



# aquaculture europe

VOL. 51 (1) MARCH 2026

**EAS: Bringing  
People Together  
since 1976!**



**AE2026:  
FOCUS on Slovenia**

**The EAS Student Group  
reflects on a highly  
successful 2025**



**EAS is a non-profit society that aims at promoting contacts among all involved in aquaculture. EAS was founded in 1976. Aquaculture Europe is the members' magazine of EAS.**

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**On the cover**

**Inset: Educational visit to the Fonda Fish Farm.** *Photo courtesy of Arne Hodaličé.*

**Background image:** Trout farm aerial view – *Photo courtesy of the Food and Fisheries Directorate of the Slovenian Ministry of Agriculture, Forestry and Food.*

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**Membership**

Membership of EAS includes the biannual PDF publication "Aquaculture Europe", the bimonthly PDF "Aquaculture Europe e-newsletter", the "Monthly Catch" newsletter featuring job opportunities, internships, open calls and PhD/Post-Doc positions and online access to a peer reviewed journal Aquaculture International (AQUI). Corporate and Institutional members also receive, on top of other benefits, one free half page advert per year in the magazine and extra visibility for their openings in the Monthly Catch newsletter.

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See [www.aquaeas.eu](http://www.aquaeas.eu) for more information on membership categories and benefits.

Dear EAS members, it is my pleasure to introduce this March issue of our magazine — an issue that reflects both the depth of our sector and the strength of our community.

We begin with a feature on aquaculture in Slovenia, prepared in the run-up to Aquaculture Europe 2026. Slovenia may be modest in size, but its aquaculture sector illustrates perfectly how innovation, environmental stewardship, and regional identity can combine to create resilient production systems. As we look ahead to AE2026, this article reminds us that European aquaculture thrives on diversity — of species, systems, landscapes, and people.

This year, we also celebrate the 50 years of EAS, on which our Executive Director Alistair Lane shares his insightful reflections, taking us from the early days of a small, visionary network of scientists and industry leaders to today's broad European platform connecting research, industry, policy, and education. It is both a historical and a personal account and a reminder of the values that continue to guide us. There will be special events for EAS members at AE2026 in Ljubljana, we hope to see you all there to celebrate.

Continuity and mentorship are further highlighted in the interview of our former Treasurer Dr. Patrick Kestemont conducted by our President-Elect Damien Toner and our Treasurer Daniel Źarski. Both of them had Patrick as a mentor, and guide us through Patrick's contribution to European aquaculture — and to generations of students and colleagues — demonstrating how leadership in our field is built on generosity, rigour, and long-term commitment.

Finally, our EAS Student Group presents its focus on 2025. The dynamism, creativity, and engagement of our students are not simply encouraging — they are essential. The future of aquaculture will be shaped by those who are today developing new tools in genetics, nutrition, health, engineering, and sustainability, and make a great contribution, that I think you can all see, to the vitality of EAS and its annual conferences.

Together, these articles capture what EAS stands for: scientific excellence, intergenerational exchange, European cooperation, and a shared commitment to advancing aquaculture responsibly. I hope you enjoy this issue and find in it both inspiration and connection as we move together towards AE2026.



Marc Vandeputte  
 EAS President 2024-2026

# Fifty years of the European Aquaculture Society !

A personal reflection by Alistair Lane

*I was employed by EAS as its first Executive Director in March 2000, following a Board decision to create this post. So being with EAS for just over 25 years basically means that half of our history happened before me - and I cannot pretend to "personally reflect" on that. But let's go !*

## Our beginnings

It was back in 1975, at the 10<sup>th</sup> European Symposium of Marine Biologists held in Oostende, Belgium, where the idea emerged to create a European association bringing together marine scientists working on fish biology and culture. Plans were made and the founding meeting of the new **European Mariculture Society** (EMS) took place on April 29 and 30, 1976 in the office of the Institute for Marine Scientific Research (IZWO) in Bredene, Belgium.

The founding members - J. Arnal (Spain), J.V. Bannister (Malta), M. Bilio (Germany), S.J. De Groot (The Netherlands), J. Fluchter (Germany), E. Jaspers (Belgium), B. Myrseth (Norway), F. O'Brien (Ireland), G. Persoone (Belgium), S. Von Boletzky (Switzerland) and T. Vukovic (Yugoslavia) – agreed objectives and developed the first set of statutes.

The core objectives of EMS were to:

1. Promote contacts between all involved or interested in marine and freshwater aquaculture.
2. To facilitate the circulation of aquaculture related information.



3. To promote the sponsorship of multi-disciplinary research concerning aquaculture.
4. To enhance cooperation among governmental, scientific and commercial organizations and individuals on all matters dealing with aquaculture.

And these remain the statutory objectives of EAS today. We all know the value of multidisciplinary approaches to grow our knowledge, but it is interesting to see how important this was also seen to be fifty years ago!

During the 1970s and into the 1980s, marine fish farming in Europe was starting to develop. From salmon production in Norway, to flatfish species (halibut, turbot and sole) in the UK, and to sea bass and sea bream in Greece and across the Mediterranean. But early mortality was high, and those species requiring live feeds in the early stages before weaning onto artificial diets had very specific problems. The first was the production of live feeds – algae, rotifers and Artemia – and their enrichment to increase their nutritional profile, and the second was swim bladder inflation with an oily water surface



Delegates at the 10th European Symposium on Marine Biology in Oostende in 1975.



**The first EMS Board in 1976, with Martin Bilio as President, meets in at the Institute for Marine Scientific Research (IZWO) in Bredene, Belgium with founding members J. Arnal (Spain), J.V. Bannister (Malta), M. Bilio (Germany), S.J. De Groot (The Netherlands), J. Fluchter (Germany), E. Jaspers (Belgium), B. Myrseth (Norway), F. O'Brien (Ireland), G. Persoone (Belgium), S. Von Boletzky (Switzerland) and T. Vukovic (Yugoslavia).**



**San Francisco Bay Brand Artemia – the first reference.**

I did my bachelor's degree in marine biology at Plymouth from 1981 to 1984, and then a master's at the University College of North Wales (Bangor) in 1985. And my first job was to develop and market live feed enrichment diets for marine fish in Europe, Japan and Korea. A small world.

resulting from the (mainly oil-based) enrichments that were available at that time. The weaning from live feeds to inert diets was also a bottleneck.

During that period, Patrick Sorgeloos of the University of Gent was publishing about the global aquaculture potential of the brine shrimp, *Artemia*, and its use as a bio-encapsulation vector for larval shrimp and fish production. It would turn out to be a total gamechanger for aquaculture, but the marine fish hatcheries in Europe had difficulties in sourcing good quality *Artemia* cysts.

So in 1977, the European Mariculture Society stepped in to fill this bottleneck by buying and selling the famous "San Francisco Bay Brand" *Artemia* to those hatcheries. And in addition, we had quality approval on the nutritional profile of the cysts from Patrick Sorgeloos!



**The EMS Board in 1978 – when Hilde Joncheere was employed as the EMS Office Manager.**

And while EMS had been 'nurtured' by its founders in its first two years, and especially by Guido Persoone and Mony Jaspers, it needed a full-time office manager to support the Bureau and the Board. And that's where Hilde Joncheere came in – in 1978 - as the EMS/EAS office manager for the next 25+ years.

### Our publications

In a time without internet or even fax machines, Mony Jaspers, one of the key founders of EMS, strongly believed (like all the other founding members) in the benefits of sharing information for the future development of the sector and the people involved. So the hand-typed European Mariculture Society newsletter was born, and its first



**The first cover of the European Mariculture Society newsletter. 1976.**



**The first EMS Special Publication. 1976.**



**The European Aquaculture Trade Directory, published in 1985.**



**The 1989 update.**



**In 1990, the EAS magazine "Aquaculture Europe" changed format to a "glossy" magazine.**



**Aquaculture International (AQI). Volume 1. Number 1. September 1993.**

(quarterly) edition was produced in 1976. In that same year, the first EMS "Special Publication" was also developed. The EMS Special Publications were a series of compilations of species- or research topic-based related publications, abstracts for one of the events that were organised, or similar grouping of material to bring the science to the producers.

During the 1980s, the aquaculture value chain started to take shape, with an increase in producers and hence, suppliers. Apart from the main feed suppliers, companies from other sectors saw opportunities in aquaculture – especially regarding marine aquaculture - with the supply of moorings, nets and cage structures. And in freshwater aquaculture, the focus was on pumps, aerators and the design of new, raceway systems.

This led EMS (now EAS – see next section) to publish the first European Aquaculture Trade Directory (EATD) in 1985. And with the sector starting to expand quickly, it was updated in 1989.

It was during that year that my career took a new turn. I had been UK based, working with Frippak Feeds, a subsidiary of the Mars Corporation, producing and marketing microencapsulated larval feeds for shrimp. Continuing the work I had done

at Bangor University, as an MSc student with David Jones – the scientist behind the microencapsulation process that led to the creation of Frippak – I was in charge of setting up distribution in Japan and Korea and introducing the use of microencapsulated nutrients for the enrichment of rotifers and *Artemia* in the prefectural Fish Breeding Centres in Japan. But the French pharmaceutical giant, Sanofi, purchased the patents from Mars and I found myself in Paris, working as a technical sales manager for France Aquaculture – the commercial arm of IFREMER – providing design and construction services for new aquaculture hatcheries and the provision of feeds. The manager of France Aquaculture at that time was Philippe Ferlin, and he was a mentor for me in those early days in France and especially later, when he was EAS President from 1998-2000.

It was a year later, in 1990, that the EAS Board decided to upgrade its publications. The newsletter became a magazine, and it took the name **AQUACULTURE EUROPE**. It was a compilation of non-scientific articles, mainly provided by members of the society and coordinated through the network of National Representatives. Right from its founding year, EMS set up National Representatives in many



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European countries, and the Board was made up of the Bureau members (President, President-Elect, Secretary and Treasurer) as well as the National Representatives. This “operating structure” functioned until 2004, when the representatives were replaced by a larger Board of Directors - as we know it today and elected by the membership.

It was also in the early 1990s that EAS, in partnership with the publishers Chapman and Hall, decided that EAS needed its own scientific journal, to bring aquaculture research into one publication and to follow the objective of promoting multi-disciplinary science. The journal name – initially proposed as Aquaculture Europe to follow the pattern of our “brand name” – was finally named as **AQUACULTURE INTERNATIONAL** or **AQUI** for short.

So Volume 1 Number 1 of the EAS peer-reviewed scientific journal Aquaculture International, was published by Chapman and Hall in September 1993. Its editor in chief was Michael Poxton, EAS Treasurer

from 1990-1992 and President from 1994-1996.

I found the contents table:

- “Constraints and possibilities for developing aquaculture.” - E. Hempel
- “Feeding, growth and environmental requirements of Arctic charr: a review of aquaculture potential.” Malcolm Jobling, Even H. Jørgensen, Einar Ringø.
- “A test of the individual feeding activity and food size preference in rainbow trout using demand feeders.” - Anders Alanärä and Eva Brännäs.
- “A method for the quantification and optimization of hydrodynamics in culture tanks.” - S. J. Cripps and M. G. Poxton.
- “Current forces on, and water flow through and around, floating fish farms.” - Geir Løland.
- “Feeding in darkness eliminates density-dependent growth suppression in Arctic charr.” - Even H. Jørgensen and Malcolm Jobling.

### A changing identity and logo

You may be confused about all these references to EMS and now EAS. When the European Mariculture Society (EMS) was founded in 1976, there was already a World Mariculture Society (WMS) in Baton Rouge in Louisiana, USA that had been established in 1969. It was surely an inspiration for the founding of EMS at that 10<sup>th</sup> European Symposium of Marine Biologists in Oostende in 1975.

But aquaculture was/is not just about mariculture, and the history of freshwater farming in Europe goes back many decades, and even centuries, for pond farming in central and eastern Europe. So the EMS Board changed the name of the European Mariculture Society to the **EUROPEAN AQUACULTURE SOCIETY** in 1984 to better reflect its activities and outreach.

As Harald Rosenthal, EAS President at that time, said “It was not easy to convince the membership to agree to an expansion of the society from a restricted marine focus to a fully European aquaculture focus. This was even more so, since I started the process long before the World Mariculture Society (WMS) did so. In fact they followed our steps and formed (a year later) the World Aquaculture Society (WAS). I feel particularly



From the European Mariculture Society to the European Aquaculture Society, with the EAS logo remade in 2011.



EAS logos for our 20<sup>th</sup>, 40<sup>th</sup> and now 50<sup>th</sup> anniversaries

good that I succeeded to gain sufficient support from the membership before WMS started the same process. At the time we needed 75% positive votes from all members in writing (e-mail messages did not count legally at that time). Also, the mailing systems were slow in several far-distant countries (such as Asia), where we had quite a few members. Finally, we managed to keep the deadline and completed the name change during my presidency.”

You can see above the evolution of the EMS/EAS logos – changed in 1984, but keeping the “map” concept – and then modernised for a fresher look in 2011, and finally with a 20-year version in 1996 in, a 40 year version in 2016 and now a 50-year version in 2026.

## Our events

One of the main ways to bring the objectives of EAS to life is through our meetings. We have always said that EAS “Brings People Together”, and that is basically our motto. Our events have therefore been the lifeblood of EAS and a source of knowledge sharing, networking and new members of the society. It is mainly through the event, that the secretariat operating costs are covered.

In the early days of EMS, networking was only possible by physical meetings, and this was the same for WMS in the USA. So in 1981, the two organisations decided to cooperate to organise the “First Aquaculture World Conference and Trade Show”. It took place in Venice, Italy from September 21-25, 1981, with the theme “Realism in Aquaculture: Achievements, Constraints, Perspectives”. It was a great first event, with attendance of 1,197 from 58 countries.

But for some reason, the next event, starting the series of **AQUACULTURE EUROPE** only took place six years later in 1987. It was held in Amsterdam from June 2-5 and was called “Aquaculture: A Biotechnology in Progress.” I remember it well, as it was my first EAS conference. I had finished my MSc, having done a thesis on the conditioning of broodstock flat oysters (*Ostrea edulis*) with microencapsulated feeds. The idea was to boost the lipid and micronutrient content of the oysters to enable “better” reproductive status and “rich” larvae. I submitted an abstract for a poster presentation but later received a phone call from one of the Programme co-chairs, Niels de Pauw, who asked me to give an oral presentation, as he found the subject to be important. So there I was, a young MSc student giving an oral presentation to shellfish scientists and nutrition experts in a parallel session in Amsterdam. Nervous is not the word.

The Aquaculture Europe events were initially planned to be held every two years, but from 1993, they were held every year. There were many research advances being made and the industry was growing, as hatchery survival, weaning technique and cage management (for marine species) started to give better results. Aquaculture Europe 1989 was held in Bordeaux and AE1991 in Dublin. And I went to Dublin to give a presentation. I also took my fiancé, Sylvie with me. It was six months before we got married so we took some time after the conference to visit Connemara on the west coast. Such fond memories, and although we should have gone back to Ireland (Cork) in 2020, we had to cancel the conference due to Covid. But we will be going back, soon.

Around the end of the 1980s, aquaculture trade fairs were starting to be organised. Possibly the three leaders at that time were Aqua Nor in Trondheim, Norway, Bordeaux Aquaculture in France and the ‘Fiere Verona’, in Italy. So, EAS, with a strong representation of French Board members teamed up with the organisers of Bordeaux Aquaculture to organise the Aquaculture Europe events in 1989 and again in 1994. The focus for those two events was on “Business joins Science” and “Measures for Success: Instrumentation in Aquaculture”. A few years later, EAS would partner with Aqua Nor and with Verona.

In 1993, EAS again teamed up with WAS to organise the World Aquaculture '93 event in Torremolinos, Spain. The Spanish sector was growing fast, with production of various fish, shellfish and crustacean species, so a great host country. The event attracted just over 1,000 participants and was themed “From Discovery to Commercialisation.” The EAS Board at that time was made up of some ‘great names in aquaculture’, including President Bjørn Myrseth, President Elect Michael Poxton, Past President John Joyce, Treasurer Patrick Kestemont and Secretary Marco Bianchini. Other Board members were Malcom Beveridge, Gavin Burnell, Neli Caldentey, Lars André Dahle, Philippe Ferlin, Alan Jones, Patrick Lavens and Marco Saroglia.

