



EU EATIP Day

Summary

Under the slogan "Our Future – Growing from water", the Aquaculture Europe 2019 conference addressed innovative ways to support the aquaculture economy. This year, the European Commission DG RTD unit "Healthy Oceans & Seas" and the EATIP co-organised a full day programme called "Low impact – High output". It addressed future opportunities of new value chains in aquaculture, specifically targeting low trophic species.

Through three consecutive sessions, major outcomes of European technology and innovation efforts contributing to ensuring food and nutrition security were presented, followed by industry-driven panel discussions where the audience had the chance to participate. The sessions provided a dissemination arena and high visibility of EU support to the sector. They also generated ideas for future research by linking Horizon 2020 project findings to opportunities for industrial applications and uptake. The AQUAEXCEL²⁰²⁰ session aimed to create a forum for engagement and exchange between researchers and potential industry beneficiaries, focusing on presenting innovative solutions generated by the project with potential high impact on the aquaculture industry.



Part I: Low impact – High output Promoting food security and new value chains in aquaculture

Figure 1: Macroalgae cultivation (Photo: Ocean Rainforest Sp/F, 2019)

The potential of aquaculture in providing safe food of the highest quality and nutritional value, across a wide range of products adapted to consumer preferences and lifestyles is very high. European policies and strategies recognise it as a full-fledged sector of the blue bioeconomy as well as an essential approach to acquiring global food and nutrition security.

The "Food from the Oceans" report highlights that the biggest potential for increasing seafood production is through mariculture, especially at lower levels in the ocean food chain. In addition, the production of shellfish, algae and other low trophic organisms contributes to carbon sequestration and eutrophication mitigation.





Under the slogan "Our Future – Growing from water" the AE 2019 conference addressed innovative ways to support the aquaculture economy, generation of new business models and support of startups. This year the unit "Healthy Oceans & Seas" from DG Research and Innovation of the European Commission and the European Aquaculture Technology and Innovation Platform (EATiP) co-organised a full day programme, setting the focus on the impact of European research for the benefit of aquaculture development, targeting low trophic aquaculture species.

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SESSION 1: Setting the scene - How can European research and innovation stimulate sustainability and competitiveness of the aquaculture sector?

Introductory talks discussed the EU research and innovation support to stimulate sustainability and competitiveness of the aquaculture sector. Alexandra Neyts (EATiP) referenced to general trends and tendencies that are reflected on the production of aquatic food, such as the climate action, the circular economy, setting a halt to the loss of biodiversity and the smarter use of land and ocean space. She called for action to jointly develop the next EU funding programme for RTD in support of a sustainable aquaculture sector. Miguel Lizaso (EC DG RTD) referred to the elected president of the European Commission Ursula Von der Leyen priorities for 'A union that strives for more' and presented the Horizon Europe proposal of the Commission. Lorella de la Cruz (EC DG MARE) presented the new strategy for EC policy on aquaculture, aiming at lowering administrative burdens, better access to space, improve competitiveness, level playing field and preparing the sector's role in the Green deal, farm to fork strategy.



Figure 2: Setting the scene at the EU EATIP Day, with speaker Yolanda Molares from ACUIPLUS

Raphaela Le Gouvello, representing the International Union for Conservation of Nature (IUCN), called for an ecosystem approach to tackle global challenges including social and biodiversity benefits, and how aquaculture as natural based solution can deliver on this. In particular she pointed at ecosystem services, diversification of species at low trophic levels, and the adoption of a "glocal" approach considering global challenges by adding value in local communities. As EATiP Mirror Platform chairperson, Yolanda Molares (ACUIPLUS) identified key challenges for the European aquaculture value





chain, as described in the EATIP position paper. The recommendations, aligned with the SDGs, relate to necessary actions to ensure and improve conditions for growth, sustainable development, innovation and international cooperation.

The chairs from the conference sessions on micro- and macroalgae, Kjell Inge Reitan (NTNU) and Jorunn Skjermo (SINTEF OCEAN) respectively, summed up the results that were presented there. Although still a curiosity, the interest is strong and yields are expected to grow when reaching an economy of scale. Especially in macroalgae farming, it was advised to learn from the experiences in China.

SESSION 2 – Low trophic production technologies and new feed resources

The second session, "Low trophic production technologies and new feed resources", focused on new findings, future bottlenecks and opportunities on sustainable production of novel food, feed and added value products from alternative low trophic resources. Ole Christensen from BioMar supported the circular economy perspective. Including an increasingly number of raw materials in its feed, new sources are being investigated such as fermented algae, single-cell proteins, kelp, processed vegetable raw material and unexploited by-products. There are still a number of challenges such as availability, technologies to improve product quality and stability, food safety issues and nutritional effects. However, his clear conclusion was that producers and consumers are ready for the change.

