vast area of distribution. Depending on their body size and age the females produce between 6,000 and 14,000 eggs. The eggs hatch after one week; the larvae measure 4 mm. If they successfully survive the dangers of the first days and weeks they reach sexual maturity after two years. The maximum age of sprat is thought to be six years.

Sprat are mainly fished with trawls and purse seines. In 2009 the total catch amounted to 667,187 t. The most important fishing nations were Denmark (195,174 t), which processes a portion of the catch into fish meal, followed by Poland (83,416 t), Sweden (81,826 t), Turkey (53,385 t), Latvia (49,550 t) and Estonia (47,299 t). Germany caught 29,223 t, and Norway 11,469 t. In Norway, whole swarms of sprats often used to be driven into narrow bays which were then cordoned off with nets and the fishes used for the manufacture of canned food. They were left there for at least three days so that they could empty their intestines before processing. This practice is said to be still common today in some regions.

One of the major sprat fishing areas is the Baltic Sea. The sprat stock, which had remained on a very high level until 2008, has in recent years diminished to such an extent that sustainable management is no longer guaranteed (fischbestaende.portal-fischerei.de). Fisheries scientists from the von Thünen Institute put a large share of the blame for this decline on the fast-growing cod stock (cod's diet largely consists of sprats). The co-dependence of biomass development between the predator cod and its prey (sprats) is referred to as the "cod-sprat swing." For 2012, the sprat fishing quota thus had to be reduced again for the fourth time in succession since 2008. At minus 22% compared to the previous year the reduction was particularly harsh this time. Further reductions of the allowable catch in the coming years cannot be ruled out.

Reduction of sprat fishing quotas in the Baltic:
2008: 454,000 t
2009: 399,000 t
2010: 380,000 t
2011: 289,000 t
2012: 225,237 t

Kieler Sprossen, La Saraghina

Despite their small size, sprats are of economic importance. In many countries they are a valued food fish. In 2008, nearly 1,300 tonnes of sprats were consumed in Germany (0.1% of the seafood market). This may not be much but the little fish is very well-known and enjoys considerable popularity. Everyone knows at least its name. The smoked product Kieler Sprotten is one of the few traditional fish products which have been able to assert themselves on the German market virtually unchanged over

Riga Gold Sprats are increasingly being sold in glass jars to show off the product quality and prevent counterfeiting.

centuries. They did not originate in Kiel but in Eckernförde and were first traded only in this area. However, with the expansion of the railway network in Germany, Kieler Sprotten became a product of national importance. Already decades ago sprats had almost the image of a well-established "brand". Meyer's 'Großes Conversation-Lexikon' (German-language encyclopedia) warned in the year 1905 of imitation "Elbsprotten" (= sprats from the River Elbe) whose bodies were higher than those of Baltic sprats. Their skin peeled away more easily and they had "greasy" flesh. In Hamburg, even smelt were often sold as sprats.

Sprats are not only smoked in Germany but also elsewhere, especially in the Baltic states Latvia and Estonia, where they are mainly processed for canning. In Latvia the production of canned sprats is said to go back to 1892, and almost six million cans of small sprats were produced in 1911. Cans with smoked sprats from the Baltic states are exported to over 30 different countries. The main customer is Russia, where smoked Riga Gold Sprats are today, as in Soviet times, still popular as a snack and any festivity would still be inconceivable without them. In Moscow alone, 2 million 160 gram cans of sprats are reported to be sold every month. The majority of them come from the Baltic states, whose products account for almost two-thirds of Russian canned fish imports. Nevertheless, only one in ten Russian supermarkets offers sprat products from more than one manufacturer.

The classic product among the canned products is smoked sprat in oil. These products are prepared either from whole headed or gutted fishes. In comparison, other products such as smoked sprat in tomato sauce have a relatively small share of the total market. In southern Europe sprats are sometimes put on skewers, deep fried and served with vegetables. Minced sprat meat is made into a kind of fish cake which is usually eaten with tomato sauce. In Scandinavian countries, sprats are rather used for making delicacies which – similar to matje herring – are based on the high enzymatic activity of the intestines and are marketed as Appetitsild or Anchovis. Unlike "real" anchovies, (sprat-) Anchovis are only lightly salted and then fermented with herbs and spices. This gives Anchovis a particularly mild flavour so that they can be eaten directly. There are also spreadable patés in cans on the market which have smoked sprats as their main ingredient. They are available, for example, in the flavours dill, garlic, lemon and onion. And with this, the range of possibilities is far from exhausted, as could be seen from a brief research exercise on the Internet: Nearly 30 products were to be found that are made of, or with, sprats.