I went to Torremolinos and clearly remember the opening addresses from Bjørn Myrseth and from Gustavo Larrazábal. I was in-between jobs at that time, with the feeds part of France Aquaculture (Frippak) having just been sold by Sanofi to the Belgian company INVE. I had an interview with the CEO of EWOS, Spain (Andrés Martin), signed a contract with him and six weeks later, found myself in Valladolid, with the task to build EWOS presence in Greece and the Eastern Mediterranean. So during those 4 days in Torremolinos, I was weaned from larval diets to grow out feeds! And in those EWOS years, I learned very much about the Greek aquaculture industry and its pioneering companies such as Selonda, Galaxidi Marine Farms, Nireus and others. But back to EAS...

In 1995, EAS signed an agreement with the Nor Fishing Foundation to organise Aquaculture Europe every second year with the Aqua Nor exhibition in Trondheim, Norway. Aqua Nor was the place to be for the salmon industry and EAS organised our event at NTNU several days before Aqua Nor started. The agreement lasted until 2013.

I first went to Trondheim in 2001 and went back every second year until our last event there. It was always hectic and always tiring, but so exciting to see the developments and innovation of the Norwegian aquaculture sector. Of course it was



The poster “Venezia '81 for the World Conference on Aquaculture and International Aquaculture Trade Show.



The EMS stand, with Hilde Joncheere.



Memories of the AE2005 Arctic Night in Svalbard - with EAS ladies Sofie Vanroose and Linda Aspeslagh, with Peter Gullestad of the Norwegian Fisheries Directorate and without Polar Bears on the outskirts of Longyearbyen.



The organising committees, EAS Board and National Representatives at the Aquaculture Europe '89 event in Bordeaux.



The handbook of contributions to the EAS Special Workshop on the culture of Sea Bass and Sea bream in Verona in 1996.



The AQUA 2000 Banner



EAS President Bjørn Myrseth opens World Aquaculture '93 in Torremolinos, Spain. Bjørn would become President for a second term in 2016-2018 – the first person to be EAS President twice.



In 1995, EAS signed an agreement with the Nor Fishing Foundation to organise Aquaculture Europe every second year with the Aqua Nor exhibition in Trondheim, Norway. Trondheim Spektrum (photo: Nor Fishing Foundation), with the old and new Aqua Nor logos



Location of the “new format” Aquaculture Europe events since 2008.



A proud moment in 2007. Alistair Lane and Yves Harache meet King Harald V of Norway.

mostly salmon, but big advances were also made in cod research and for other species such as mussels.

I have many memories of those years, but three stand out.

The first was in 2003, when our Aquaculture Europe event took the theme “Beyond Monoculture.” It was the first time that a European conference dived into the concept (at that time) of Integrated Multi-Trophic Aquaculture (IMTA). Of course, Thierry Chopin was there, to tell us all more about the concept – why it makes sense, why it isn’t new, and how it can be a game changer for aquaculture in Europe. And it started the journey – still not finished today – towards integrated farming systems, at sea and on land, that build circularity into their functioning.

The second was in 2005, when we had a memorable “Arctic Night.” After a full Aqua Nor day, about 150 persons met at Trondheim airport at 22:00 for a chartered SAS flight up to Svalbard. We visited the museum, gallery and – about 3:00 in the morning - the famous Longyearbyen pub, with the biggest selection of whisky that I had ever seen. The flight back arrived in Trondheim around 6:30 in the morning, with time for breakfast before another long Aqua Nor day.

And finally, the third was in 2007. Our Aquaculture Europe event that year was held in Istanbul, alongside the Future Fish Eurasia event, but we organised the EAS Aqua Nor Forum in Trondheim. It was a three-session panel discussion on “Welfare as a driver for technological development” and brought together biologists, engineers and welfare advocates. Around 250 persons from 34 countries were present. During the official opening on the trade fair, EAS President Yves Harache and I had the honour and pleasure to meet King Harald V and tell him about EAS and the Forum that we had developed. He was genuinely interested and stayed much longer than planned in front of the EAS stand.

Back to the third of the aquaculture fairs – the one organised in Verona during the 1990s. In 1996, one month after the Aquaculture Europe event in Budapest, EAS organised a special workshop in Verona that was dedicated to “Seabass and Seabream Culture: problems and prospects.” The workshop was attended by a massive 346 participants from 27 countries and is still remembered by many as a “landmark” event for that sector and it received much press attention.

And, to end this section, two other landmarks for our events.



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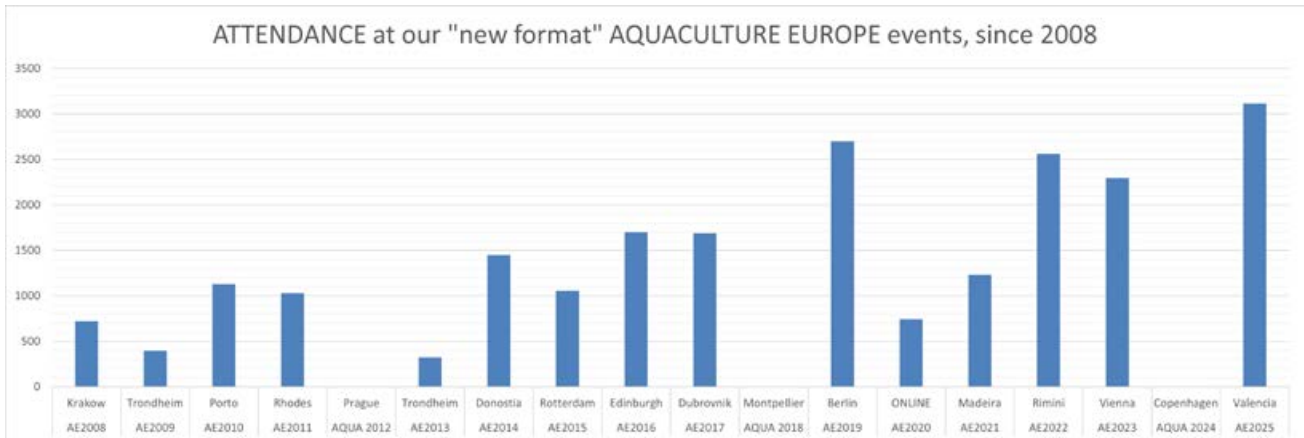
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**Attendance at the “new format” Aquaculture Europe events since 2008. Note that attendance figures for the AQUA events in 2012, 2018 and 2024 have not been included.**

In 2000, just after I joined EAS, we teamed up with the World Aquaculture Society to organise the first (official) **AQUA** event. It was organised in Nice, France, with 1,600 attendees. EAS and WAS made an agreement to organise AQUA in Europe every six years. Since that time, it has shown a positive development, with AQUA events taking place in Florence (2006), Prague (2012), Montpellier (2018) and the highly successful AQUA 2024 in Copenhagen.

In 2008, EAS decided that it should create a **NEW FORMAT Aquaculture Europe** event, where we develop our own trade show and build a unique event that comprises a scientific conference, the trade exhibition, industry forums, workshops, student events and receptions. This obviously required more logistics for the conference programme development and an extended database of potential exhibitors and sponsors. To that end, EAS made an agreement with MF Cooksey (John Cooksey’s company) in 2007, and this partnership has lasted ever since. John Cooksey is the Executive Director of the World Aquaculture Society, and EAS has worked with him and with Mario Stael (MAREVENT) to build a model for EAS and our events, using their experience with WAS and all its Chapter events, but adapting that to meet our needs for conference quality and the best possible networking opportunities for all participants.

The graphic at the top of this page shows the locations of our events since 2008 and their attendance. We have experienced continued growth in attendance, apart from the last of our “Trondheim series” and the “COVID years,” where for the first time in our history, the 2020 event was cancelled and was organised online. Attendance at AE2010 in Porto exceeded 1,000 and AE2019 in Berlin broke the 2,500 barrier. We are therefore confident in our claim that Aquaculture Europe is THE leading European aquaculture event.

## Our projects

It was late 1999, or early 2000 that I got a phone call from Philippe Ferlin. He had handed over the EAS Presidency to our first woman President, Rosa Flos, and he wanted to let me know that the EAS Board had approved the opening of a post for an Executive Director. I had finished my journey with EWOS, having been their General Manager in France since my period in Spain. So I was open for new opportunities and put my candidature forward before being interviewed by Rosa and Gavin Burnell, EAS secretary at that time.

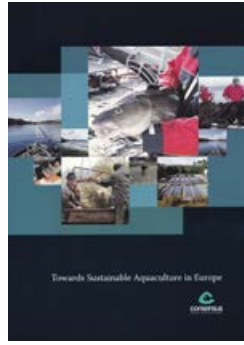
When I joined EAS in March 2000, we had just submitted the final report to the European Commission of our first project, AquaFlow. Coordinated by EAS (who had employed Frederic Luizi as project manager) and in partnership with FEAP, AquaFlow produced one-page summaries of EU research in aquaculture that were then translated into EU languages by our “national representatives” and sent (by fax) to the national producer organisations that were members of FEAP. The idea was to keep producers informed of research findings that could be of relevance to them in their operations.



A wonderful initiative, but the reality was that the final report had just been rejected by DG RTD, so my first job was to make the required corrections so that we could be paid. Talk about “jumping in at the deep end” ! But AquaFlow was refunded – and then refunded again for a third cycle. And in 2004, we employed Els Vanderperren as AquaFlow project assistant.



**Constantin Vamvakas, Head of Aquaculture at DG FISH, oversaw the first European Commission strategy to develop aquaculture. Here presenting during one of the CONSENSUS stakeholder workshops in 2005.**

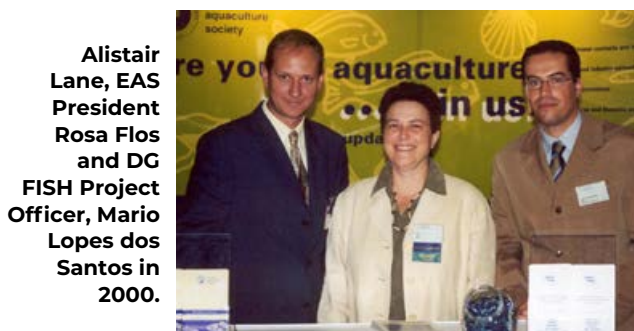


**The CONSENSUS project produced 78 indicators under 6 pillars for sustainable aquaculture practices as the basis for future standards.**



**Alistair Lane presenting the outcomes of our studies for the Fisheries Committee (PECH) of the European Parliament.**

Our strategy for projects was to help in dissemination and communication for projects that could help move forward the sustainable development of the sector. We had projects on food value chains and network dynamics; monitoring, managing and transferring marine and maritime knowledge; recommendations for further development of the EU regulatory framework for organic aquaculture; bridging the gap between science and producers to support the European marine mollusc production sector and international cooperation on sustainable solutions for aquaculture development in South-East Asia. We mostly partnered with FEAP, but also, from 2005, with the European Aquaculture Technology and Innovation Platform (EATiP) and we have continued to work with both since.



**Alistair Lane, EAS President  
Rosa Flos and DG FISH Project Officer, Mario Lopes dos Santos in 2000.**

Our second project was called CONSENSUS. It started in 2005 and defined sustainability indicators for European aquaculture – through stakeholder consensus. EAS employed Joke Charles to assist us on this project, and we formulated 78 indicators for sustainable aquaculture practices that could be a basis for future standards.

In parallel to our projects, EAS was contributing to European aquaculture policy, with the first European Commission Strategy for aquaculture development published in 2002. Under the coordination of Constantin Vamvakas, head of aquaculture in DG FISH (as it was at that time), we started to put aquaculture on the Commission radar.

And later, with co-authors Courtney Hough (FEAP) and John Bostock (Stirling), we published several documents for the Fisheries (PECH) Committee of the European Parliament. In 2009 on the competitiveness of the European aquaculture sector. In the same year, on the impact of “A strategy for the sustainable development of European aquaculture,” and a year later, the FAO Regional Review on Status and Trends in Aquaculture Development in Europe. Our last input to PECH was in 2014, when I presented the outputs to the European Parliament on the long-term economic and environmental impact of an increased European aquaculture sector.

In 2019, EAS employed Ana Visković to help boost our social media presence, to develop the EASstalk webinar and podcast series, to support the growing student group activities and to represent EAS in our projects. Our current project portfolio is made up of the following:

- AWARE - building the first European RAS that uses reclaimed water with zero residues to produce fish and vegetables fit for human consumption.
- IGNITION - creating new knowledge in animal welfare and developing new strategies to improve animal health through non-invasive tools.
- INNOAQUA - demonstrating and mainstreaming of innovative algae-based foods and solutions, and ecology, circularity and digitalization concepts.
- AQUASERV - enhancing, integrating and customising research infrastructure capacities and providing transnational access (on-site or remote) to further scientific advances.

In addition to these, EAS provides expertise in the preparation of Guidance and Background Documents for the EU Aquaculture Assistance Mechanism (AAM) that is supporting Member

States, the aquaculture industry, and other relevant stakeholders, in the implementation of the 2021-2030 Strategic Guidelines for a more sustainable and competitive EU aquaculture.

## Our people

EAS has always been about people, and although this article contains a lot of my personal reflections, this section is dedicated to the EAS staff members over the years, and their roles in helping EAS to fulfil its objectives, through operational management of the secretariat.

It is also dedicated to the EAS Past Presidents, the Bureau and Board members and the National Representatives over the years.

And finally, to those who have had a significant impact on the development of European aquaculture (our EAS Honorary Life Member awardees) and those that have given so much of their energy to EAS (our Distinguished Service awardees).



1978

**Hilde Joncheere – the first EAS staff member and pillar of EAS for close to 30 years**



1984

**Linda Aspeslagh – the “anchor” through most of my time**

2004



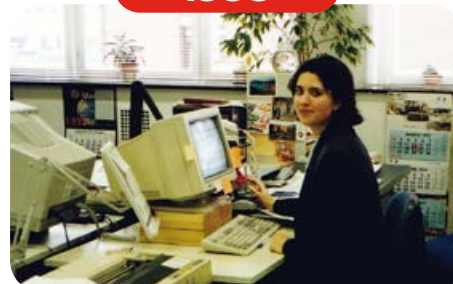
**Our first Project Assistant Els Vanderperrren (left) with Sofie**

1999



**Sofie Vanroose – membership and conferences assistant**

1993



**Karla Scheire – administrative assistant**

2022



**Linda Aspeslagh (centre) with Herve Migaud (EAS President 2020-2022) and Alistair Lane at Linda’s last Aquaculture Europe event before she retired.**

2023



**The current EAS team, with Ilse Craeynest (centre) – creative, efficient and deadly sharp on the numbers – and Ana Visković (right) – social media guru, project and programme manager and student group support.**

2025



**The EAS team at Aquaculture Europe 2025 in Valencia.**

### EAS Past Presidents:

1976-1980 Martin Bilio (Germany)  
1980-1982 Guido Persoone (Belgium)  
1982-1984 Harald Rosenthal (Germany)  
1984-1986 Alan Jones (UK)  
1986-1988 Hans Ackefors (Sweden)  
1988-1990 Jean-Jacques Sabaut (France)  
1990-1992 John Joyce (Ireland)  
1992-1994 Bjørn Myrseth (Norway)  
1994-1996 Michael Poxton (UK)  
1996-1998 Patrick Lavens (Belgium)  
1998-2000 Philippe Ferlin (France)  
2000-2002 Rosa Flos (Spain)  
2002-2004 Michael New (UK)  
2004-2006 Johan Verreth (The Netherlands)  
2006-2008 Laszlo Varadi (Hungary)  
2008-2010 Selina Stead (UK)  
2010-2012 Yves Harache (France)  
2012-2014 Kjell Maroni (Norway)  
2014-2016 Sachi Kaushik (France)  
2016-2018 Bjørn Myrseth (Norway)  
2018-2020 Gavin Burnell (Ireland)  
2020-2022 Herve Migaud (UK)  
2022-2024 Bente Torstensen (Norway)  
2024-2026 Marc Vandeputte (France)

### Awardees

EAS has two awards that it makes to outstanding individuals in the European Aquaculture sector. Honorary Life Membership of EAS is an award given to someone that has made a significant impact on the development of European aquaculture. The EAS award for Distinguished Services is destined for individuals that have devoted very significant effort and time to the development of EAS and its objectives.