Ragnar Nystøyl from Kontali Analyse presented the EUMOFA – Blue bioeconomy report focusing on low trophic aquaculture products including macro-, micro-algae and molluscs. Key elements of success are to create a market for the product, tailor it for consumer's demands at a feasible price, and limit possible negative impacts of its production. The major challenge is the lack of a mature market for algae in Europe compared to Asia, and the low acceptance for using the coastal zone for its production.

Maria Barbosa presented the results of the MAGNIFICENT BBI project, where two different species of microalgae are included as sustainable raw materials in aquafeed, food and bioenergy. Maria referred to the potential of microalgae as primary producers, grown in seawater, rich in fatty acids, with high productivity and no arable land requirements. Jose Maria Pinilla from the SME project AQUAOLIVE mentioned the valorisation of bio based products in relation to the Bioeconomy. An olive-based additive showed promising results from trials, with improved productivity, gut health and fish meat quality of some aquaculture commercial species. Philip James from the newly started AquaVitae project referred to the need for balancing the SDGs, the environmental (14, 13, 12) on one side, and the socio-economic (8, 2, 9) on the other side. He highlighted the importance of international cooperation and referred to the Belém Statement, its objectives and work to be done under this policy initiative. In particular, he described the AquaVitae project work, expected impacts in relation to a set of different low trophic species as a bioremediation tool, and to the testing of new sensors and data technologies in aquaculture. Urd Grandorf Bak from Ocean Rainforest presented the results of the BBI project MacroCascade, looking at refinery and processing optimisation for the production and utilisation of seaweed biomass as a functional ingredient in food and feed. Selective breeding, better understanding of chemical composition and ensilage are all promising actions to promote a low-cost production. In addition, she highlighted several positive impacts of macroalgal cultivation on the environment such as its potential to reduce ocean acidification and climate change, and nutritional bioremediation.







Figure 3: Panel discussion, from left to right: Philip James, Urd Grandorf Bak, Ole Christensen, Adriana Casillas, Jan Giebichentstein, Ragnar Nystøyl and moderator Alexandra Neyts

A first panel discussion, consisting of some of the speakers in addition to Adriana Casillas from IPIFF and Jan Giebichenstein from Cfeed, triggered a dialogue on the state of the art of low trophic production technologies and new feed resources. The fish feed sector is seeing a gradual shift from land based plant material towards marine low-trophic protein sources, but the main bottleneck is Omega-3 availability. Research and innovation, along with regulations fitting for purpose were identified as key to release the potential of LTS in aquaculture. It was agreed that one new raw material will not be able to fulfil the aquaculture feed needs, but that there is a need for a pallet of different ingredients. The positive perception of LTS combined with the increased focus on lower Fish-In-Fish-Out (FIFO) ratios and CO₂ footprints, and the demand for healthy, high quality food can make these products competitive in the future. Fish diets can control diseases, and particular feed ingredients derived from LTS can used as additives with the specific aim to reduce deformities or to boost the immune system. The mimicking of natural biotic trophic interactions might be used as a guide to optimise feeding strategies. In order to become sustainable, innovation and knowledge is needed on the processing of the materials, on the reduction of the workload, and on their environmental and socio-economic impact. Automation of processes, such as mechanical harvesting and seeding, specialised processing vessels with on-board biorefinery, as well as species-specific site selection were mentioned as essential developments to be stimulated. It was also advised to focus on cost-efficient, innovative cultivation and processing methods where Europe has a competitive advantage, while stimulating concentration on a few, high-potential species to reach economies of scale. Financial and/or "green" incentives to stimulate the LTS were regarded as important to stimulate the market on its way to become profitable. Consumer acceptance, the development of suitable markets, in terms of both price and biomass, and an overall growing aquaculture sector are in any case essential to sustain any successful value chain based on LTS. An additional application of LTS is their role in the delivery of ecosystem services, expected to receive increased attention as climate mitigation actions.

Europe has a unique position, producing food with very high food safety standards. This should not be jeopardised. Introduction of any new feed component from species or of ingredients from waste streams in the food chain requires hence appropriate regulations, based on a thorough understanding of food safety, health risk and potential environmental impact issues. However, if overregulated, or if approving procedures last many years, innovative processes might happen elsewhere.