Sprat has different names in the different regions of Italy. In Liguria, they are called Serretta, in the Abruzzi Papalina (after the synonym *Clupea papalina*, under which sprat was in 1846 erroneously described again as a new species) and in the Adriatic region Veneto La Saraghina. This is also the name of an optically very attractive sprat product, manufactured according to traditional methods by the company Adler from Cesenatico. In Adler's "La Saraghina" the sprats are arranged so regularly in shallow wooden vats that the finished product looks almost like a pie. The original product idea probably comes from the area around Cornwell on the south coast of England, where salted sardines were arranged in this way in wooden barrels during the 19th century. The main customer for this unusual fish product was at that time Italy.

Whilst the manufacturing process of this "fish pie" in England is today only shown in a museum factory, the old tradition lives on in Italy. The company Adler in the mean time sells its "La Saraghina" under the prestigious joint brand Certified Upper Adriatic Products (PCAA), which is only permitted to list products that are manufactured using original methods and that originate in the region, that preserve the natural quality of the raw materials, that are in accordance with the traditions of the Mediterranean diet, and that meet all modern hygiene and quality requirements.

The sprat is one of the "pesce azzurro" fishes (blue fish), a name which in Italy combines several small fish species. In addition to sprat these are mainly sardines, mullet, mackerel and anchovies. The sprat from which Adler produces its Saraghina are fished in the Adriatic from small boats using artisanal methods. They are said to differ in size, meat quality and taste from the sprats caught in the North and Baltic Seas. The main fishing season lasts from April to July. These are the busiest weeks in the year for the Adler company. The day-fresh catches are thoroughly sorted immediately after landing and all undamaged fish are packed in salt, which comes from the famous salt pans of Cervia. After a maturation period of 15 to 20 days the salted sprats are carefully laid by hand into wooden barrels and then subjected to slight pressure from the top to reduce the fishes' water content. In this way they have a long shelf-life in spite of their relatively low salt concentration. La Saraghina are traded in the classic 10 and 4 kg wooden barrels, vacuum-packed in 100 or 500 g packs (shelf-life 180 days) or sliced as a modern product (spicy or in olive oil) in cans (shelf-life 12 months). La Saraghina can be eaten cold as a snack, as an ingredient in salads or on bread, or warm, for example, with pasta dishes. A selection of interesting recipe ideas can be found on saraghina.it.

Manfred Klinkhardt

Aina Afanasjeva, Director, Eurofish International Organisation

Aligning Eurofish services with the real needs of the member countries

Aina Afanasjeva, a Latvian national, became Director of Eurofish in May 2009 just as the impact of the economic and financial crises were becoming apparent. Her first two years in office were spent making the organisation leaner and more efficient while simultaneously coping with the after effects of a serious car accident that kept her from the office for the first few months of 2010.

You have been associated with the FAO EASTFISH project as a National Liaison Officer and then with Eurofish as a Member Country Representative before becoming Director. How would you characterise the change from playing a relatively limited role in the organisation to actually leading it?

Yes, indeed, I was among those national representatives who contributed to the FAO EASTFISH project and the establishment of its successor, Eurofish. It was a different time; perhaps even a time when we had yet to learn about basic requirements in the area of quality assurance (including seafood safety and implementation of the HACCP system). The European Union had only fifteen Member States. Eurofish in this context was seen as a service institution also for the potential EU members looking to adopt EU requirements in the field of fisheries. Coming from Latvia - one of the EU candidate countries I can certainly acknowledge the importance of EASTFISH and Eurofish in this context. The usefulness is possibly best illustrated by the valuable contribution to member countries in the process of adapting their fish processing industry to international and particularly European Union standards, as well as facilitating new trade relations with emerging partners in the fish and seafood sectors across Europe. We have also been rewarded by a fruitful cooperation.

My appointment as Director of Eurofish in May 2009 was naturally an honour and a privilege. Unfortunately, my appointment coincided with the period of the global economic and financial crises and the euro zone financial crisis and it is a personal challenge to serve as Director at such difficult and demanding times.

What impact did the financial and economic crises that started in 2008 have on Eurofish? How has the organisation coped the last three years and what is the status today?

Each year brings its own challenges and opportunities. Like the rings of a tree, a ten year period shows development over time. Unfortunately, the past few years were characterised by crises that started in 2008 and still continue with the problems in the euro zone.

When there is an economic downturn, everybody is forced to think more about reducing or optimising costs and changing or shifting priorities. The same happened in our case, when we were forced to go through a restructuring process. First and foremost, Eurofish has adapted its services to the needs of a rapidly changing environment. Focus has been put on the one hand on how to tailor and align our services with the real needs and priorities of our member countries and their industries. Taking on the role of sole publisher of the Eurofish Magazine with all its financial implications was another challenge. On the other hand, considerable efforts have been made to make Eurofish leaner and more effective by implementing a series of administrative cost-saving measures.

Despite all these challenges, I am confident that Eurofish has the potential to grow further and consolidate its position in the region as provider of information, know-how and other services to the fisheries sector in Europe, including part of the Mediterranean. The organisation has demonstrated that it has the necessary will and ability to act at crucial times.

Where do you see Eurofish five years into the future? What do you foresee as the challenges facing the European fisheries and aquaculture sectors and what role do you envisage for Eurofish under these circumstances?