### EAS Honorary Life Members:

G. Ravagnan (Italy, since 1981)  
E. Monten (Sweden, since 1987 †)  
Bernard Chevassus-au-Louis (France, since 1989)  
Eric Edwards (UK, since 1991)  
Peter Hjul (UK, since 1993 †)  
Trygve Gjedrem (Norway, since 1995)  
Jean Bally (Martinique, since 1997)  
Colin Nash (USA, since 2000)  
Courtney Hough (UK and Belgium, since 2010)  
Pascal Divanach (Greece, since 2011 †)  
Patrick Sorgeloos (Belgium, since 2012)  
Michael New (UK, since 2014)  
Sachi Kaushik (France, since 2017)  
Stefano Cataudella (Italy, since 2022)  
László Varadi (Hungary, since 2023)  
Bjørn Myrseth (Norway, since 2024)  
Javier Ojeda (Spain, since 2025)

### EAS Award for distinguished services:

Guido Persoone (Belgium) (year unknown)  
Niels De Pauw (Belgium) (year unknown)  
Yves Harache (France) (2014)  
Selina Stead (UK) (2016)  
Margriet Drouillon (Belgium) (2018)  
Gavin Burnell (Ireland) (2021)  
Mariana Ferreira (Portugal) (2024)

## Creating solutions for aquaculture

**Lucta**



**Feeding stimulation**  
through sensory  
and gut sensing

**Improvement of**  
feed efficiency

**Reduction of**  
reliance on marine  
animal ingredients

**Luctarom®**  
**Luctamax®**

## And finally – our students !!

Our students are our lifeblood. Our future. And right from its founding, EAS encouraged student memberships with reduced rates, assistance at our events and other activities directly targeted towards young persons.

But it was only in May 2005, during the AE2005 event in Trondheim, Norway, that the **European Aquaculture Society - Student Group (EAS-SG)** was officially launched. Over the years, it has evolved into one of the leading student organizations in the field of aquaculture. Its mission is simple: To unite students who are passionate about aquaculture and related disciplines.

And since that time, it has developed a core network of National Coordinators (NCs) - motivated students or recent graduates who represent the EAS Student Group in their country. They act as the main link between local students and the wider EAS-SG community, helping to strengthen aquaculture education, research, and networking across Europe and beyond. Becoming a National Coordinator is a rewarding way to contribute to the aquaculture community, develop leadership skills, and support fellow students.



At the end of 2017, the EAS Board changed the byelaws to enable the direct election of a **STUDENT REPRESENTATIVE** to the EAS Board of Directors, and this was first done for the elections of the 2018-2020 Board.

The Student Representative on the EAS Board of Directors serves as the official voice of students within the European Aquaculture Society (EAS) and this role ensures that student perspectives, needs, and ideas are actively considered in discussions and decisions at the highest level of the organisation.

Over recent years, the Student Group has dramatically accelerated in its organisation, management and membership. It has small “task forces” for membership support, content creation, event management and funding and is creating more tools for networking and mutual support. This is linked to the change in 2019, when student membership of the EAS became free of charge and EAS currently has close to 600 student members!



**The Board of the EAS Student Group at Aquaculture Europe 2008.**

### **EAS Student Group Board members and Past Presidents**

From its founding, the EAS student Group had a President and its own management team. That has since evolved – and since 2018, one place on the EAS Board of Directors is allocated to a student. EAS members can therefore directly elect a student to the EAS Board.

#### **EAS\_SG Presidents:**

- 2005-06 Foundation of the EAS SG; Magdolna Trenoszki, Hungary
- 2006-07 no active president
- 2007-08 no active president
- 2008-09 Goncalo Santos, Portugal
- 2009-10 Magdolna Trenoszki, Hungary
- 2010-11 Stefan Meyer, Germany
- 2011-12 Benedikt Frenzl, Austria
- 2012-13 Tsjerk Terpstra, The Netherlands
- 2013-14 Rob van de Ven, The Netherlands
- 2014-15 João Rito, Portugal
- 2015-16 Antonios Chalaris, Greece
- 2016-17 Gala Podgornik, Croatia
- 2017-18 Nuno Leite, Portugal

#### **Student Representatives on the Board of Directors:**

- 2018-20, Kathrin Steinberg, Germany
- 2020-22, Elisavet Syropoulou, Greece
- 2022-24, Mariana Ferreira, Portugal
- 2024-26 Silvia Natale, Italy

Amongst the MANY activities that the SG organises, I want to showcase two:

### **Mentoring**

EAS members have a collective knowledge and expertise that literally spans across thousands of years. Many of our 'senior' members have been pivotal to the growth of aquaculture, leading their respective fields and contributing significantly to scientific advancements.

The impressive student engagement at Aquaculture Europe events underscores the potential for meaningful exchanges between students and seasoned experts. To build on this foundation, EAS launched "Adopt a Student", a mentoring initiative designed to foster informal, impactful connections between students and senior members - not just at events but throughout the year.

### **The Student Spotlight Award**

The European Aquaculture Society (EAS) introduced the Student Spotlight Award in 2019 at the Aquaculture Europe 2019 event in Berlin, Germany. This initiative was designed to recognize and support outstanding student contributions to aquaculture research by awarding the best student abstracts submitted as oral presentations or ePosters for the event.



**The AE2025 Student Spotlight Award finalists on stage after their pitch presentations. From left to right: EAS President 2024-2026 Marc Vandeputte, Alice Gasperini, Carl John Saramines (voted as the 2025 winner), Diogo Amaral and EAS Student Group Board Representative, Silvia Natale.**



**One of our "Adopt a student" pairs, Fernando Afonso and Mairin-Rua Ni Aodha.**

All abstracts submitted by students are carefully reviewed by the EAS Board Members, who select a shortlist of the most promising contributions. The final evaluation is conducted by the Programme Chairs who determine the three finalists. Each finalist receives a €300 award, with the ultimate winner receiving an additional €300 award, totalling €600 for his/her exceptional achievement.

The three finalists are invited to showcase their research during a three-minute pitch presentation at the Opening Plenary session of either the Aquaculture Europe or AQUA event, with the audience voting for the overall winner. This high-profile platform allows students to present their work to an international audience of researchers, industry professionals, and policymakers.

Last year, as part of a communication campaign to boost EAS membership, we solicited "testimonials" from EAS members – Past Presidents and past student group leaders.

I think that a good way to end this article is by simply citing in full the testimonials received from Rob, João, Kathrin and Mariana. They capture very well the essence of EAS and its values.

“Being a part of the European Aquaculture Society has been an incredible experience for me since the start of my career in aquaculture. As the former President of the EAS Student Group, I had the opportunity to build a strong professional network, connect with leading experts, and gain invaluable insights into the aquaculture industry.

The yearly EAS conferences are especially valuable—not only for staying up to date with the latest developments in aquaculture but also for maintaining and strengthening relationships within the community. They are a fantastic mix of professional growth, collaboration, and great fun. The connections I have made through EAS have shaped my career and led to lasting friendships. I highly recommend EAS membership to anyone looking to expand their network and be part of this dynamic community.”

**Rob van de Ven, Managing Director at Landing Aquaculture BV**



**Rob van de Ven, Student Group President 2013-2014.**

“I started my EAS journey in the EAS-SG and it has been a most inspirational and rewarding experience. It is an impressive network of young professionals which provided me with many opportunities to grow personally and professionally and make lifelong friends. I can only recommend to all students (and non-students of course) to get involved and take hold of all the opportunities the EAS offers, within the conferences, but also outside of those. Being part of the EAS has not only enhanced my network and broadened my knowledge significantly, but also taught me how to be a leader and mentor and just keeps me inspired.”

**Kathrin Steinberg, Scientific Coordinator at Aquaculture Welfare Standards Initiative**



**Kathrin Steinberg, EAS Board Student Representative 2018-2020.**



**Mariana Ferreira, EAS Board Student Representative 2022-2024**

“When I joined the aquaculture field in 2019, I had no idea how to navigate it or connect with the right people. Becoming an EAS member changed that. Through its webinars, publications, and conferences, I met experts, made friends, and built a network that has been invaluable for my career. Getting involved as National Coordinator and later Student Representative on the EAS Board of Directors gave me even more opportunities to collaborate and learn from inspiring people. More than just a professional network, EAS became a community where I felt supported and motivated. If you’re looking for guidance, connections, and a place to grow in aquaculture, EAS membership is a must”!

**Mariana Ferreira, Postdoctoral Researcher, Nord University - FBA**

“It would be impossible to talk about my professional career without a big mention of EAS. When I was just trying to discover myself as a young researcher, I attended my 1st EAS conference in Prague back in 2012. The admirable job done by EAS to put all types of professionals around the aquaculture sector talking with each other was what impressed me the most. The following year, I got involved in activities as a student, and the warm welcome by everyone fuelled my motivation. What did I gain with it? Not money. Much more than that. Network, knowledge, mentorship, friends...

We created SEAentia (our company) partially thanks to the influence EAS had on us! And you know what? We survived, and we're thriving! Also, with EAS help. The promotion and contacts Alistair and his team happily have been doing in our favour are priceless!

**João Rito, Founding Partner and General Director, SEAentia**



**João Rito, Student Group President 2014/2015. João Rito, Student Group President 2014-2015.**

I am especially proud of these “stars” and of all the other students since 2005 that have given their time and energy to EAS. I am also immensely humbled by the motivation and dedication of EAS Board members throughout our history, and as we go forward.

I look forward very much to seeing as many EAS members as possible at our AE2026 event in Ljubljana.

## ASC Farm Standard:

### How Does It Turn Commitment into Verifiable Performance?

The **ASC Farm Standard** consolidates the ASC science-based requirements into an integrated and auditable framework for farm certification across species and production systems. It's designed to drive measurable environmental and social outcomes while improving consistency and comparability.

As aquaculture production expands, market access and stakeholder trust increasingly depend on verified performance, not stated commitments. The ASC Farm Standard sets a clear, performance-based benchmark for responsible farming, embedding continuous improvement within certification cycles and assuring it through independent third-party audits.

*“The ASC Farm Standard translates the latest scientific insight and stakeholder consensus into a robust, outcome-oriented framework. It sets ambitious requirements and assures that farms demonstrate measurable performance through credible, independent verification.”*

**Michiel Fransen,**  
Director of Science and Standards, ASC

The standard strengthens requirements for animal health and welfare across the full production cycle, emphasising preventive health management, systematic welfare monitoring and responsible, risk-based veterinary treatments.

Certification is underpinned by the ASC Programme Assurance system, including accredited certification bodies, structured audits, corrective actions and public transparency.

Together, these elements move responsible aquaculture from policy commitment to verifiable evidence, enabling producers to demonstrate compliance, continuous improvement and real-world impact.

**Find out more:**  
[asc-aqua.org/producers/asc-standards/the-asc-farm-standard/](http://asc-aqua.org/producers/asc-standards/the-asc-farm-standard/)



**Setting The Standard for Seafood**

# ADOPT A STUDENT

## mentorship program

A light-commitment mentoring match between aquaculture students and experienced professionals.

### How it works?

After you register as a mentor or mentee, we match participants based on interests, experience, and practical preferences (time zone, language, availability).

Matched pairs agree on their goals and preferred communication style in the first meeting, then connect regularly online (and in person at Aquaculture Europe when possible).

### Benefits

#### For mentors:

- Give back to the aquaculture community
- Stay connected to new ideas & emerging research
- Recognition through EAS channels
- FREE EAS membership while active

#### For mentees:

- Career guidance and sector insight
- Networking and introductions
- Feedback on CVs, abstracts, manuscripts, funding approaches

**You'll agree on goals, meeting frequency, and how you'll communicate in the first meeting.**



Máirín-Rua Ní Aodha & Fernando Afonso



Julian Zwarg & Gavin Burnell



**Aerial view of the Fonda Fish Farm.**  
 Photo courtesy of Borut Furlan

# Aquaculture in Slovenia

As the aquaculture community prepares to attend the Aquaculture Europe 2026 event in Ljubljana this September, this article presents the status of aquaculture in Slovenia, with an overview of cultivated species, production methodologies, challenges and opportunities, as well as the strategic objectives established by the Slovenian government in line with those of the European Union.



Slovenia is known for its natural beauty and rich cultural heritage, but its coastline is very short - just 47 Km. Marine capture fisheries is therefore low at about 150 tonnes per year, as is the inland capture fisheries, with some 70 tonnes of carp and 22 tonnes of rainbow trout fished each year. Only 90 people were directly engaged in marine fishing in 2021. Aquaculture is also a small sector, but a relatively dynamic one, providing an additional 190 jobs.

In 2024, exports of fish and fishery products by Slovenia were valued at approximately €102 million, with the bulk of exports going to Croatia. In the same year, imports of fish and fishery products were worth €240 million, making Slovenia a net importer of fishery products. The 2019 average per capita consumption was estimated at 13 kg, slightly below the consumption of neighbouring countries such as Croatia and Italy.

## Aquaculture in Slovenia

Key figures (Source: EUMOFA 2024/2025)



### Sector value and volume

€5.8 million  
value

1,640 tonnes  
2022 volume

#### 64% freshwater

Rainbow trout (*Oncorhynchus mykiss*)  
Brown trout (*Salmo trutta*)  
Common carp (*Cyprinus carpio*)  
Freshwater catfish (*Clarias gariepinus*)

#### 36% marine waters

European seabass (*Dicentrarchus labrax*)  
Gilthead seabream (*Sparus aurata*)  
Mediterranean mussel (*Mytilus galloprovincialis*)  
Warty venus (*Venus verrucosa*)

### Production systems



### Consumption

2022 per capita  
**11.17 kg**  
fishery & aquaculture products

Change vs 2021  
**-5%**  
variation in consumption (2022/2021)

Source: EUMOFA (2024/2025), Consumption data: 2022.

## Freshwater aquaculture in Slovenia

Slovenia has abundant water resources which support about 100 active fish farming facilities, where farmers cultivate different species of fish. More than 90 species of fish live in Slovenian rivers and lakes, of which 33 species are permanently protected. Native fish species predominate, which is why Slovenia is also considered an excellent fishing tourist destination.

About 1,100 tonnes of freshwater fish are produced annually and about 150 people are active in the freshwater aquaculture sector. Most facilities are engaged in cold-water, flow through production of rainbow trout. And just a few in warm-water and/or RAS systems. One company is working in aquaponics. Fisheries associations are responsible for management in fishing districts on the basis of the Freshwater Fisheries Act. These bodies are also engaged in the breeding of fish for angling purposes. Slovenian fishing districts are extremely popular among tourists because of their unspoilt nature and the rich fisheries resources, for example the Soča River with the marble trout.

Most enterprises are micro or small enterprises, and for many, aquaculture is a secondary activity. With a few exceptions, all producers sell on the local market. For reasons of economic sustainability,

Photos courtesy of the Food and Fisheries Directorate of the Slovenian Ministry of Agriculture, Forestry and Food



Hand feeding trout.



Sampling trout.



Trout farm in beautiful Slovenian scenery.

producers often seek added value through processing, offers for tourists, and recreational fishing, among other activities.

Local production has the added advantage of being very fresh and is of high quality, so consumers can safely make the most of the well documented benefits of fish consumption. Smaller fish farms mainly sell fish on the local market, while larger ones also sell to wholesalers and to other EU countries. The most important species by volume are rainbow trout and brown trout, both of which are known for their taste and nutritional value. Most Slovenian

fish farming facilities cultivate trout from juveniles to market size. Fry are purchased from specialised fish farmers who maintain broodstock for egg production.

But some farmers produce other species of fish, including marble trout, brook trout, huchen, grayling, and African catfish. Carp is also popular in Slovenia and is prepared in many ways. It is considered the most important farmed fish in warm, lowland ponds, where it is grown in polyculture with other species including pike, a favourite among sports fishers.