The panel conclusions were that low trophic aquaculture species have a place in the markets, provided that consumer accept them at a fair final price. These species are a suitable solution to the sustainability of the industry providing additional services such as bioremediation, carbon sequestration and climate-change neutrality.

SESSION 3 – Efficient management systems to optimize sustainability and competitiveness

The afternoon session "Efficient management systems to optimize sustainability and competitiveness" presented sustainable, resilient, climate friendly and competitive practices through eco-intensification, intelligent management and new systems for the production of low trophic species.

Lorenzo Gennari from the European Mollusc Producers Association (EMPA) analysed the potential of open systems IMTA (Integrated Multi-Trophic Aquaculture). The many steps between the release of fish farm waste and the assimilation of nutrients by LTS, and the low probability to find sites that are optimal for fish, shellfish and seaweed farms at the same time showed that the feasibility of farm scale IMTA is rather low. However, the assimilation capability of Suspended Particulate Matter (SPM) by shellfish should be studied, to allow the analysis of direct fish farm waste uptake. EMPA supported the food system approach for aquaculture, considering all actors involved in the food chain, from production to consumer, and bringing sectors together to maximise the services provided.

Ana Granados and Anna Sonesson, both representing the Farm Animal Breeding and Reproduction Technology Platform (FABRE) explained the importance of genetic improvement for aquaculture species such as oysters and carps for improving feed efficiency, optimal growth, disease resistance, production quality and environmental impact. They supported the need for breeding programmes for new species, closing the reproduction cycle, allowing large-scale phenotypic recordings and identification of genomic information of individuals or families. Development of successful industries for those species can only be done through a coordinated action by experts from the whole value chain, i.e. breeding, reproduction, production management, feeding, health, processing, market, economy.

Roberto Pastres from the University of Venice presented the concept of ecological intensification and optimization of aquaculture as developed in the GAIN project. It looks at precision aquaculture, novel feeds and efficient reuse of wastewater from RAS, providing a sustainability index that takes into consideration Life Cycle Assessment, fish-welfare, economic impact and fish farming management. They tested commercial and close-to-market sensors in salmon and trout farms at different sites to estimate fish size and biomass distribution, and worked towards oxygen supply optimisation. Isabelle Arzul, IFREMER, was a representative of the VIVALDI project for the prevention and mitigation of farmed bivalve diseases. She stated that there is room for diversification, in particular with local species. She signalled the increase of mortality events, due to pathogens, as a key sustainability challenge for the shellfish industry. The consortium developed sensors and magnetic beads to improve the detection of pathogens, the stimulation of immunity and optimised genetic selection to produce resistant animals, as well as models and husbandry practices to reduce mortalities. She also mentioned the improved communication among stakeholders as significant in order to make a change. Annette Wilson from AquaTT presented the SEAFOOD^{TOMORROW} project. As representative of this project she addressed the sustainability and competitiveness of low trophic aquaculture with new or improved technologies. In the production part of the value chain the project optimised multi contaminant detection sensors, tailor





made fortified fish, tools for IMTA, and proposed buffer zones in shellfish production areas. Further down the value chain, several eco-innovation solutions are proposed, such as sodium reduction of products, PSP detoxification procedures, water and energy reducing measures and norovirus depuration. Consumer-related actions were also presented, such as screening tools, QR codes and user-friendly communication tools.



Figure 4: Panel discussion with from left to right Anna Sonesonn, Ana Granados, David Bassett, Jesper Heldbo, Annette Wilson, Lorenzo Gennari, Isabelle Arzul and moderators Marta Iglesias & Miguel Lizaso

During the second panel discussion, David Bassett (EATiP, manager of the EURASTiP project) and Jesper Heldbo (AquaCircle) accompanied the speakers for discussions touching upon indicators of sustainability environmental impact. All agreed that standardized indicators taking into account the ecosystem services are needed. This requires a broad range of interested, but not necessarily aligned, stakeholders to pull together to agree on indicators, assessment tools and auditing requirements. A strong methodological framework and a global long-term strategy, endorsed by policy makers, and alignment of funding mechanisms on a European level were said to be critical to reach a cost-efficient and sustainable development of the sector.

Removal of carbon, nitrogen and phosphorous, and, as far as the shellfish industry is concerned, chlorophyll A and TRIX index appear to be the most important aspects. When analysing the overall value, the use of coastal space and the utilisation rate of produced biomass should also be taken into account. When farming local endemic species, natural populations can be restored and hence be an additional benefit of the ecosystem services. Eliminating the risk of spreading human and animal food-borne diseases would lead to a better utilisation of both sludge from fish farms and wasted food for the production of new feeds.