This anniversary event gives us a singular opportunity to think about how we can enhance and improve the ways that a knowledge-based institution can contribute to facilitating the development of fisheries and aquaculture sectors in

an expanding and changing Europe. It is particularly important to implement the lessons learned during the crisis.

Taking the lead in informing the public of positive and sustainable developments in the fisheries and aquaculture sectors in our member countries and more widely in Europe will likely be a priority for us. In addition, the coming years should see increased awareness of Eurofish amongst EU authorities, government institutions and the media.

We will devote more efforts to strengthening our role in different projects, a task which I am certain that Eurofish is well equipped to tackle. Topics such as facilitation of trade relations and opportunities to get better value for fisheries and aquaculture products, and the identification of trade and market opportunities will certainly be covered by future studies implemented by Eurofish.

Having strong contacts with the emerging markets of Eastern Europe, Eurofish provides a good platform to European companies looking for business opportunities and cooperation, building new partnerships and identification of investment opportunities in Central and Eastern European countries, including countries as Ukraine, Russia and Kazakhstan. These are areas where Eurofish can play a greater role in providing services using its expertise and extensive networks, including the global FISH INFO Network, which comprises several regional organisations coordinated by FAO-GLOBEFISH: INFOPESCA in Latin America, INFOFISH in Asia and the Pacific, INFOPECHE in West Africa, INFOSA in Southern Africa, INFOYU in China, INFOSAMAK in the Arab countries and Eurofish in Central and Eastern Europe.

In addition, we will capitalise both on our experience in European research projects and on being a member of several networks, such as the European Aquaculture Technology and Innovation Platform (EATiP). This will mean greater involvement of our member countries' SMEs and associations in European projects focused on innovation and in actively promoting them at international events (e.g. workshops, conferences).

The subjects of environmental awareness, sustainability of fish resources along with climate change is also on our list of future priorities. Today it is more important than ever to further develop our activities in this direction.

Last but not least, I hope that more countries will join Eurofish, once the recession is behind us.

Audun Lem, Senior Officer, Policy and Economics Division, Fisheries and Aquaculture Department, FAO

Rapid increase in consumption and trade in Eurofish members over last decade

Dr Audun Lem leads FAO GLOBEFFISH, the organisation at the centre of the global FISH INFO Network, of which Eurofish is part. Fish is the most globally traded commodity and Eurofish could collaborate more extensively with its partners in the FISH INFO Network to build on their experience.

The Eurofish member countries are European but the organisation is also part of the FISH InfoNetwork. How do you see Eurofish working more closely with other parts of the FISH InfoNetwork yet at the same time furthering the interests of its member countries?

The Eurofish member countries belong to the same geographical area, but are at the same time quite diverse. Some are large producers and exporters, others are net importers. Some are landlocked and have developed important aquaculture facilities; others are coastal states with substantial capture fisheries as well. And marine aquaculture has become important to the national economies for many of the Eurofish member countries. Some are EU members, others are aspiring to join the EU, and others again have decided to remain outside the EU. Common for them all is that consumption and trade has been increasing quite rapidly over the last decade. For some, the processing industry and distribution has also seen a tremendous development lately. They also all interact more with each other and with the global supply chain to an extent quite unimaginable only a few years ago.

Global issues are also impacting local conditions much more than in the past with topics such as ecolabelling, responsible production and sourcing, IUU fishing, market access, food safety and traceability becoming mainstream issues for the national sector, whether small or large.

In this respect, Eurofish as part of the FIN may build on the experience in other regions to assist on more crosscutting

issues. And also to assist companies in the Eurofish member countries to gain market access in non-European markets for example.

The member countries of Eurofish represent the entire geographic spectrum from north to south and east to west. With your experience from the FAO how would you reconcile the different needs and interests of this diverse group of countries in a way that is acceptable to all?

The difference in needs and interests provides a number of opportunities for transfer of knowledge and experience, for industry development, for market and product development etc. In this sense, the diversity is enriching with the potential to increase integration as well as to assist the industry to continue to move forward. When we look at the astonishing accomplishments that have taken place within the industry in the Eurofish area, in distribution and consumption, in aquaculture developments over the last decade, we should be optimistic also about the future.

The Eurofish Magazine seeks to inform about developments in fisheries and aquaculture in the Eurofish member countries and also to carry information on topics that are of interest to the industry in general. It also has to consider the interests of advertisers. In your opinion which are the subjects to which more or less coverage should be devoted to in the future?

Generally, it is easier to point to what should be given more emphasis and not the opposite. As the magazine has developed, I believe that there is a good balance today between the most important issues, especially those related to market access, food quality and safety and the space given to information about companies, trade and products. In particular, I find the country profiles of value and the information about successful companies operating in the region.

Victor Hjort, Director of Eurofish, 2003-2009

Managing projects successfully gained us vital experience

Victor Hjort headed the newly established international organisation Eurofish for six years from 2003, a period which put the organisation on a more stable footing with more countries joining and the work from projects increasing.