### Marine production – fish and shellfish

Slovenia has one marine farm where gilt-head seabream and European seabass are reared. The Fonda fish farm is located in Piran Bay on the southernmost point of the Slovenian sea, and is characterised by clean, deep water and strong water currents. The Fonda Fish Garden, established in 2003, is located in the Sečovlje Salina national reserve in an ecologically typical coastal area of the Piran Bay. From the outset, the company's commitment to quality, sustainability, competitiveness, and animal welfare has been unwavering. With careful management of fish farming, adherence to industry best practices and strict traceability, the company consistently produces high value and tasty products. The Piran seabass and seabream grown by Fonda are sought after both by local chefs and prestigious restaurants. Key factors contributing to this success include careful selection of juveniles, high-quality feed, manual feeding, and slow growth.

Fonda is also the pioneer of a unique educational tourism programme that has brought the company numerous awards and the prestigious title "Single Experiences of Slovenia". The programme invites lovers of nature, sea, fish, and food to explore the unspoilt marine environment.

In the Slovenian sea, bivalve molluscs are also grown in different areas. The most commonly cultivated species is Mediterranean mussel (*Mytilus galloprovincialis*) and, in smaller quantities, the warty venus clam (*Venus verrucosa*), and in recent times, experimental breeding of oysters (*Ostrea edulis*) has also taken place. Over the past few years, shellfish farmers have been facing a decline in production due to climate change and other predators. For this reason, new areas for the cultivation of marine organisms have been added, in line with the Maritime Spatial Plan, and it is anticipated that the production of bivalve molluscs will rise again to the previous level.

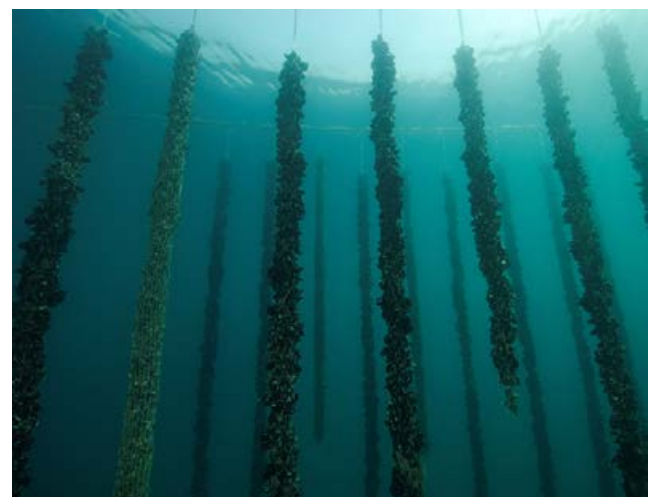


**Hand feeding sea bream cages.**

*Photo courtesy of Arne Hodalič*



**A long-line Mediterranean mussel farm.** *Photo above and below courtesy of the Food and Fisheries Directorate of the Slovenian Ministry of Agriculture, Forestry and Food*



**A long-line Mediterranean mussel farm.**

Challenges	Opportunities
Low productivity and poor capital strength of the sector.	Raising consumer awareness of the benefits of home-grown food.
Harmonised spatial planning - including space for (shellfish) aquaculture activities.	Ensure further development and promote greater competitiveness of the aquaculture sector.
Climate change, environmental performance and biodiversity considerations.	The introduction of environmentally friendly forms of aquaculture based on the environmental acceptability of this economic activity.
Information and traceability of aquaculture products.	Ensuring quality, healthy and fresh products, mainly from domestic production, by ensuring traceability.
Optimising and shortening administrative procedures.	Digitalisation to shorten the authorisation procedures for aquaculture.

### Challenges and opportunities

While Slovenia has aquaculture that provides a fresh, local supply of different species of high quality fish, fish consumption per capita is only about half of the EU average of 24 kg.

The coastline is very small, and the fish resources in the Adriatic Sea are generally overexploited, and under stringent quota systems applied by the EU and by GFCM. Marine aquaculture is performing quite well, but there are physical limits to expansion. The biggest opportunity is in the freshwater fish farming sector, but the products are generally less well received by consumers that prefer marine species.

Production from the domestic aquaculture industry can meet any increase in per capita fish consumption in an environmentally friendly way. Aquaculture also offers undiscovered opportunities for tourism development. Fish farming facilities can attract tourists who want to learn about traditional fishing methods and taste local fish. One of the tourist attractions is commercial ponds or the possibility of preparing fish at the fish farm facility itself. Another possibility is to stock ponds with fish that are dedicated to anglers and sports fishers. Organising sport fishing competitions could help diversifying income sources. In other parts of Europe fish farmers offer bird and animal watching, restaurants and even overnight stays. This could be a model for Slovenia.



**Coastal fisheries.** Photos courtesy of the Food and Fisheries Directorate of the Slovenian Ministry of Agriculture, Forestry and Food



**Fonda Bass (top) and Fonda Bream.**  
*Photos courtesy of Janez Pukšič and Gorazd Šinik*

## Government and non-government sector policies and development strategies

Effective fisheries policies and measures help ensure sustainable and competitive fisheries that will sustain the balance between available resources and the environment and increase the competitiveness of Slovenian aquaculture on national and European markets. To increase the competitiveness of the processing industry, the focus is on the exploitation of niche markets and innovative technologies, coupled with raising awareness about the health benefits of fish consumption with a view to promoting fisheries' products. Slovenian fisheries policy also aims to ensure adequate working conditions and safety of fishermen, enhance the development of coastal fishing areas, and seek synergies between fisheries and tourism, cultural heritage and tradition. In the field of freshwater fisheries, the policies aim to ensure sustainable management of fisheries resources in inland waterways, in particular the preservation and protection of fish stocks and the provision of recreational fishing.

The green transition of the sector has a prominent place in the programme and investments will

support shift to lower-carbon fuels and low-impact fishing techniques and gears as well as modernising fishing ports and developing circular economy to give value to seafood waste. Funding will be provided also for research and innovation into green technologies as well as activities to improve conservation status of biodiversity and habitats. Organic aquaculture, algae, recirculating systems and aquaculture providing environmental services will be supported too.

The digital transition of the Slovenian fisheries, aquaculture and processing sectors will be achieved via a wide range of innovative solutions from means of control and collection of fisheries data to new IT technologies applied to aquaculture and processing. It will lead to enhanced and modernised data management and fisheries monitoring technology, electronic traceability, use of new digital tools and improved digital skills of workers.

The financial support will also help manage and extend marine protected areas and collect marine litter. The programme will reinforce the environmental actions undertaken under the Slovenian prioritised action framework for Natura 2000: monitoring of marine and maritime habitats and species and promotion of scientific knowledge, in line with the EU's Birds and Habitats Directives.

## The European Maritime, Fisheries and Aquaculture Fund (EMFAF)

Slovenia receives EUR 24 million from the EMFAF 2021–2027, of which EUR 10.5 million is earmarked for investments in promotion, innovation, processing, and research in aquaculture. The investments are intended to modernise fish farming facilities to make them more climate friendly.

EMFAF allows for diversification and therefore also investments in on-farm activities that are complementary to aquaculture. It supports the transition to organic breeding. A key challenge in cold-water fish-farming establishments will be to ensure an adequate yet ecologically acceptable flow rate: by improving the quality of water (using aerators, nanobubbles, etc.), aquaculture farmers will be better prepared for longer periods of drought caused by climate change.

In addition, the construction of new, sustainable, facilities such as closed RAS systems is promoted in conjunction with investments in energy efficiency, algae-based technologies for wastewater treatment, and biomass production for animal nutrition, pharmaceuticals, cosmetics, and organic fertilisers.

Photos: Food and Fisheries Directorate of the Slovenian Ministry of Agriculture, Forestry and Food



All this will contribute to meeting the objectives of the Circular Economy Action Plan under the European Green Deal. The fund will also support digitalisation and robotisation (e.g. for storage and on-line monitoring) and encourages investments in aquaponics and algae cultivation.

Micro SMEs have simplified access to funding - for example, without having to submit a business plan - and are encouraged to introduce technological solutions to make better use of natural resources, improve their own products, and sell directly to the final consumer. These fish farming facilities have a lower production intensity, but at the local level they constitute an important source of good quality food. Through simplifications of this kind the EMFAF will contribute to a clearer, less onerous, more transparent, and more flexible administrative framework, which are also among the key priorities of the Strategic Guidelines for EU Aquaculture.

The EMFAF programme benefits from a good cooperation between the European Commission, national managing authority and local partners.

### Institutional and legal framework

The Fisheries sector is under the Ministry of Agriculture, Forestry and Food, whose main responsibilities are drawing up fishery policy and legislation; developing the fishery sector; management of Slovenian inland water fishery resources; and relations with the EU under the CFP and the European Fisheries Fund for the sustainable development of fisheries, aquaculture, processing, and marketing of fishery and aquaculture products.

The Marine Fisheries Act (ZMR-2) of 2005 provides for the management, conservation and exploitation of fishery resources and transposes the contents of the Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora. The stated purpose of this Act is to implement European Community policy in the field of fisheries. Fish is declared to be a natural resource under special national protection in accordance with national and

Community rules. The Act regulates commercial fishing, non-commercial fishing and recreational fishing which may be carried out after obtaining valid fishing licences by the Minister responsible for marine fishing. The text further specifies prohibitions and requirements concerning commercial and non-commercial fishing, and recreational fishing.

The Freshwater Fishery Act also of 2005, which is composed of 19 Sections, lays down provisions governing management of freshwater fisheries and fishery resources in inland waters. The main objectives of this Act are: (1) integrated planning and management of fish in the territorial areas; (2) facilitate the sustainable use of fish and fishing ethics; (3) planning, promotion and control of breeding of fish for restocking waters. The objectives of this Act also refer to: (1) conservation and protection of natural populations of fish, diversity of their species, age structure and abundance; (2) protection of endangered fish species and their communities; (3) preventing the introduction of alien fish species in inland waters and their dissemination; (4) protection and conservation of salmonid and cyprinid waters. Management of fisheries includes planning, implementation of measures to maintain the favourable state of fish, the sustainable use of fish, keeping prescribed records and reporting, professional training on fishing, implementation of supervisory duties of fishery services, implementation of tasks and activities relating to fish deaths and others. The sustainable use of fish allows natural self-regeneration and long-term maintenance of fish without deterioration of the situation of plant and animal species.

At the regional level, Slovenia is a member of the General Fisheries Commission for the Mediterranean is (GFCM).

### In conclusion...

Slovenian aquaculture has a lot of potential for growth. There is a particular opportunity for organic farming in warm water facilities. Today, Slovenian fish farming is based primarily on flow-through fish farming systems. Output from such farms depends on the quantity of permitted water abstraction from the watercourse. The primary objective of Slovenian aquaculture is to fulfil domestic demand for fish. This is becoming difficult to accommodate due to increasingly stringent environmental measures, frequent periods of drought or exceptional flooding, and the use of traditional flow-through breeding systems of limited capacity. Aquaculture farmers are forced to look for new technologies and to make improvements to existing facilities to achieve greater production capacity.

In addition to the fact that Slovenian fish farming facilities provide quality and tasty fish, they also play an important role in the conservation of natural resources. It is therefore important that consumers support local aquaculture and choose fish that are produced in a sustainable way. To this end, a campaign to raise public awareness of the benefits of consuming local fish and shellfish is being carried out with the help of European funds (EMFF and EMFAF).

**And we look forward to welcoming you at Aquaculture Europe 2026!**



This article is based on an article written by Mr. Borut Kosi of the Ministry of Agriculture, Forestry and Food, Slovenia for EUROFUSH and on country profiles from FAO and the EU Aquaculture Assistance Mechanism, with the following references:

“Slovenian fish and shellfish breeding is environmentally sensitive.” Borut Kosi, Fisheries Division, Food and Fisheries Directorate, Ministry of Agriculture, Forestry and Food, Slovenia. February 15, 2024. [eurofish.dk/magazine-issues/em-1-2024](https://eurofish.dk/magazine-issues/em-1-2024)

The EU Aquaculture Assistance Mechanism, Country Information, Slovenia. [aquaculture.ec.europa.eu/country-information/slovenia](https://aquaculture.ec.europa.eu/country-information/slovenia)

FAO. 2026. Fishery and Aquaculture Country Profiles. Slovenia, 2025. Country Profile Fact Sheets. In: Fisheries and Aquaculture. Updated Jan 2, 2026. [www.fao.org/fishery/en/facp/SVN?lang=en](http://www.fao.org/fishery/en/facp/SVN?lang=en)

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# 20 Years of Student Voice in Aquaculture: Highlights from 2025

WRITTEN BY EAS-SG CONTENT CREATION TEAM:

**ALEKSANDRA DOBRIČIĆ, PHD CANDIDATE, UNIVERSITY OF BELGRADE, SERBIA**

**TOMÁŠ PĚNKA, POSTDOC RESEARCHER, FROV JU, CZECHIA**

The year 2025 marked a defining milestone for the EAS Student Group: our 20th anniversary. Two decades of growth, collaboration, and dedication culminated in a record-breaking achievement - the highest number of student members in our history. This success reflects the tireless efforts of our teams, who have taken on everything from organizing activities and welcoming new members to producing promotional materials, securing sponsors, and ensuring that the student voice remains strong within the European Aquaculture Society. We are especially proud to have closed this landmark year with the support of two valued sponsors: SPAROS (Portugal), MATIS (Iceland), and to have started the year by welcoming a new sponsor, Biochem (Germany).



The **EAS Student Group Summer Workshop 2025** marked the first in-person event of the year and was hosted by the University of Bologna, Department of Veterinary Medical Sciences, Italy, with the support of the group's sponsors, SPAROS and MATIS, as well as local sponsors including the University of Bologna and SERINAR. The workshop took place in Cesenatico, Emilia-Romagna, Italy, from August 3 to 8. The event brought together young professionals, researchers, and students for a week of technical sessions, field excursions, and collaborative group work, all aimed at fostering knowledge exchange and strengthening a dynamic community focused on the future of European aquaculture.

12 participants representing more than eight European countries and a wide range of backgrounds, including Master's and Ph.D. students and early-career scientists took part in the workshop. Each attendee contributed unique research interests, regional perspectives, and professional aspirations, creating a rich and collaborative atmosphere. The opening ceremony was held at the University Centre for Blue Growth in Cesenatico and featured a panel of speakers who set an inspiring tone for the week. *Full Professor and Director of the Department of Veterinary Medical Sciences*, Pier Paolo Gatta, welcomed participants on behalf of the University of Bologna, highlighting the importance of youth-driven innovation and cross-border collaboration. *Full Professor and EAS Board Member Alessio Bonaldo* spoke about the growing relevance of integrated and ecosystem-based approaches in aquaculture science. *Silvia Natale, a PhD candidate, and Student Representative on the EAS Board of Directors*, presented the mission of the Student Group and its role in connecting students across Europe.

These opening remarks laid the foundation for a week of teamwork and creative thinking, with the shared goal of developing meaningful initiatives for students who strongly believe in the future of this sector. Throughout the group work sessions, participants also took part in several field visits. One of the highlights was a visit to a traditional "Valle", a lagoon-based aquaculture system practiced for centuries along the Italian coast. This experience offered an in-depth look at artisanal fish farming, where ecological cycles, cultural practices, and historical land use intersect. Participants explored



**Participants of the EAS Student Group Summer Workshop 2025.**

how seasonal rhythms, bird migrations, and salinity variations are integrated into low-impact production systems that support biodiversity, local heritage, and cultural traditions. The visit sparked valuable discussions on how traditional and modern aquaculture systems can complement each other, particularly in the context of sustainability and climate resilience.

Another key visit was to the facilities of the Blue Growth Centre in Cesenatico, an aquaculture research facility led by Alessio Bonaldo. Students toured experimental setups, including recirculating aquaculture systems (RAS) for feed trials, water quality monitoring technologies, behavioural analysis tools, hatchery units for marine and freshwater species, and laboratories dedicated to gene expression and enzyme activity studies. They engaged with researchers and technicians, explored potential internship and collaboration opportunities, and reflected on how academic research can directly improve farm performance and environmental sustainability. Participants also had the opportunity to visit the new facility currently under construction, which will include three recirculating systems with up to 21 tanks dedicated to nutrition trials, along with separate units for reproduction and fish pathology.