Finally, effective knowledge transfer can be achieved through a good understanding of the sector, of the stakeholders' perceptions towards new regulating measures and of the barriers to overcome to ensure implementation of these measures. Improving this transfer can be done through implementing mechanisms of co-construction, designing fit-for-purpose communication and knowledge transfer. For that, it is again important to consider the whole value chain, including all actors. This corresponds well with the approach adopted by the new president-elected of the Commission.





Part II: AQUAEXCEL²⁰²⁰ BROKERAGE EVENT 2019

From Research Innovation to Industry Application



This session was dedicated to the H2020 research infrastructure project AQUAEXCEL²⁰²⁰, which integrates leading European aquaculture research facilities that work towards bringing aquaculture research in Europe to a new level. This was the project's second brokerage event, titled "From Research Innovation to Industry Application". It was organised by EATiP and AquaTT to create a forum for engagement and exchange between researchers and potential industry beneficiaries of the research results generated from the AQUAEXCEL²⁰²⁰ project, through both the varied research taking place within the AQUAEXCEL²⁰²⁰ project and through its Transnational Access (TNA) programme. The TNA programme funds access to 39 top aquaculture research facilities across Europe, offering researchers the possibility to undertake experimental trials on commercially important aquaculture fish species and system types.

The first researcher to take to the stage was Dr Stavros Chatzifotis (Hellenic Centre for Marine Research, HCMR), who highlighted research findings looking at three different types of insect meal replacements. Insect-meal replacements are a popular and important research topic, and Dr. Stavros was followed by PhD student Ana Basto (Interdisciplinary Centre of Marine and Environmental Research of the University of Porto, CIIMAR) who discussed outcomes of research on European seabass fed by the mealworm *Tenebrio molitor*. The principal aim of this research was to assess the use of large quantities of insects as protein sources to replace fishmeal in diets for sea bass, and to examine possible effects on their growth and welfare. Dr Jovanka Lukic (University of Belgrade) then gave a presentation on the effects of Lactic Acid Bacteria applied either through live feed or commercial dry feed, on growth and microflora of larval pike perch.

Along with fish nutrition various other aquaculture research areas were covered through the following presentations. Dr. Josep Calduch-Giner (Consejo Superior de Investigaciones Científicas, CSIC) presented a protocol for early life management for optimal fish performance, highlighting surprising findings in relation to low O₂ (hypoxic) conditions at early life stages of gilthead sea bream and their impact later in life. In terms of fish disease, Dr. Carla Piazzon (Consejo Superior de Investigaciones Científicas, CSIC) presented on gene expression analysis of Atlantic salmon gills and how it reveals certain key molecules during amoebic gill disease, one of the main health challenges for the marine Atlantic salmon industry worldwide. It is expected that the findings could contribute to a more timely and accurate detection of the disease which will prevent stock losses and improve fish welfare.

In addition to the high potential knowledge outputs, innovative findings and developments from the AQUAEXCEL²⁰²⁰ project were presented, one of which was AE-FishBIT. This tiny device is designed to be attached to the operculum of farmed fish for individual monitoring of their metabolic traits. The newly patented tool is the result of collaboration amongst biologists, engineers and bioinformaticians from two AQUAEXCEL²⁰²⁰ institutes. Dr Jaume Pérez-Sánchez (Consejo Superior de Investigaciones Científicas, CSIC) provided a short video and a presentation on the AE-FishBIT. After this, Orestis Stavrakidis-Zachou (Hellenic Centre for Marine Research, HCMR / University of Crete) presented on AquaFishDEB - a functional model for fish growth, feed intake and waste production in aquaculture.







Figure 4: Jaume Perez-Sanchez (CSIC) shows the AEFishBIT video, a promotional tool to disseminate information on this smart device for monitoring fish health and welfare.

After the presentations, an industry panel discussion followed, whereby industry experts had the opportunity to ask questions and further clarifications to the presenters. The panellists consisted of EATIP and National Mirror Platform representatives, as well as the CEO of MealFood Europe and Vice-President of IPIFF (International Platform of Insects for Food and Feed), since several presented results were insect-meal based. Online polling through Kahoot was carried out to gauge the audiences' interest in the results and how relevant they are to industry. For more information on AQUAEXCEL²⁰²⁰ please visit https://www.aquaexcel2020.eu/.

To view the Innovative Output Project Catalogues presented at this and past brokerage events please visit: <u>https://aquaexcel2020.eu/results</u>.



Figure 5: AQUAEXCEL²⁰²⁰ networking session that took place after the presentations had finished.