As the first director of Eurofish what do you remember most vividly about your time at the organisation?

What I remember most about my time leading Eurofish was that when I took over as the first director in May 2003 Eurofish was an organisation full of positive anticipation about its existence and its growth. No longer a project under the wings of FAO but a small independent organisation with the minimum number of member countries required to support it, the new body had to create new income with activities living up to the mission given by its member countries. There was a sense of pioneering in the organisation mixed with the sobering thought of all the kinds of challenges that we had to deal with.

Looking back at this scenario there are many memorable moments, all representing different achievements that contributed to the growth and consolidation of the organisation. To be able to hand over a vital organisation (with no fewer challenges) to the new director six years later was, from a personal point of view, a significant milestone in this extraordinary experience.

What would you say were your main contributions to Eurofish?

I would say my main contributions to the organisation were expanding the membership of the organisation from 6 to 12 member countries and heading a team of outstanding professionals with drive and enthusiasm to create remarkable results in project execution and publishing.

Where do you think the organisation should direct its efforts today to best serve its members?

Today too Eurofish has an important role in assisting countries in Eastern Europe to develop their fisheries sector, but Europe is not the same as when the Eurofish Agreement was signed. Now Eurofish is a specialised regional European organisation working all across Europe within and outside the EU.

With its experience in project management, on its own or in smaller and bigger partnerships, Eurofish provides a unique opportunity for the fishery sectors in its member countries to obtain reliable professional assistance on reasonable terms. And Eurofish has unparalleled opportunities to help build bridges and partnerships to the East. As for the insight, there is no way better than to read the Eurofish Magazine to stay updated on the European and global fishery scene.

Jochen Nierentz, Former Director, FAO EASTFISH

Eurofish should highlight its unique features

Jochen Nierentz was the first director of the FAO EASTFISH project, and one of the key people behind the successful launch of the Eurofish International Organisation in 2002. This interview recollects some of the circumstances that led to the establishing of EASTFISH and then Eurofish, and suggests how Eurofish could better serve its member countries in the future.

You had an important role to play in establishing Eurofish. Were you satisfied with the outcome?

The idea of an EASTFISH/ Eurofish Organisation was obviously sparked by the enormous political shifts at the end of 1989.

FAO had already, in the early 90s, through its GLOBEFISH office, been involved in training the post harvest sector in Eastern Europe. To my knowledge FAO has never before in its existence set up a regional project for this geographical area. Also having used a host country in northern Europe was a unique feature, which was only possible thanks to the innovative and open minded leadership in the Fisheries Department of FAO and of course the generous support of Denmark. Looking back at more than 18 years activities in the Central and Eastern European fisheries sector, one can only judge the existence and the activities that materialised as an enormous achievement.

Did you ever wonder whether Eurofish would actually take off and was there a plan B if it did not?

We had a project duration of 3 years with an anticipated extension of another three years. During this period at least five member countries had to ratify the Eurofish agreement, which finally happened by October 2001. So the first Governing Council of the new organisation was scheduled for January 2002.

With regard to a plan B; the transition from an FAO project to a small specialised regional institution was a challenge in most of the members of the FISH INFO Network. If the only handicap for the establishment of the organisation had been the financial feasibility, one could have considered moving the headquarter to a member country, where the cost of living was lower. Such a move had been successfully completed in the FISH INFO Network for INFOPESCA, moving from Panama City to Montevideo, Uruguay, and for INFOSAMAK, moving from Bahrain to Casablanca, Morocco.

The economic and political landscape has changed very much in Europe since the days when Eurofish was established. How do you think the organisation can best serve the interests of its member countries under these new circumstances?

The Eurofish Magazine and its website are the main vehicles to communicate the unique features of the Eurofish Organisation and these tools have to be impeccable, up to date and future oriented. Both media should be open to controversial discussions. Eurofish does not have to be the source, but should be an attractive forum for strategic partners to present their ideas. In this way Eurofish will be recognized as a think tank, helping to identify values and contributing to the value chain implementation.

Eurofish was and is known for its knowledge of the Central and Eastern European fisheries sector. This remains of vital importance. Eurofish is recognised also for having a close collaboration with the fisheries ministries, directorates and post harvest institutions in its member countries. In this connection it is pivotal to feel the pulse of member countries regarding their expectations and requirements.

Information distribution, fish processing, quality assurance, the legislative regulations in the post harvest sector, marketing and its requirements remain the basic features to be covered. However now the requirements have to take more into account issues like sustainability of resources, climate change, increased demand for food, the dominant role of aquaculture, cost and demand for energy, health, increased average age of the population. Upgrading of byproducts in view of limited resources, transport cost, environmental requirements could be some of the more specific issues where Eurofish should become involved.

It is obvious that expertise needs to be identified on an ad hoc base when needed. Therefore the existence of a constantly updated databank of consultants and institutions is of key importance, and also one of the unique features with which Eurofish will be identified.