Throughout the week, the workshop strongly emphasized student-led engagement and collaborative learning. National Coordinators (NCs) played a central role in facilitating discussions, organizing activities, and fostering an inclusive environment. Informal sessions enabled NCs to exchange ideas on outreach strategies, student



**Participants visiting traditional “Valle”.**

involvement, and the future direction of the group, including ways to support researchers in underfunded regions, increase aquaculture’s visibility among younger generations, and strengthen connections between academia and industry.

The EAS Student Group extends its heartfelt thanks to the University of Bologna, the European Aquaculture Society, and all local partners in Emilia-Romagna who made the event possible. Special appreciation goes to Prof. Pier Paolo Gatta, Prof. Alessio Bonaldo, and the dedicated staff and volunteers who supported the logistics, field visits, and educational activities throughout the week.

If you missed our daily vlogs from the Summer Workshop, you can watch them by clicking on the links below.

**Day 1 - link to [https://youtu.be/S3\\_5vPVITy4](https://youtu.be/S3_5vPVITy4)**

**Day 2 - link to <https://youtu.be/DgLTQw54rcI>**

**Day 3 - link to <https://youtu.be/yEB3EiiADYg>**

## Student engagement before and during Aquaculture Europe 2025

In preparation for the Aquaculture Europe 2025 conference, the EAS Student Group made every effort to organise dedicated workshops to help students feel fully prepared and confident. Two outstanding pre-conference webinars were delivered with this goal in mind. The first, "[How to Communicate Science in Aquaculture](#)", was hosted by Joana Branco, *Science Crunchers*. The webinar focused on effective science communication strategies, providing students with practical tools to clearly and engagingly present their research and was followed by a hands-on practical session during the conference itself. The second event was the "[Author Workshop](#)", led by Judith Terpos, *Springer Nature*. This session offered valuable insights into the academic publishing process, guiding students on how to structure a manuscript, navigate peer review, and enhance the visibility and impact of their research.

Later in September, attention shifted to the year's most important gathering: Aquaculture Europe 2025 (AE 2025), held from 22 to 25 September in Valencia, Spain, at the modern and spacious Palacio de Congresos de Valencia. Organized by the European Aquaculture Society (EAS), the conference brought together more than three thousand participants, including more than 380 students, from nearly 100 countries, highlighting the growing global importance of aquaculture research, technology, and policy. The overarching theme, "Aquaculture for everyone", was reflected both in the scientific programme and in efforts to make the event accessible to students and early-career researchers.

Scientific sessions covered the full spectrum of aquaculture topics, ranging from recirculating aquaculture systems to fish nutrition, genetics, biotechnology, welfare, and environmental management. Students were integrated into the program not only as observers but also as presenters, with many contributing oral talks and e-posters. The conference also had a remarkable balance between academic content and industry presence. A large trade exhibition, which was fully booked months before the event, showcased the newest technologies in feeding, water treatment, monitoring systems, breeding, and fish health. For



**Meet N' Eat "ASC & Me: Let's Talk Impact", with Kathrin Steinberg, Ola Luthman and students.**

students, this created an opportunity to understand the direct applications of academic research. Conversations with company representatives often revealed potential internship opportunities, job openings, and collaborations, adding a career-development dimension that goes beyond a traditional scientific conference.

Throughout the conference, students actively planned and delivered a series of dedicated activities for their peers, further strengthening engagement within the student community.

On Monday, 22 September, the Science Crunchers Workshop, led by Miguel Leal, *Science Crunchers*, took place as a practical continuation of the earlier webinar on science communication. The session provided participants with hands-on training and essential skills to communicate their research clearly, confidently, and effectively, completing a valuable learning journey from theory to practice.

Every day of the conference, the Student Group organised the popular Meet N' Eat initiative, designed to foster networking in an informal and welcoming setting. Participants could book a seat at pre-reserved thematic tables in nearby restaurants, connecting over lunch with peers working on similar research areas. The discussion tables covered key aquaculture topics, including nutrition, engineering,

sustainability, reproduction, welfare, and non-vertebrate species.

A distinctive element of the initiative was the “Science Blind Date” format, designed especially for students who were new to the discipline or attending the conference on their own. The idea was to help them avoid dining alone and instead foster connections with other researchers in an informal, friendly setting. The EAS Student Group managed all the reservation logistics, while participants paid for their own meals.

This year, Meet N’ Eat opened with a special edition organised in collaboration with the Aquaculture Stewardship Council (ASC) under the title “ASC & Me: Let’s Talk Impact”, featuring Kathrin Steinberg and Ola Luthman. The session created an open space for discussion on sustainability, certification, and measurable impact in aquaculture, offering students the opportunity to engage directly with sector representatives and gain first-hand insights into the industry.

After a full day of sessions at AE 2025, students gathered at El Camarote & The Roof for an evening designed to shift from conference mode to connection mode. The reception offered a relaxed

setting where conversations could continue beyond lecture halls and poster areas. With music in the background and refreshing drinks in hand, participants had the opportunity to meet fellow students from different universities and countries, exchange experiences, and expand their professional network in an informal atmosphere. The fun activities helped break the ice, making it easy for first time attendees to feel welcome and included.

Events like this highlight the importance of creating spaces where young professionals can connect more personally, build friendships, and strengthen the sense of community within the aquaculture field.

During Plenary 1 at AE 2025 in Valencia, the EAS Student Group presented a special anniversary video celebrating 20 years of growth, collaboration, and student engagement in aquaculture. The video, created by National Coordinators from across Europe, highlights their experiences and the strong community that continues to expand each year.

Featured students included Silvia Natale, Tamás Bartucz, Matthew Mainieri, Laura Ostolaza Perez Cruz, Marica Andersson, Vasiliki Papadimitriou,



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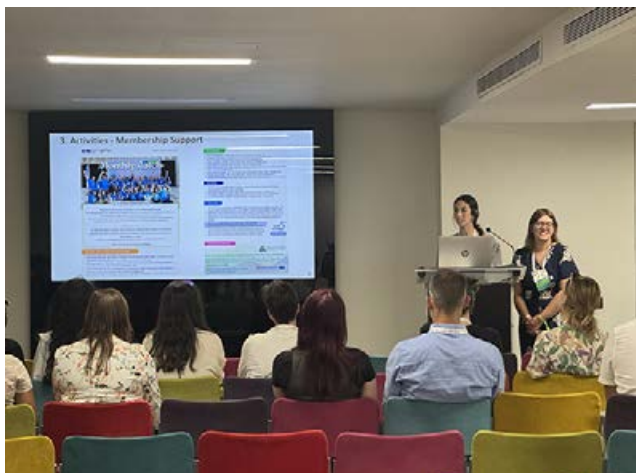
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[The anniversary video can be viewed here: \[ https://youtu.be/tg0jxoQzrOg \]](https://youtu.be/tg0jxoQzrOg)



**Silvia Natale and Adriana Oliveira at the EAS-SG Student Workshop.**

As part of the Aquaculture Europe 2025 Conference, the EAS Student Workshop provided a unique platform for students to directly engage with leading companies in the aquaculture sector. This initiative aims to foster collaboration between academia and industry, encouraging students to explore real-world applications of scientific knowledge and better understand the professional landscape of aquaculture.

The session began with a brief presentation by the EAS Student Group, delivered by Silvia Natale, *Student Representative of the EAS Board of Directors*, with the support of Adriana Oliveira, *assistant coordinator/ National Coordinator for Portugal*, highlighting the group's continuous growth over the years and its mission to support students across Europe. The presentation aimed to inform participants about ongoing initiatives, opportunities, and activities, while also encouraging students from different countries to join the network and become actively involved in the EAS community.

Following this introduction, three companies: LaMotte Europe, SPAROS, and MATIS, which shared their expertise through presentations and interactive discussions. Each company offered a different perspective on innovation in aquaculture, providing students with valuable insights into industrial practices, research applications, and technological advancements.

## LaMotte Europe

LaMotte Europe, a recognised leader in water analysis for over a century, presented its innovative solutions for aquaculture and environmental water quality monitoring. Through the introduction of the SpinTouch® Fx photometer, Tim Schofield demonstrated how technological innovation can ensure accuracy, simplicity, and reliability in multi parameter water testing. The presentation emphasised the company's commitment to supporting sustainable aquaculture operations through precise and user friendly analytical tools designed for both professional and educational use.

## SPAROS

SPAROS representatives Ana Nobre and Andreia Raposo introduced the FEEDNETICS Virtual Nutrition Lab, a digital platform designed to support innovation and learning in fish nutrition and aquafeed formulation. The company demonstrated how virtual tools can be integrated into academic and research environments to enhance understanding of sustainability and feed optimisation in aquaculture. SPAROS's participation reinforced the importance of digitalisation and data driven approaches as key enablers for future advancements in the aquaculture sector.

## MATIS

MATIS is an Icelandic R&D company specialised in food and biotechnology. Wolfgang Koppe and David Sutter presented its activities and research focused on sustainable aquaculture practices. Through its Aquaculture Research Station, MARS, MATIS conducts pioneering work to improve feed efficiency, enhance fish health, and reduce environmental impacts such as nutrient discharge. The presentation highlighted MATIS's role in promoting responsible and environmentally conscious aquaculture through applied research and innovation.

## Connecting Students and Industry

The EAS Student Workshop aims to strengthen the link between students and the aquaculture industry, fostering direct interaction, collaboration, and mutual learning. By engaging with companies like LaMotteEurope, SPAROS, and MATIS, students gain valuable insights into real-world industrial challenges and technological innovation. These connections not only broaden students' professional understanding but also create future opportunities for internships, research collaborations, and career development within the aquaculture sector.

The EAS Student Workshop aims to strengthen the link between students and the aquaculture industry, fostering direct interaction, collaboration, and mutual learning. By engaging with companies such as LaMotte Europe, SPAROS, and MATIS, students gain valuable insight into real world industrial challenges and technological innovation. These connections broaden their professional perspective and open pathways for internships, research collaborations, and long term career development within the aquaculture sector.



**Student winners with Silvia Natale, Adriana Oliveira, Ana Nobre, and Andreia Raposo.**

Beyond industry engagement, the workshop also addressed practical aspects of student mobility and conference participation, including the possibility of future student travel grants. For many young researchers, financial barriers can limit involvement in international events. This discussion was therefore particularly appreciated and demonstrated EAS's continued commitment to supporting the next generation of aquaculture professionals.

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## AWARDS

Beyond networking and professional development activities, Aquaculture Europe 2025 also celebrated academic excellence and student achievement through several prestigious recognitions and awards.

### Travel Grants

Each year, the EAS Student Group Travel Grant recognises and supports exceptional international students attending Aquaculture Europe. The travel grant aims to encourage participation, foster networking, and give visibility to outstanding young researchers in our community.

For 2025, applicants submitted their conference abstracts along with a motivational letter. After a careful selection process, three students were awarded the EAS Student Group Travel Grant, receiving €250 each:

- Yoon-Ji Lee – *Jeju National University, Republic of Korea*, with an abstract entitled: “Role of Interleukin-6 in Edwardsiella piscicida Infection Revealed Through CRISPR/Cas9 Gene Editing in Zebrafish”
- Manojkumar Chandraprakasham – *University of Tasmania, Australia*, with an abstract entitled: “Quantitative Proteomic Analysis of Atlantic Salmon *Salmo salar* Brain Regions, Head Kidney, and Spleen in Response to Elevated Water Temperature”
- Brenda Maria Alho – *Federal University of Pará (UFPA), Brazil*, with an abstract entitled: “Electrocardiographic Assessment of Anaesthesia in Juvenile Tambaqui *Colossoma macropomum* Using Menthol”

A short recognition ceremony was held during Plenary 2, where Martin Føre, *Programme Chair*, and Silvia Natale, *Student Representative on the EAS Board of Directors*, presented the certificates to the winners.

### The Ibrahim Okumus Award

The Ibrahim Okumus Award (EAS Student Group) was presented to Esther Hoyo Alvarez, *IMEDEA-CSIC, Spain* for her poster entitled “Cardiac Responses, Activity, and Oxygen Consumption of European seabass Subjected to Stress Challenges,” presented during the Welfare session. The



**Martin Føre, Brenda Maria Alho, Yoon-Ji Lee, Manojkumar Chandraprakasham, Silvia Natale (from left to right).**

award was introduced by Silvia Natale, *Student Representative on the EAS Board of Directors*.

### Student Spotlight Award

The Student Spotlight Award, celebrates the outstanding research and talent of the next generation of aquaculture professionals. For AE2025, a total of 163 student abstracts were received by the 1 May deadline. Following a rigorous pre-selection by the EAS Board of Directors, the *AE2025 Programme Co-Chairs*, Diego Mendiola and Martin Føre, selected three finalists to present their work live in the plenary session:

- Alice Gasperini, *Institute of Aquaculture Torre de la Sal (CSIC), Spain*. With an abstract entitled “Decoding Biological Ageing to Enhance Welfare in Farmed Sea Bream: A Transcriptional and Epigenetic Approach”
- Diogo Amaral, *CIIMAR, Portugal*. With an abstract entitled “Circular Production of Mealworm (*Tenebrio molitor*) Meal: Effects on Bioactive Properties and Implications for Rainbow Trout (*Oncorhynchus mykiss*) Immune and Oxidative Status”
- Carl John Saromines, *IRTA, Spain*. With an abstract entitled “Mushroom Meal as an Alternative Aquafeed Protein Ingredient: Impact on Growth Performance and Gut Microbiome of Rainbow Trout (*Oncorhynchus mykiss*)”

The session was hosted by Silvia Natale, *Student Representative on the EAS Board of Directors*, and the award was presented by Marc Vandeputte, *President of EAS*. Out of an estimated 700 attendees in the plenary, the audience voted Carl John



**Carl John Saromines receiving his award from Marc Vandeputte (left), and the finalists with Marc Vandeputte and Silvia Natale (right).**

Saromines as the winner of the Student Spotlight Award 2025, receiving an additional €300 prize. A special mention goes to Alice Gasperini, not only for her excellent research but also for being the youngest finalist at just 21 years old.

Beyond the scientific programme, the EAS-SG event team created a Virtual Walking Tour of Valencia, allowing participants to explore the historic streets and iconic landmarks at their own pace through a self-guided route accessible via Google Maps.

Community spirit was further reflected at the EAS and EAS-SG booth, where limited edition t-shirts and stickers were completely sold out. These items are exclusively available during EAS events and will return at Aquaculture Europe 2026 in Ljubljana, Slovenia.



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The events that marked 2025 reflected the same core strengths of the Student Group: creating spaces where students can learn, connect, and take the lead. Whether in smaller workshop settings or at one of Europe's largest conferences, both occasions combined professional development with peer-to-peer exchange, showing how student-led initiatives and international collaboration can shape the future of aquaculture. This shared spirit of engagement and collaboration defined 2025 as a milestone year and set the stage for the Student Group's continued growth.

As we reflect on this anniversary year, it is clear that the EAS Student Group has become more than just a network - it is a community built on shared passion, collaboration, and resilience. The journey from its founding to today has been shaped by countless contributions, both big and small, from students across Europe. Today, the Student Group counts 34 National Coordinators representing 21 European countries, with 12 countries represented by two National Coordinators and 9 by one, demonstrating the expanding reach and structure of our network.

If your country of origin, or the country where you are currently studying, is not yet represented, we warmly encourage you to get in touch with us at [eassg@aquaeas.eu](mailto:eassg@aquaeas.eu) and become part of this growing community.

Alongside this growing representation, the EAS Student Group has developed several concrete tools to support students and early career professionals. One key initiative is *The Monthly Catch*, which began as a student led idea to share opportunities exclusively within the student community. Compiled by the EAS Student Group, this monthly PDF provides a curated overview of job offers, internships, open calls, and PhD and Postdoctoral positions in aquaculture. EAS members are invited to contribute opportunities, with Institutional and Corporate members especially encouraged to use this channel to reach young professionals. EAS members also have access to a dedicated database containing the latest editions. In February 2025, the EAS Board formally recognised the impact of this initiative by adopting *The Monthly Catch* as an

## EAS Student Group National Coordinators 2025/2026

\*The EAS-SG has 34 National Coordinators

representing 21 European countries:

- 12 of which with two NCs
- 9 with one NC

Countries still without NCs!