Eurofish could initiate the European Fish Industry Indicator, by organizing a simple electronic questionnaire to be sent to the fish industry on a monthly basis. This indicator would ask for the expectations for production, raw material prices etc.

Industry and governments have an interest to promote the benefits of fish consumption. This is an area where Eurofish could think of cooperation with nutrition initiatives in member countries.

Last but not least it should not be forgotten that FAO has a wealth of information available which should find its way to national administrations, industry leaders and be used by Eurofish to identify upcoming issues of importance.

The success of the organisation will be based on the close collaboration with member countries, strategic partners and of course the dedication and ideas of the staff.

Eurofish commemorates its tenth anniversary

The Eurofish Member Countries have their say

The Eurofish Organisation's mandate is laid down by its member countries, who are a vital part of the organisation. We have sought their opinions on three issues. These are, how Eurofish can better play a role in dealing with some of the challenges that are facing the fisheries and fish farming sectors in its member states; how the varied needs, reflecting the diversity of the membership in the Eurofish Organisation, can be reconciled to benefit all the members; and finally, how the Eurofish Magazine can be of greater use to its readership in the member countries.

Eurofish can facilitate its members' participation in projects

Eurofish is the only European organization that works "across" geographic and institutional borders and is, because of its size, a non-bureaucratic and flexible organization. Because of the enlargement of the EU the role of Eurofish has gradually changed, as the new EU Member States naturally give high priority to adapting to the EU. But even so Eurofish still has a big role to play. This can be concerning the development within markets, the "know-how" and the bilateral contacts and cooperation within Europe as well as world-wide.

The new EU Member States that are also members of Eurofish will still benefit from projects that can bring new firms and sectors in line with tough international demands and competition. Over the years Eurofish has created results and proved its value within various areas, for instance with the Eurofish Magazine, the website and guides to the industry; and with projects and workshops related to industry, trade, aquaculture and seafood safety.

In some way the results of helping the Eastern European countries have been so efficient, that Eurofish has made itself a little bit "redundant". However, the organization has been good at adapting and has begun looking beyond Central and Eastern Europe; even though these countries still have its full attention. The organization is very aware about its core mission, which is the serving of the member states. But it has also understood the necessity of obtaining projects that can form the basis of a stable financial situation in order to take care of its core tasks.

Jakob Munkhøj Nielsen
Head, Centre for Fisheries, Ministry of Food, Agriculture and Fisheries, Denmark

Several areas where Eurofish member countries could profitably work together

The sector has long standing traditions in Latvia, but today it is facing rapid changes and is in real need of dynamic development. For operators it is important to be competitive at a European and global level. Access to the best knowledge and experience are most useful tools to be shared between them with Eurofish support. Fish is a subject of international trade. On the local market it competes with imported products, and on export markets it competes with other exporters and local production. Without good and the most recent information, without appropriate marketing skills and management tools, one can hardly stay in business nowadays. These are fields where Eurofish could assist its member states.

Different Eurofish members represent different traditions and their fisheries sectors have also their own diversity. However there are a lot of things that can be settled and achieved together. For example, joint efforts to make European products more competitive on the global market, consumer interests and product safety, innovations and best practices, better supplies of raw materials, cooperation and joint ventures. Many issues of common interests can be found through open minded discussions and mutual contacts.

The Eurofish Magazine is quite effective in providing necessary and useful information for the fisheries sector. Some attention in the future could be paid to not very long, but analytical articles on recent developments, trends and changes in the main European fish products markets. It is also important to show innovative methods, technologies and new approches in the magazine, like the recirculation guide for aquaculture, bone cutting technology in carp production, and other good examples.

Normunds Riekstins, Director, Fisheries Department, Ministry of Agriculture, Latvia

Seafood must be sustainable to secure the industry's long term growth

Norway has high ambitions for the further development of its seafood sector. The world population is growing and incomes in emerging economies are taking people above subsistence levels. The Norwegian government is committed to ensuring that seafood also in the future will fulfill its potential as a dependable source of protein and other essential nutrients. Quality, safety, responsibility and sustainability are key elements in order to succeed.

A prerequisite for long-term growth and development is an environmentally sustainable seafood industry which minimises risks to the marine environment and biological diversity. It is also a prerequisite that we maintain and develop markets for our seafood. Every seafood producer in any country is fundamentally dependent on the market's willingness to pay for our products. In order to do this we must not only deliver safe seafood of high quality, but also develop products that are environmentally acceptable to modern consumers and which they would know how to prepare.

Information and knowledge sharing on developments within technology, research, consumer patterns and seafood trends is important for all Eurofish member countries. I believe that the Eurofish organisation contributes, and will continue to contribute to this endeavour in the future.

There will of course always be different needs and interests in a diverse group of countries. We do on the other hand experience daily the global nature of our common business sector. We are dependent on each other in trade issues and we also have a common interest in developing the seafood sector in relation to other food producing sectors.

It is clear that consumers' expectations and demands have become a legitimate factor in the international food trade. We perceive an increased environmental consciousness and awareness of the importance of sustainability, both within the industry and amongst consumers. Many countries are battling lifestyle diseases and consumers and governments are increasingly aware of the link between diet and health. At the same time the seafood sector experiences an increased focus on the health benefits of seafood, as a number of scientific studies have drawn attention to the potential health benefits from eating seafood regularly. I believe that both sustainability issues and the spread of information about the health benefits of seafood are examples of areas that we have in common, despite our different needs and issues.

We have to inspire each other, learn from each other and cooperate in order to tell the world that it is possible to produce seafood in an environmentally sustainable manner and that seafood is delicious, healthy and easy to prepare.

A demand for healthy, convenient food of high quality is a major consumer trend, compatible with the characteristics of seafood. Documentation and information on seafood safety, sustainability, nutrition and quality are necessary to enable the consumers to make informed choices as well as to inspire producers. One of the subjects I find most interesting in the Eurofish magazine is the coverage of the seafood trade in other countries. In addition to descriptions of what is produced and how it is produced, I would be interested in even more information on developments in consumer patterns around Europe.

Astrid Holtan
Deputy Director General. Department of Aquaculture, Seafood and Markets, Norwegian Ministry of Fisheries and Coastal Affairs

More market trends and forecasts needed in the Eurofish Magazine

The main problems facing the Lithuanian fisheries sector are the old and technically obsolete fishing fleet, the lack of opportunities in Mauritania and Morocco, the decline in fishing possibilities in the waters of the regional fisheries management organisations, as well as inadequate sector involvement in the debates on these important issues.

The aquaculture sector faces problems too, including how to increase production, develop sales on the local market and how to promote itself. Eurofish could contribute to solving these issues by providing advice and information on, for example, ways to encourage consumers to eat locally produced fish and seafood, and methods to increase sales. Lithuania appreciates the information on closed recirculation systems and their development in the recent issues of the Eurofish Magazine.

The different interests of the Eurofish member states could be reconciled by emphasising their regional aspect, while talking about the best practice first of all particular member states characteristics should be firstly considered. Different interests could be also combined while discussing EU issues which are relevant for the most of the organization members.

We would like to see the Eurofish Magazine devote more attention to EU issues (CFP reform, market regulation, new financial regulation EMFF) as well as global trends. Analysing the most recent statistical data on countries and commodities to develop market forecasts for the quarter, six months, and twelve months would also be very useful.

Darius Nienius
Director, Fisheries Department, Ministry of Agriculture, Lithuania

Information is key to understanding changing markets

Nowadays fisheries is a very international industry. A lot of the fish caught and processed in Estonia is exported and at the same time processing companies are importing raw material. The spectrum of trading partners is very wide, covering neighbouring countries but also other continents. So, events and developments in other countries' fisheries are directly and indirectly influencing the Estonian fisheries sector. The keyword to staying abreast of developments on changing markets is information. The Eurofish Magazine is one very good source of information with a balanced selection of topics and it should continue to be a leader in this field.

On the one hand neighbouring countries have similar interests and cultural affinities, but at the same time they are competing heavily with each other. In general the fisheries sector is in a unique situation (demand is higher than supply) and it gives one common topic of interest for very different countries. For favouring trade flows and reducing tariff and non-tariff barriers several international organizations and agreements (WTO, Codex, CITES, etc.) have been formed. Very important for trade is the common understanding of international rules in all these different countries. Eurofish has organised very successfully different events and seminars to introduce different norms and requirements in international trade and I'm sure that this practice will continue.

Hannes Ulmas
Head of the Bureau of Market Organization, Department of Fisheries Economics, Ministry of Agriculture, Estonia

Countries can learn from each others experiences

Fisheries in Albania from marine fisheries to the farming industry are facing several challenges. This is because of the transition the sector is going through as it seeks to comply with the European Union rules and regulations. These challenges range from infrastructure to support activities for fisheries. Examples include the creation of efficient landing sites, wholesale markets, a balanced fishing fleet, and an aquaculture sector that needs to become sustainable and environmental-friendly.

Better knowing the fishery and aquaculture sector of other countries, through information sharing and common participation at workshops is beneficial, since it creates the opportunity to learn from each other. Learning and knowledge is not limited to technical aspects, but also to economical, political, social, organisational and managerial issues that are part of the fishery sector.

I think Eurofish Magazine should cover all possible aspects encompassing the fishery and aquaculture business: from small to big industry players, from artisanal to industrial fishing, from family-managed to mega aquaculture farms, in particular giving examples of successful stories in fisheries. It could also include a section for discussions and suggestions from readers.

Mimoza Cobani
Aquaculture specialist, Ministry of Environment, Forests and Water Administration, Albania

Eurofish commemorates its tenth anniversary

And now for our partners...