\*Records January 2026

**Geographical distribution of National Coordinators across Europe.**

5



**National Coordinators at Aquaculture Europe 2025.**

official EAS publication, marking a major milestone in the evolution of the Student Group.

In parallel, the EAS-SG Membership Support Team continues to maintain and regularly update the [interactive Map of Aquaculture Universities and Research Centres](#), available exclusively to registered EAS members. This resource supports students, early career professionals, and researchers in navigating the European aquaculture education and research landscape by highlighting universities, research institutes, and specialised centres actively engaged in aquaculture teaching, research, and innovation. For many students, it serves as a practical tool when exploring study programmes, internships, thesis placements, PhD opportunities, mobility grants, and research collaborations, while strengthening networking and informed decision making across the community.

AE 2025 was not only the last major activity of the year but also a celebration of how far we have come

together over the past **20 years**, and a reminder that the next chapter will be shaped by a new generation ready to lead, innovate, and strengthen aquaculture across Europe and beyond.

## Sponsorship Update

Looking ahead to 2026, the EAS Student Group will unfortunately be saying goodbye to one of our valued sponsors, MATIS, who will no longer be able to continue their sponsorship due to the closure of the MARS (MATIS Aquaculture Research Station). We are deeply grateful for their support over the past year. Their sponsorship enabled us to organise numerous activities, strengthen student engagement, and provide financial support that directly benefited our student community. We sincerely thank MATIS for their commitment and contribution to the development of young aquaculture professionals.

At the same time, we would like to express our sincere appreciation to SPAROS for their continuous support over the past 11 years. Their long-standing commitment to the EAS Student Group has played a key role in helping us grow, maintain our activities, and consistently support aquaculture students

across Europe and beyond. We are truly grateful for their trust and dedication to empowering the next generation of aquaculture professionals.

We are also pleased to welcome Biochem as a Classic Sponsor starting in January 2026. Biochem is a family-owned animal nutrition company based in Germany, focused on developing high-quality feed additives and dietary solutions. With a strong foundation in animal health and nutrition, Biochem supports aquaculture by providing nutritional solutions that improve feed efficiency, promote gut and immune health, and enhance overall fish welfare. Their products and expertise can be applied across multiple aquaculture species, combining scientific innovation with practical solutions for sustainable and productive aquaculture systems.

For more information about Biochem, please visit: [www.biochem.net/en/about-us](http://www.biochem.net/en/about-us)

We warmly invite other organisations interested in supporting the next generation of aquaculture professionals to explore our sponsorship opportunities. The sponsorship overview is available at:

[www.aquaeas.eu/sponsor-us](http://www.aquaeas.eu/sponsor-us)

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co-operatives and salmon operations. Along the way, students will engage directly with farmers, innovators, investors and regulators, while also experiencing Connemara through shared meals, fireside discussions and coastal immersion activities.

Working in interdisciplinary teams, students will identify real market challenges and develop innovative aquaculture solutions. Supported by expert mentors, they will build value propositions, explore business models and refine their ideas into investor-style pitches presented at the programme finale.

By the end of the Aquahack, participants will leave with new sector insight, innovation skills, industry connections and formal recognition of their participation.

To further strengthen engagement, innovation, and real world exposure among aquaculture students, the EAS Student Group proudly supports this initiative as one of the first major activities of 2026. The programme reflects a shared commitment to bridging academic research and industry practice, empowering students to transform knowledge into real world impact.

### Who should apply?

Postgraduate students studying aquaculture, marine science, biotechnology, sustainability or related disciplines, particularly those curious about innovation, entrepreneurship and real-world impact. No prior business experience is required.

### Practical details

**Dates: 18–21 May 2026**

**Location:** Carna, Co. Galway (Residential)  
Flights to Ireland and travel to Galway city is self-funded; all accommodation, meals, bus transfer from Galway city to Carna and local programme costs in Connemara are covered.

### How to apply

Submit an online application here **Ireland's Edge - Aquahack** ([forms.gle/1urzftxDfssp5Qai7](https://forms.gle/1urzftxDfssp5Qai7)) alongside a short video introduction.

**Shortlisted candidates will be invited to interview, with 10 participants selected for the 2026 cohort.**

**Deadline for applications 31 March 2026**



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# Strengthening women’s leadership and investment readiness in Mediterranean and Black Sea aquaculture

Women aquaculture professionals from eight Mediterranean and Black Sea countries completed an advanced training programme aimed at strengthening their leadership and investment readiness within a rapidly evolving aquatic food sector.



The 2026 edition of the Women in Aquaculture training series was hosted in İzmir, Türkiye on 19–21 January. The programme combined technical site visits with peer exchange and expert input, enabling participants to analyse different operational and business models and to better understand how investment, innovation and sustainability interact in practice.

The programme focused on investment readiness, targeting women active across aquaculture value chains who are seeking to scale operations, improve financial viability, and navigate increasingly complex production and regulatory environments. Participants included aquaculture entrepreneurs, farm and hatchery managers, operations and production managers, processors, researchers and public sector professionals, reflecting the diversity of women-led roles across the region.

By the end of the programme, participants reported increased confidence in evaluating investment opportunities, a clearer understanding of how technical and operational choices affect financial viability and the identification of concrete next steps for business development and collaboration. Participants highlighted the value of hands-on site visits, which helped translate theory into practical experience and showcased the diversity of roles and career paths within the aquaculture sector. Participants also noted that the opportunity to directly observe and sample products during the visits helped demonstrate the high-quality taste and presentation standards achieved by women-led processing companies, reinforcing the importance of value addition and market positioning.

“Seeing different companies and women-led businesses first-hand made the training especially meaningful,” noted one participant. “The training was a truly valuable and inspiring experience, both professionally and personally,” said another. “Sharing experiences and perspectives with other women in the aquaculture sector created an empowering environment and strong collective energy.”

Beyond individual skills development, the programme strengthened peer exchange among women professionals from across the Mediterranean and Black Sea region, supporting the development of networks for continued collaboration.

## Turning regional collaboration into practical training outcomes

This workshop, organized by the [General Fisheries Commission for the Mediterranean](#) of the United Nations, in partnership with the Federation of European Aquaculture Producers (FEAP), with the involvement of FEAP member Aegean Exporters’ Associations and with the support of the European Union, is part of an ongoing series of training series, with previous editions held in Tunisia, Greece and Spain.

“This training goes beyond technical skills. It reflects the commitment of GFCM Members and partners -particularly FEAP- not only to recognize the role of women in aquaculture, but also to turn this commitment into concrete actions that strengthen their contribution to the blue economy,” said **Houssam Hamza, GFCM Aquaculture Officer.**



The series aims to strengthen technical skills, facilitate the exchange of knowledge and experience, and build a professional network among women active in Mediterranean and Black Sea aquatic food systems. This network-building dynamic contributed to the creation of the Network of Women in Aquaculture, an initiative dedicated to promoting gender equality and inclusivity across the global aquaculture sector.



## Why this matters for the region

Aquatic food systems in the Mediterranean and the Black Sea produce more than 2 million tonnes of food annually, generating USD 21.5 billion and supporting 1.17 million jobs along the value chain. Aquaculture relies on over 35 000 enterprises, most of them small- and medium-sized, and accounts for more than 45 percent of total aquatic food production in the region.

Women represent 29 percent of jobs across fisheries and aquaculture value chains. At the same time, aquaculture is expected to play an increasingly central role in meeting future food demand, with regional production needing to grow by 14–29 percent by 2050 to keep pace with population growth.

In this context, strengthening women's leadership and investment readiness is increasingly recognized as critical for improving sector resilience, supporting sustainable growth, and ensuring that small- and medium-sized enterprises can adapt to challenges linked to climate change, disease, evolving technologies and regulatory complexity.

The United Nations declared 2026 the **International Year of the Woman Farmer** (IYWF 2026). The Year will spotlight the essential roles women play across agrifood systems, from production to trade, while often going unrecognized. Women farmers are central to food security, nutrition and economic resilience. The International Year of the Woman Farmer will raise awareness and promote actions to close the gender gaps and improve women's livelihoods worldwide.



INTERNATIONAL YEAR OF THE  
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# Sustainable aquaculture in action: production, science and policy working together in the Mediterranean and the Black Sea

Over 130 persons gathered in Athens, Greece, and online for the FEAP–GFCM Technical Consultation on Sustainable Aquaculture Practices, highlighting the importance of structured producer engagement in regional aquaculture governance.

The two-day event, jointly organized by the Federation of European Aquaculture Producers and the General Fisheries Commission for the Mediterranean (GFCM) of the Food and Agriculture Organization of the United Nations (FAO), with financial support from the European Union, brought together producers, national authorities, experts from the GFCM Technical Advisory Groups (TAG) and Aquaculture Demonstration Centres, researchers and sector associations from across the Mediterranean and Black Sea region. The active participation of national authorities and the Hellenic Aquaculture Producers Organization further strengthened the practical focus of the discussions.



**From left to right: From FEAP – Javier Ojeda, Catherine Pons, Szilvia Mihalfy, Lara Barazi (FEAP President). From GFCM – Houssam Hamza, Roberto Emma, Giorgos Paximadi**

With projections indicating that fisheries and aquaculture production will need to increase by 14 to 29 percent by 2050 to meet future demand, sustainable aquaculture development is increasingly recognized as a central component of food security, economic resilience and FAO's Blue Transformation vision.

## A strategic pillar of regional food security

Aquaculture continues to consolidate its role in Mediterranean and Black Sea aquatic food systems. According to The State of Mediterranean and Black Sea Fisheries 2025, total aquaculture production in 2023 reached 2.97 million tonnes, generating approximately USD 9.3 billion. Marine and brackish water aquaculture accounted for 940 000 tonnes, representing more than 45 percent of total aquatic food production in the region.

## Regulatory clarity as a condition for sustainable investment

During the consultation, participants examined governance frameworks and responsible investment conditions needed to ensure balanced growth. Discussions underscored the importance of aligning environmental, social and governance principles with commercial viability and long-term planning.

Licensing complexity and administrative fragmentation were identified as structural

challenges in several countries. Participants highlighted the need for clearer procedures, improved interinstitutional coordination and predictable timelines. The digitalization of administrative processes and the establishment of transparent spatial planning frameworks were presented as practical solutions to reduce bottlenecks and enhance investor confidence.

*“Sustainable growth depends not only on innovation, but on regulatory clarity and predictable frameworks,”* noted Philippos Papageorgiou, TAG leader on Governance and Responsible Investment.

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## Science-based spatial planning and measurable environmental performance

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Marine spatial planning and allocated zones for aquaculture were considered as key tools for balancing environmental protection with sustainable production. Participants emphasized that monitoring frameworks must be science-based, proportionate and harmonized, enabling operators to demonstrate compliance while avoiding unnecessary duplication.

The consultation also explored restorative and resource-efficient aquaculture systems, including integrated multitrophic aquaculture, recirculating aquaculture systems and bivalve production. These models were discussed in the context of ecosystem services, nutrient management and climate adaptation. Participants also underscored the importance of measurable indicators and economic feasibility when considering scaling up opportunities.

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## Health management and climate adaptation as core operational priorities

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Aquatic animal health and welfare were central themes throughout the two-day consultation. Experts and producers exchanged experiences on pathogen management, vaccination strategies, zoning approaches and antimicrobial resistance.

Rising sea temperatures, extreme weather events and shifting disease patterns were recognized as increasing risks to farm-level stability. Participants



**During the consultation presentations.**

underlined the urgency of strengthened biosecurity protocols, early-warning systems and regional coordination mechanisms to mitigate transboundary threats.

*“Climate change is already shaping operational decisions. Adaptation is no longer optional; it is integral to farm management,”* observed Alessio Bonaldo, TAG leader on Innovation and Technology, Professor at Bologna University.

Climate-smart aquaculture practices, improved monitoring tools and enhanced data sharing were identified as essential components of resilience.

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## Efficiency gains across the value chain to reduce losses and strengthen competitiveness

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Improving competitiveness through greater value chain efficiency was another key topic of discussion. Participants reviewed pre-harvest losses, processing inefficiencies and market-related constraints affecting producers across the region.

Building on FAO methodologies, upcoming pilot surveys will assess loss points along the aquaculture chain, with the objective of translating findings into targeted technical recommendations. Reducing food loss was framed not only as a sustainability measure but also as an economic opportunity to enhance profitability and resource efficiency.

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## Digital transformation and artificial intelligence as emerging growth drivers

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Innovation and digital transformation featured prominently in the discussions, including a dedicated exchange on the responsible use of artificial intelligence in aquaculture operations.

Participants explored measurable value creation through precision feeding, biomass estimation, water quality monitoring, predictive maintenance and climate forecasting. At the beginning of the session, approximately one-third of participants indicated they were already using artificial intelligence tools in their operations; by the end, nearly all expressed interest in wider implementation.

Successful digital uptake, however, will require targeted training, accessible investment instruments and practical demonstration environments, particularly for small- and medium-sized enterprises.

## From consultation to policy guidance

The consolidated outputs of the technical consultation will be submitted to the GFCM Committee on Aquaculture and, subsequently, the annual session of the GFCM, for further consideration. *“By reinforcing direct interactions between the Technical Advisory Groups and*

*producers, the discussions strengthened a producer-driven approach to sustainable aquaculture development in the Mediterranean and the Black Sea,”* stated Houssam Hamza, GFCM Aquaculture Officer.

Javier Ojeda, Secretary General of FEAP also stressed that *“Sustainable growth of aquaculture depends not only on innovation, but on regulatory clarity and predictable frameworks. FEAP welcomes the opportunity to work with the GFCM and national authorities to streamline regulatory frameworks and create investment conditions that reward responsible aquaculture undertakings.”*

Through continued cooperation among producers, national administrations and regional institutions, the sector is advancing towards a more resilient, efficient and sustainable future, in line with the objectives of the GFCM 2030 Strategy and FAO’s Blue Transformation vision.

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## About the cooperation between FEAP and GFCM

FEAP actively supports the GFCM 2030 Strategy for sustainable fisheries and aquaculture by promoting and implementing its key components within the European aquaculture sector. FEAP helps disseminate and apply the GFCM's guidelines to strengthen sustainability and resilience in aquaculture. It also co-organises capacity-building events and experience-exchange initiatives with GFCM members and stakeholders, including programmes to empower women's leadership in sustainable aquaculture, thereby contributing directly to the Strategy's objectives for sustainable growth, stakeholder participation, and knowledge sharing across the Mediterranean and Black Sea region. [feap.info/feap-activities-supporting-the-gfcm-2030-strategy](https://feap.info/feap-activities-supporting-the-gfcm-2030-strategy)

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# FROM PRODUCING MORE TO PRODUCING BETTER

## Patrick Kestemont on four decades of European aquaculture



**A**s Professor Patrick Kestemont of the University of Namur prepares to close his distinguished academic career, he remains as deeply engaged with aquaculture science as ever. Known internationally for his work in fish physiology, toxicology, reproduction, and larviculture, he has long combined fundamental research with applied objectives relevant to the industry.

We spoke with him about the evolution of aquaculture in Europe, the shifting role of science in the sector, and his vision for the upcoming “Fish Physiology in Support to a Sustainable Aquaculture” conference, to be held in Namur in July 2026.

**Q: Patrick, when you look back over your career, how would you describe the evolution of aquaculture in Europe?**

When I started in the late 1980s, European aquaculture was still a young and relatively small industry. At that time, trout and carp dominated freshwater production, while marine aquaculture of sea bass and sea bream was only beginning. The focus was almost entirely technical: how to reproduce species in captivity, raise larvae successfully, and produce more fish faster. Since then, the priorities have changed profoundly. We have moved from producing more fish to producing better fish. Better in terms of quality, nutritional value, animal welfare, and sustainability. Issues such as environmental impact, the use of fishmeal and fish oil, and alternatives to antibiotics have gradually come to the forefront. Aquaculture today is no longer only about yield, but about ethics, environmental responsibility, and consumer trust.