In addition to the Member Countries, the Eurofish Organisation is also supported by a network of partners. Over the years this network has grown wider and deeper as new partners join and collaborations with older partners get closer. For this edition of the Eurofish Magazine we asked them how they would evaluate the partnership and how they see the future.

Studying the opportunities in potential new markets

The Norwegian Seafood Council does several projects every year to explore new markets or to update information about markets we are already working in. This is information about everything from macroeconomics to food habits, retail structure and competition in the seafood market. It is also important to travel in the market and get to know the seafood business and the level of development in the market. We are happy to work with a partner like Eurofish, who has a high degree of knowledge both about the seafood industry, the markets we are doing research in and about the type of information that is crucial in this kind of projects.

Eastern Europe has been an important working area for the NSC for a long time and will be also in the future. Central Europe consists to a large extent of prosperous new markets for us and will be more and more important. Eurofish could be a partner in developing this region further, not only as a market for Norwegian seafood, but also in general as fish markets and fish producers.

Egil Ove Sundheim
Director of Market Information and Market Access, Norwegian Seafood Council

Building networks to benefit Eastern Europe

During two years of cooperation in the EUMOFA project, Eurofish concretely achieved both the results we expected: (i) developing technical solutions for the data management and information dissemination, specifically targeted to the monitoring of fishery trade; (ii) bringing to the work team its capacity for networking and relationships with intra and extra-EU sector organisations. The benefit for COGEA was the positive partnership with a relevant player in the fishery sector; and it was a pleasure for me personally as project manager to cooperate with Eurofish's experts.

In the future I foresee our partnership as playing an even more competitive role in providing economic/market/social analysis services to the most relevant bodies at the EU level. The networking group we are jointly creating will have greater expertise and be more competitive than each of the individual organisations. This new networking group, with the added value of Eurofish, could play a strategic role in the EU new member states and especially in the eastern regions of Europe. In 2012 I would like to start with Eurofish a joint marketing campaign to promote the services of this networking group.

Alvise Bragadin
Partner
COGEA

Cluster searches for new fishing opportunities

The experience of working with Eurofish has been very positive. Our Cluster acknowledges Eurofish as a very professional and efficient partner in providing practical information to fishing owners (e.g. from the Russian market). In the near future I would like to repeat the same project that we did with Russia: a study with a seminar with wide participation from the administration and industry, plus a field visit to the target country. For the Cluster it is important to follow a practical approach in countries where there are fishing opportunities or where the "rules" are changing.

Pablo Xandri, Managing Director, Cluster of Fishing Companies in Third Countries (CEPPT), Spain

Better fish feeds lead to greater sustainability

The Guide to Recirculation has been translated into several languages, which proves that a lot of local aquaculture producers and authorities have found it to be a useful tool.

As a speaker at recirculation workshops in several Eurofish member countries I would list Turkey at the top in terms of their aquaculture industry followed by Poland. Overall, Turkey has excellent natural conditions both on land and at sea, and I believe we have just seen the beginning of a huge leap in the aquaculture industry in Turkey. In the near future, we will also see more environmental friendly land based farms in Turkey using recirculation technology. On land, Poland is far ahead, and has already built several recirculation trout farms to protect the environment.

And talking about the future, I think the development of excellent new feed types has made the European aquaculture sector much more sustainable. We have to remember that the best way to be sustainable is to avoid spillage in the production change. The more the farmer can make out of the feed in terms of fish meat, the more productive he will be, and the less the discharge will be. Fish feed is by far the most expensive cost in the production, so it really makes sense to be efficient here, which most farmers have realized today. Secondly, I believe that the European Fishery fund has a major impact in driving the sector towards a sustainable industry in the way that environmentally-friendly solutions are supported. This of course means that the sector is turning towards recirculation systems with a high degree of cleaner technology and waste water treatment. Finally, I see a trend in larger and more advanced systems being built, which are in fact more sustainable that many small systems, simply by the fact that it requires large profitable systems to afford the investment in cleaner technology.

Jacob Bregnballe
Sales Director, AKVA group
Author of A Guide to Recirculation Aquaculture

Harmonisation is likely for different certification schemes

Certification schemes have been launched heavily during the last 10 years in the fisheries industry and now cover the whole supply chain from wild fisheries or aquaculture to retail or distribution. The driver for these schemes are retailers or big international fish producing companies when it comes to quality and food safety or hygiene standards, and NGO's when we are talking about sustainability standards. We expect the many standards to be harmonised in the near future and a good guess will be that ISO will start organizing the harmonisation. Until this happens, the best advice for people and companies working inside the supply chain for fish products, is to learn the different standards which are relevant and to try to implement one company management system that takes care of demands from different sources (standards and relevant rules from authorities).

All companies, whether big or small, should and can apply for certification schemes. The system size is adapted to the size of the company and many companies learn that if they put effort into building a company-based management system then additional requirements coming from the different certification standards will be easy and logical to implement.