**Q: That shift from quantity to quality has been transformative. But has European aquaculture reached the ambitions that researchers once had for it?**

Not really – at least not in terms of growth. European aquaculture has remained quite stable for years. There are many reasons for that, but one is certainly the strict regulatory and environmental framework we have chosen, which reflects our ethical standards but also limits economic competitiveness. Producers here must comply with welfare rules, environmental constraints, and high labour costs, while competitors in tropical countries can produce at lower prices with fewer restrictions. So Europe cannot and should not aim to compete on volume. Instead, we should focus on quality, regional products, and niche markets – producing species that are locally valued, with high welfare and environmental standards. That is where European aquaculture can truly excel.

**Q: You’ve worked extensively abroad as well, particularly in Asia. How does Europe’s model of aquaculture compare with that of developing regions such as Vietnam?**

In developing countries such as Vietnam, now classified as a middle income country, where I’ve worked for many years, aquaculture is a central part of people’s lives. Production is enormous, often using simple but effective technologies. Welfare is not a primary concern – the focus is on feeding people and generating income. In Europe, it’s the opposite: we are guided by ethical, environmental, and consumer considerations. Both approaches are legitimate, but they operate in different contexts.

The challenge is to find a balance: how to maintain Europe's high standards while still contributing meaningfully to global food security. Aquaculture is a global industry, what happens in the Mekong Delta or in Norway affects European markets immediately.

**Q: Despite Belgium's modest aquaculture production, its scientific community is remarkably strong. How did this concentration of expertise develop?**

Belgium has a long and interesting history in aquaculture research. Flemish scientists such as Patrick Sorgeloos pioneered work on Artemia and marine larviculture, while French-speaking universities developed expertise through historical ties with Africa – especially in tilapia and African catfish culture. Many Belgian experts also worked for FAO and brought that experience home.

So, although Belgium never developed a large aquaculture industry, it became a hub for scientific innovation and training. In some ways, this separation from industry allowed Belgian researchers to pursue both fundamental and applied questions with a high degree of independence.

**Q: You've witnessed the field evolve for nearly four decades. Has the role of scientists within aquaculture changed over that time?**

In the 1990s, researchers were very much at the forefront of innovation – proposing new species, technologies, and solutions that helped shape the industry. Today, the dynamic has shifted. Research is often more reactive: industry defines the problems, and scientists are asked to solve them. That's not necessarily negative, but it does



mean we have to work harder to keep creativity and long-term thinking alive. I have always tried to balance fundamental research – the physiological mechanisms – with applied projects that serve practical needs. The link between the two remains essential if we want science to stay relevant for this industry.

**Q: Physiology has been central to your own career. In your view, which areas of fish physiology are shaping aquaculture today?**

Physiology has been at the heart of aquaculture from the very beginning. It includes reproduction, nutrition, welfare, and stress. Today, I find the study of the microbiota and its interaction with immunity particularly fascinating. Understanding how gut and skin microbial communities affect fish health could help us replace antibiotics with more natural immunostimulant strategies. Another promising direction is the study of domestication mechanisms. With French colleagues, including Pascal Fontaine, I'm investigating how traits evolve across generations in captive fish – not just through genetic selection, but through physiological and behavioural adaptation. Such knowledge could help us develop new species better suited to future farming conditions, including those affected by climate change.

**Q: Climate change and sustainability now dominate the discussion. How do these global changes influence aquaculture research and practice?**

Climate change is already altering temperature and salinity patterns in both freshwater and marine systems. For instance, in Vietnam, rising salinity in the Mekong Delta is threatening the traditional farming of Pangasius, a strictly freshwater species. We are now searching for alternative catfish species that can tolerate brackish water. In Europe,



warming rivers may make trout farming impossible in many regions within a few decades. These are not theoretical problems – they are happening now. Physiology again becomes crucial, because it helps us understand how fish cope with stress and adapt to new environments.

**Q: That brings us to your upcoming conference in Namur. What inspired you to create Fish Physiology in Support to a Sustainable Aquaculture, and what do you hope it will achieve?**

This conference is intended as a meeting point for all the disciplines that contribute to fish physiology: reproduction, nutrition, immunology, welfare, stress, genetics, and more. These communities often meet separately, but rarely together. Our goal is to bring them into one room to look at physiology as a whole, and to discuss how it can support a more sustainable aquaculture sector. We will have keynote lectures from leading experts worldwide, offering both retrospective and forward-looking perspectives. For me personally, this event represents both a scientific milestone and a symbolic way to close my academic career – by connecting people and ideas that have shaped the field over decades.

**Q: Finally, as someone who has trained many students and young researchers, what message would you like to share with the next generation of aquaculture scientists?**

Be curious and open-minded. Do excellent fundamental work, but never lose contact with reality – with the farmers, the companies, and the people who apply what we discover. Build networks early, travel, and collaborate, because aquaculture is a global science whose progress depends on dialogue between research and practice. And above all, remember that fish physiology is not an old discipline; it remains the backbone of sustainable aquaculture, since everything ultimately depends on how fish function, grow, reproduce, and adapt. I also believe that meetings like the upcoming conference in Namur offer a valuable opportunity for young scientists to begin those connections — to meet colleagues from different backgrounds, exchange perspectives, and see how physiology unites the many strands of modern aquaculture research.

**Interview conducted by Daniel Źarski and Damien Toner for the European Aquaculture Society.**



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# aquacultuR

## A step towards more standardization in aquaculture research and production

**ANIL AXEL TELLBÜSCHER<sup>1</sup>, SIMÃO CORREIA<sup>2</sup>,  
MADHAV KARTHIKEYAN<sup>3</sup>, TOMÁŠ PĚNKA<sup>4</sup>,  
DAVIDE A. MACHADO E SILVA<sup>5</sup>**



**Recently, an R package named aquacultuR has been published on CRAN, the Central R Network Repository. The package can be used for data analysis in an aquaculture context and is a collaborative initiative of young members of the European Aquaculture Society. We invite you to discuss with us and join the developer community!**

### What's wrong with our metrics?

Metrics such as the Specific Growth Rate (SGR), Feed Conversion Ratio (FCR), Feed Conversion Efficiency (FCE), and Apparent Digestibility Coefficients (ADC) have been used for decades by both scientists and fish farmers to make the growth of fish or performance of feeds easily comparable. The FCE, for instance, has been mentioned already in the 1940s in a study on the husbandry of bulls (Grings, 1993). Interestingly, and despite their generalised use, many of the fundamental zootechnical metrics lack uniformity in the way they are calculated, interpreted and reported.

Let us use the FCR as an example: The FCR describes the feed demand per unit of bodyweight gain of an animal - simple at first glance. However, a fish nutritionist will likely be interested in comparing the FCR based on the true feed intake between groups, which is the amount of feed fed, corrected for feed losses and the dry matter content of the feed. This FCR was termed as the biological FCR (bFCR). A farm operator, meanwhile, will not receive a refund for uneaten feed that ends up on the bottom of a fjord or fishpond, or in his drum filter. The same is true for feed batches with slightly lower dry matter content. What is relevant in such a context is the total feed quantity given, regardless of whether it is eaten or lost. This FCR has thus been named the economic FCR (eFCR), because it reflects the circumstances in a production environment (Glencross et al., 2024). The slight but important difference between these two metrics is that we can expect  $eFCR > bFCR$  under all circumstances, because satiation feeding is difficult to achieve and a feed will never have a dry matter content of 100% at farm gate.

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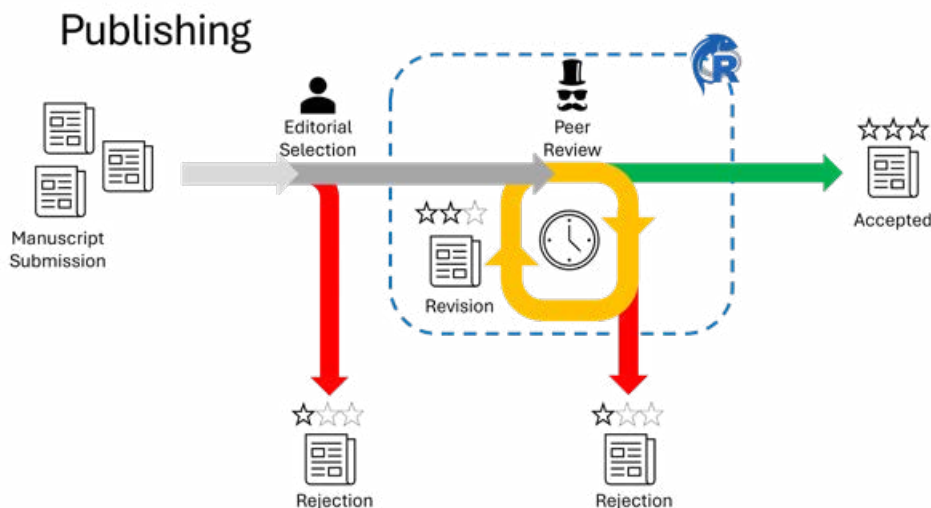
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<sup>3</sup>University of Crete, Greece

<sup>4</sup>University of South Bohemia in České Budějovice, FFPW USB, CENAKVA, Institute of Aquaculture and Protection of Waters, Zátíší 728/II, 389 01 Vodňany, Czech Republic

<sup>5</sup>CESAM (Centre for Environmental and Marine Studies), Aveiro, Portugal

**Figure 1: Peer review and possible pitfalls. Once a manuscript enters peer review, incorrect formulae might lead to rejection or necessary revisions. Besides the additional time demand, re-calculations during revision stage might turn significant into non-significant results. Using a software solution can help to avoid such issues and facilitate reviewing (blue box).**



The FCR is also a good example of difficulties in the interpretability of the metrics we use. Recently, a humorous article in *misPeces* described that an  $FCR < 1$  led to some disbelief among Spanish aquaculture farmers who did not want to believe that fish can circumvent the principle of mass conservation (Guelfo, 2026). Indeed, it might not appear immediately plausible why to relate feed dry matter with biomass in the form of wet weight. There is thus the need to address the peculiarities of such seemingly simple metrics. If this example is not convincing, we encourage you sit down and reason about the various ways for calculating the relative growth rate.

### Facilitating academic publishing

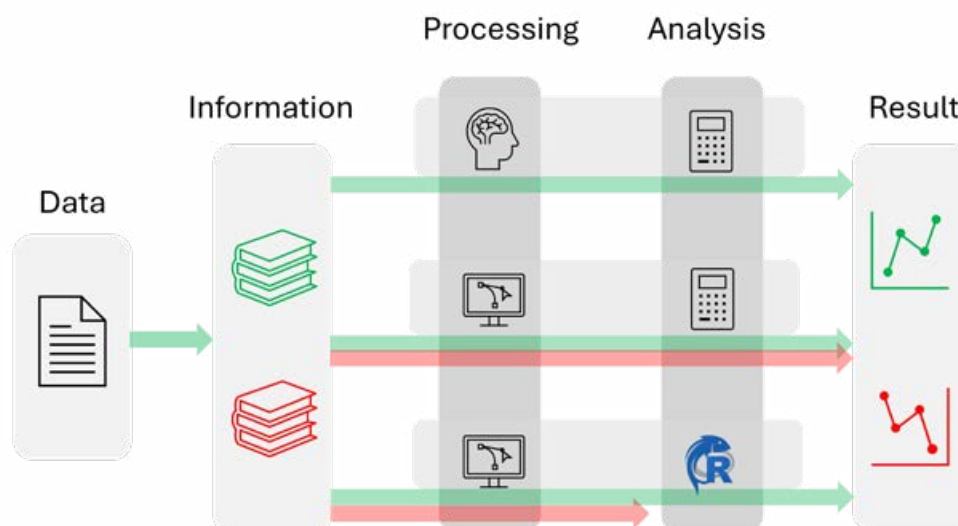
The problems with our seemingly simple metrics found their way into academic publishing as well. There were, of course, attempts to approach the topic scientifically, by summarising existing metrics (Lugert et al., 2016), clarify misconceptions (Jobling, 2003; Glencross et al., 2024) and address errors in deriving, applying, or interpreting them (Bureau and Hua, 2006; Crane et al., 2019). However, the number of manuscripts sent out for peer review and containing mistakes is still considerable. While these issues are usually invisible, they have practical consequences for the peer reviewing process because reviewers need to spend time to verify formulae. Meanwhile, it is generally accepted not to describe the underlying equations of statistical tests as these are usually included into software. Authors, in turn, may then need to revise large parts of their results, figures and tables if it turns out that they made a mistake (Fig. 1). Re-analysing data might,

in extreme cases, make effects initially reported as significant become non-significant. Do we really want to rewrite an entire research article because we calculated the SGR with the wrong logarithm? A “seal of correctness” in form of a software function that ensures correctness and reproducibility of the calculations could thus be of immense help.

### Constraining AI

The nowadays ubiquitous and sometimes perhaps too carefree use of Artificial Intelligence (AI) in scientific writing does not solve but rather exacerbates the problem. Large Language Models (LLMs) do not truly understand their input data and can therefore not distinguish between correct and incorrect. Incorrect equations might thus be used by the LLM to calculate those metrics that are also easy to confuse for humans. If there are two versions of the same thing, AI might use both interchangeably. These issues can be tackled by a) clearly documenting the existing equations for those people who prefer to do the maths on their own and b) creating a set of software functions in a programming language that is frequently used for data analysis. Such a digital toolbox can simplify any manual data analysis workflow just as the “Trendline” function in Microsoft Excel does. However, the far more important argument in favour of a software solution is that artificial intelligence is ultimately also based on existing program code and functions implemented in programming languages. Such software packages can also provide constraints, “handcuffing” AI to the correct way of calculating the desired output (Fig. 2).

**Figure 2: Manual and AI-assisted data analysis process. Manual data analysis includes performing calculations after cross-checking with available information and reasoning. Nowadays, data analysis tasks are increasingly performed using AI. Software packages that deliver routines (functions) for the calculations in demand can efficiently constrain AI and ensure correct results.**



### An R package as first step towards unambiguity

In response to the depicted issues, *aquacultuR*, an R package with functions to calculate the most commonly used metrics in aquaculture, has been created. The package is now available via the [Comprehensive R Archive Network \(CRAN\)](https://cran.r-project.org/) and can thus be installed like any other R package via R or RStudio. Currently implemented are functions related to growth, feed conversion, nutrient use efficiency, and feed digestibility. All metrics are fully documented, and a formulary has been added to provide additional background information.

Choosing R as a programming language is based on the fact that it is the most popular software for statistical data analysis, has a huge community of developers and contributors, and is widely used within the scientific community. There are, however, also other reasons to focus on R instead of other Open-Source alternatives such as Python. From a technical viewpoint, the major advantage of R is that packages are managed in a centralised manner through CRAN. CRAN is known for its rigorous standards regarding code documentation

and the required and enforced technical quality of packages that are published. While, for instance, Python offers the Python Package Index (PyPI), this package repository is less strictly curated. Issues with package dependencies and cross-compatibility are thus, unfortunately, much more common.

The development version of *aquacultuR* is hosted on [GitHub](https://github.com/), which is a collaborative platform that offers the possibility to contribute to the package by writing code. Additionally, it is possible to report issues, make suggestions (e.g., new functions or features), or start a discussion thread. GitHub can thus be used much like a forum after an account has been created.

We hope that the aquaculture community will make frequent use and, more importantly, engage in discussions and contribute actively to the improvement of this new resource. We are open for feedback and any kind of input, either via the GitHub [Issue Tracker](https://github.com/aquacultuR/aquacultuR/issues), the [Discussion Forum](https://github.com/aquacultuR/aquacultuR/discussions), or via [E-Mail](mailto:info@aquacultuR.com). We would also like to thank the European Aquaculture Society for the opportunity to popularise this initiative.

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# Bridging the gaps in EU aquaculture: Building resilience in Manila clam farming



Climate change is reshaping European aquaculture at an unprecedented pace. Marine heatwaves are increasing in frequency and intensity, and rising temperatures favour the emergence and spread of pathogens. For bivalve farming systems, where animals are entirely at the mercy of surrounding environmental conditions, these pressures can rapidly translate into mortality events and production instability.