Jacob Færgemand
Managing Director
Bureau Veritas Certification
Denmark

Lithuania's fish farmers should unite

The main challenges facing the fish farming sector is the lack of knowledge, experience and financing.

Individual fish farmers are too weak to be able to function alone on the market as competitive players, therefore uniting everyone would be a way to share knowledge and experience among local players and to present a common front when seeking advice in Europe.

In our opinion the Eurofish Magazine should devote more attention to subjects like: innovation in the fish farming sector and information on the CFP reform (maybe some discussions or comments by specialists on how the reform would affect the market players).

Gintaras Šilinskas
President
ZMARE, the Amateur Fishermen's Association
Lithuania

For more information on the Eurofish tenth anniversary please visit www.eurofish.dk

Seafood Barcelona launch to draw on Eurofish Magazine

Since its beginnings the Eurofish Magazine has been important for the promotion of Alimentaria and for its specialised shows Interpesca, Expoconser and Congelexpo. We are aware we are working with a very professional, rigorous and competitive magazine aimed at all who are working in the sector.

In addition to Alimentaria, the international food and drinks exhibition, that will return to Barcelona on 26-29 March 2012, we are working on the launch of Seafood Barcelona, a new event from Diversified Business Communications, that will be held from 15 to 17 October 2012 in the Fira de Barcelona venue. We will use the Eurofish Magazine and its informative and specialised support to promote our events to our target audience. And we enjoy working with the excellent team of professionals who make Eurofish.

J. Antonio Valls
Alimentaria, Spain

A partnership that goes back many years

We have been working with Eurofish since the day of its establishment and as Eurasia Trade Fairs we have collaborated with Eurofish to promote Future Fish Eurasia, our trade show on fish imports/exports, processing, aquaculture and fisheries. Over the years Eurofish has been one of the leading supporters of Future Fish Eurasia. Eurofish has contributed to our show by organising worshops in many editions of Future Fish Eurasia. Through advertising in the Eurofish magazine we have reached target groups worldwide. Mass e-mailing campaigns done by Eurofsh have also boosted interest in Future Fish Eurasia from time to time. Putting business aside, the staff members of Eurofish we have associated with in the last 10 years have been absolutely wonderful to work with. We look forward to many more years of collaboration between Eurofish and Eurasia Trade Fairs.

Levent Akdogan
Eurasia Trade Fairs, Turkey

Promoting Italian events in Scandinavia

We have been working with Eurofish since 2006 and the advertising in the Magazine and the editorial coverage has supported us in the promotion of our event, the Mediterranean Seafood Exposition, in Denmark and in Scandinavia attracting visitors and potential exhibitors.

Roberta Masini
Rimini Fiera, Italy

Birthday greetings from *fish international* in Bremen

I have appreciated the work with the Eurofish team through all the years – they have always been open to our topics and as helpful as we could wish. It always has been fun working on the several projects for fair participations at our show "fish international" in Bremen and also at others abroad e.g. in Turkey or Poland. Your magazine gives us a good insight into the industry and information on companies – we love reading it and we know our customers do too.

Sabine Wedell
Messe Bremen, Germany

Congratulations to Eurofish!

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12-14 February, 2012
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15-16 February 2012
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25-28 February, 2012
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11-13 March 2012
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27-30 March, 2012
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Publisher EUROFISH International Organisation
H.C. Andersens Boulevard 44-46
DK-1553 Copenhagen V
Denmark

Tel.: +45 333 777 55
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info@eurofish.dk, eurofish.dk, eurofishmagazine.com

Managing editor Aina Afanasjeva

Editorial offices Behnan Thomas (bt)
H.C. Andersens Boulevard 44-46
DK-1553 Copenhagen V
Denmark

Tel.: +45 333 777 55
behnan.thomas@eurofish.dk

Dr. Manfred Klinkhardt (mk)
Redaktionsbüro Delbrück
Franz-Stock-Straße 23
D-33129 Delbrück
Germany

Tel.: +49 5250 933416
manfred.klinkhardt@web.de

Editorial board Lahsen Ababouch, Audun Lem

Translation Yvonne Bulmer

Advertising Eckhard Preuß
Marderstieg 7
D-21717 Fredenbeck
Germany

Tel.: +49 4149 8020
Fax: +49 4149 7292
e.preuss@freenet.de

Aleksandra Petersen
Eurofish Magazine
H.C. Andersens Boulevard 44-46
DK-1553 Copenhagen V
Denmark

Tel.: +45 333 777 63
Fax: +45 333 777 56
aleksandra.petersen@eurofish.dk

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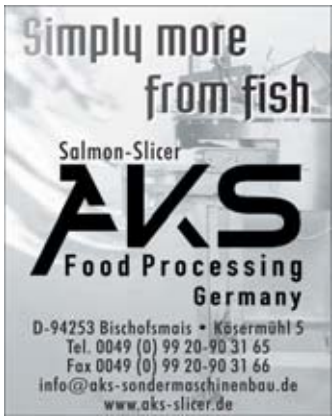

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