Unlike finfish aquaculture, shellfish farming offers limited opportunities for intervention once stress and disease events occur. Consequently, improving the resilience and adaptive capacity of farmed bivalve stocks through selective breeding is increasingly viewed as a strategic priority for sustainable production. However, the implementation of structured breeding programmes in European clam aquaculture has

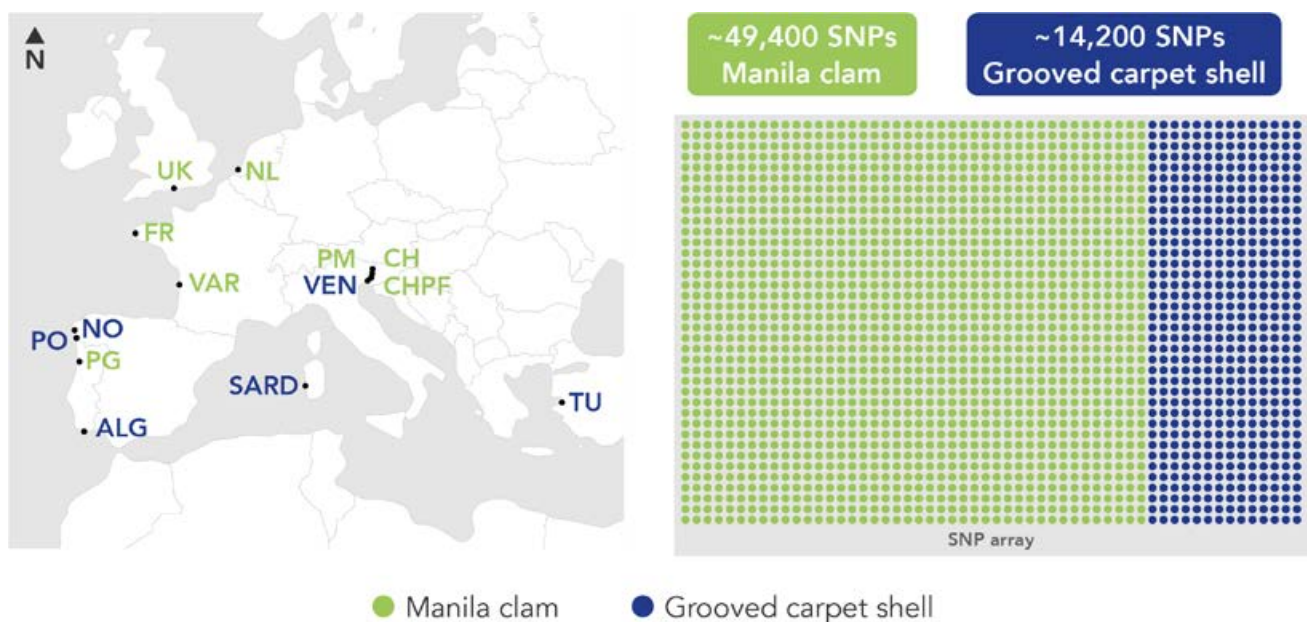
long been constrained by the lack of dedicated genomic tools. The Horizon Europe funded project “IGNITION” was designed to address this gap by developing practical genomic solutions tailored to European clam species.

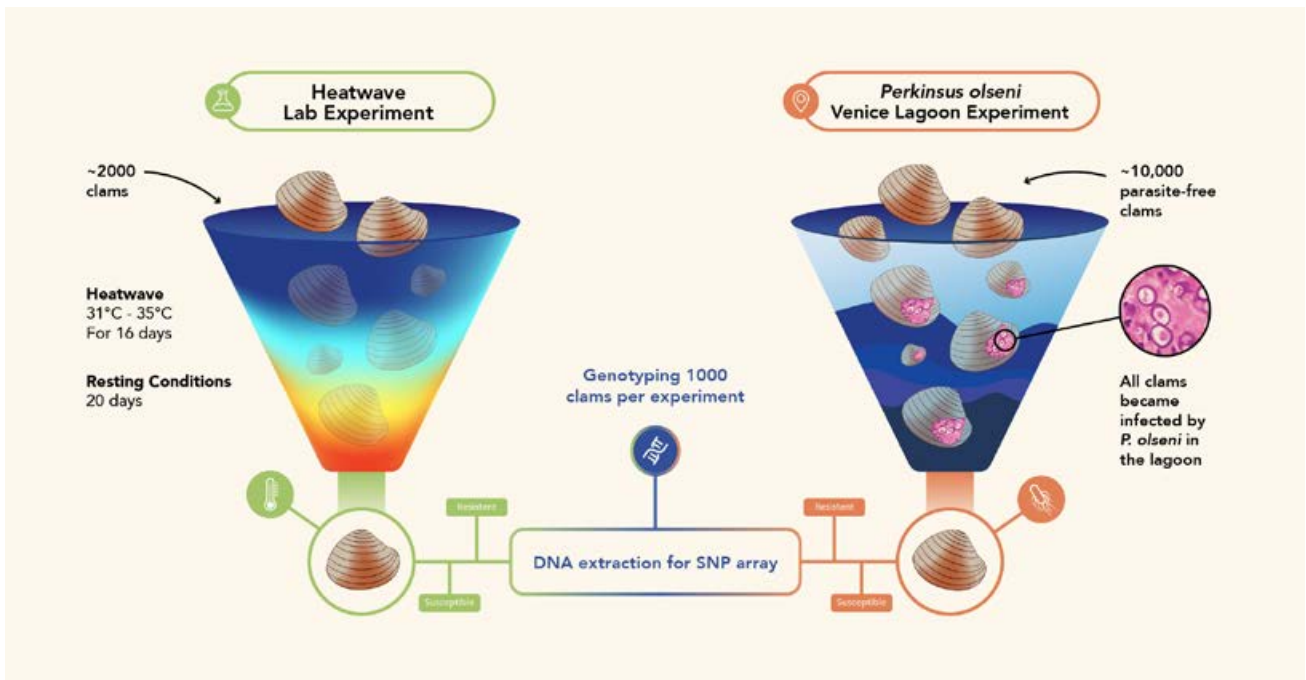
## A genomic platform for European clams

A major outcome of the IGNITION project is the development of the first dual-species single nucleotide polymorphism (SNP) array specifically designed for European clam aquaculture. The platform includes 63,585 genomic markers, comprising 49,392 markers for the Manila clam (*Ruditapes philippinarum*) and 14,193 markers for the native grooved carpet shell (*Ruditapes decussatus*).

### Geographic sampling and SNP array composition for Manila Clam and Grooved Carpet shell.

Credit: Science Crunchers





**Clam genotyping infographic.** Credit: Science Crunchers

Developed using multiple European populations, the array was designed to capture the genetic diversity present across farming regions, ensuring applicability to both hatchery stocks and natural populations. For the first time, clam producers and researchers have access to a standardized genomic tool capable of supporting pedigree reconstruction, estimation of genetic parameters, and large-scale genotyping. Importantly, the platform has already moved beyond research development and is now commercially available, marking a transition from experimental genomics to operational infrastructure for the aquaculture sector.

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### From tool development to real-world testing

To demonstrate its practical applicability, the SNP array was immediately deployed within large-scale resilience experiments conducted as part of the IGNITION project. In collaboration with the SATMAR hatchery, a controlled cross involving 15 sires and 50 dams generated an F1 Manila clam population. Approximately 1,000 individuals were exposed to a simulated marine heatwave under laboratory conditions. Following acclimation, animals

experienced daily temperatures ranging from 31°C to 35°C for 16 days, mimicking extreme thermal events recently observed in the Venice Lagoon, one of the most important production areas in Europe.

A second cohort of F1 clams was transferred to field conditions in the Venice Lagoon to evaluate resistance to the protozoan parasite *Perkinsus olseni* under natural exposure. Infection prevalence was monitored monthly, and once infection levels exceeded 40%, approximately 1,000 individuals were sampled and analysed for infestation intensity.

Across both experimental challenges, around 2,000 clams were genotyped using the newly developed SNP array, linking survival, growth performance, and infection data with genome-wide genetic information. The successful application of the platform under both laboratory and field conditions confirmed its practical robustness and suitability for large-scale breeding applications.

Although analyses are still ongoing, preliminary observations suggest the presence of heritable variation for several traits of commercial and adaptive relevance, including growth performance, resistance to *Perkinsus* infection, and tolerance to heat stress. These early indications highlight the potential for selective breeding approaches to contribute to improved resilience in European Manila clam aquaculture.

**From research to sector adoption**

Climatic conditions mean that European clam aquaculture is increasingly transitioning toward hatchery-based seed supply, creating favourable conditions for systematic genetic improvement. The availability of a validated SNP array tailored to European populations provides the genomic foundation needed to support future breeding initiatives aimed at enhancing both productivity and resilience. The platform has already attracted interest beyond the research community. Industrial partners are promoting the SNP array through their communication channels, and the tool has been presented at scientific and sector-focused conferences. Several research institutions and commercial hatcheries have expressed interest in adopting the platform, highlighting growing recognition of genomics as a practical component of modern shellfish aquaculture.

By combining large-scale challenge experiments with a practical genomic tool, the IGNITION project provides European clam aquaculture with the foundations needed to progressively integrate genetic improvement into routine production systems.



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# A BOOST FOR LOW TROPHIC AQUACULTURE

Financially supported by the Sustainable Blue Economy Partnership

[www.bluepartnership.eu](http://www.bluepartnership.eu) and the EU, BLUEBOOST [www.blueboost.eu](http://www.blueboost.eu) aims to demonstrate if the co-culture of a wide range of low trophic species with established species can boost current European aquaculture of blue foods and feeds while reducing the environmental footprint and moving towards a carbon-neutral aquaculture blue economy.

**BLUEBOOST** is providing knowledge based solutions that will enable the aquaculture industry to overcome bottlenecks that inhibit Governments and businesses, following an impact pathway that can increase the volume and diversity of aquaculture products, reduce environmental footprint towards a carbon-neutral economy, raise the circularity and competitiveness of the blue economy, provide new products, restore ecosystems, create jobs and increase ecosystems resilience against climate change.

The consortium consists of partners from seven countries (Spain, Portugal, Poland, Italy, Brazil, Sweden, Finland) and three seas / oceans (Atlantic – north and south, Mediterranean, Baltic). Partners are experts in the ecology, hydrobiology, culture of low trophic species, integrated multitrophic aquaculture (IMTA),



**The life cycle assessment and economics teams on crayfish cages situated in a Polish carp where freshwater IMTA is being applied by the West Pomeranian University of Technology in Szczecin.**

economics and life cycle assessment (LCA) of blue food and feed production.

The partners are working with six different IMTA systems and a wide range of species from different trophic levels to evaluate the use of waste streams from traditionally farmed species to provide nutrients and feed for low trophic species. The nutrients and carbon fluxes are being mapped, and the environmental footprint of six systems with and without IMTA, determined employing LCA to demonstrate the benefits and trade-offs of incorporating extractive low trophic species in combination with traditional aquaculture species. Self-financed partners will examine new products and test low trophic blue feed ingredients in the diets of marine organisms. To restore ecosystems, threatened oyster species will be farmed in Italy and Spain and coastal ponds of the Ebro Delta will be offered as new aquaculture sites that protect against climate change related sea level rise and storm intensification.

It is envisaged that BLUEBOOST will involve (co-creation/co-design) and impact all stakeholder levels providing societal value creation such as: (a) technical advances that provide new sustainable production methods and products; (b) reduced environmental footprint of blue food and feeds; (c) environmental restorative aquaculture practices; (d) improved economics with increased volume and diversity of production; (e), policy-making to provide conditions for and to drive desired



**Brazilian sardine cages used for IMTA with mussels and seaweed in Santa Catarina, Brazil managed by UFSC and UNIVALI, Brazil**

change and (f) low carbon products and business investments to meet consumer demand. This win-win scenario will deliver improved diversification of blue foods and feeds and, at the same time, increase production volumes and quality, to improve the competitiveness of European and Brazilian aquaculture while reducing the industries environmental footprint.

BLUEBOOST activities are planned over a period of 3 years (April 2024 to March 2027) and are divided

in four work packages. In WP1, management of BLUEBOOST will follow a thoroughly tested continuously updated formula that has achieved the successful execution of a wide range of international projects. In WP2 the partners in the consortium will develop six novel integrated commercial and pilot scale IMTA systems with a wide range of low trophic species that exploit nutrient cycles and circular use of waste streams. In addition, new blue products will be developed. In WP3 LCA will be used to compare environmental impacts of current monoculture to the novel integrated systems; results will be used both to further optimise the design of the novel systems and to model estimated environmental impacts of fully upscaled commercial production. In WP4 the outputs from WP2 and WP3 will be disseminated to stakeholders and society, demonstrating the importance of the application of sustainable aquaculture systems.

### Novel Integrated Multitrophic Aquaculture (IMTA) Systems

In this component of the project BLUEBOOST is developing six novel integrated commercial and pilot scale IMTA systems employing a wide range of low-trophic species. The general idea is to

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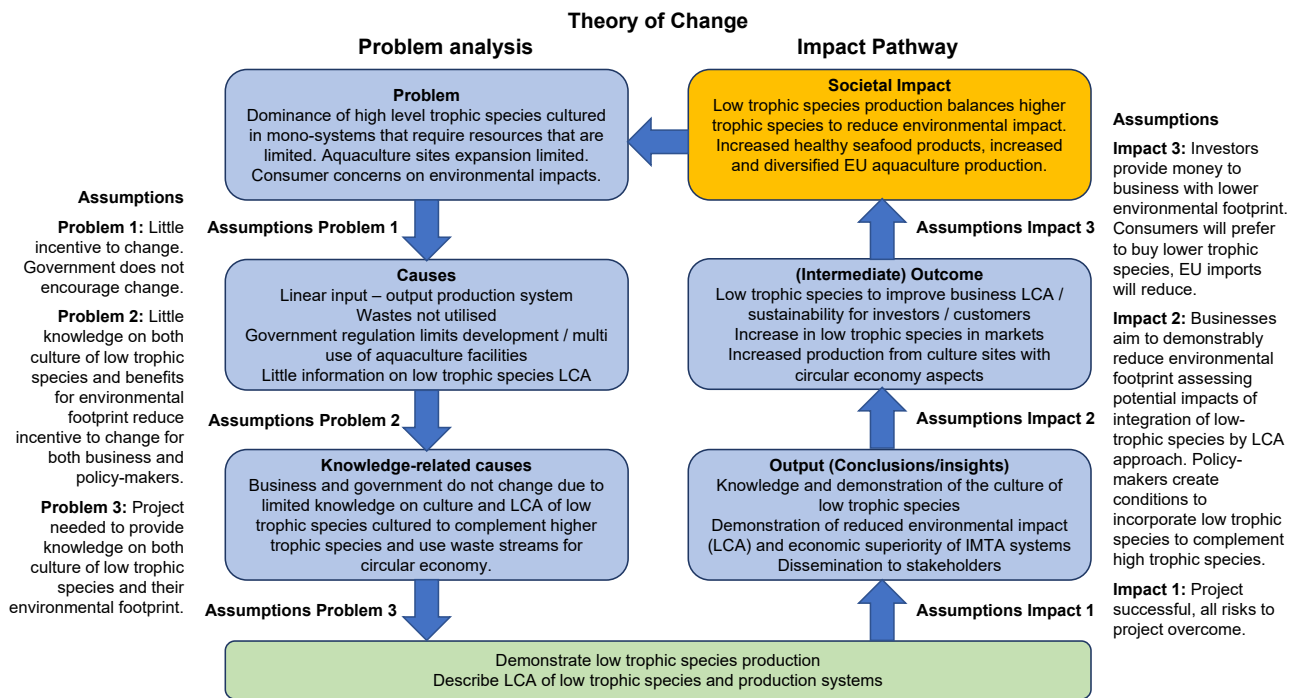
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**Assumptions**

**Problem 1:** Little incentive to change. Government does not encourage change.

**Problem 2:** Little knowledge on both culture of low trophic species and benefits for environmental footprint reduce incentive to change for both business and policy-makers.

**Problem 3:** Project needed to provide knowledge on both culture of low trophic species and their environmental footprint.

**Impact 3:** Investors provide money to business with lower environmental footprint. Consumers will prefer to buy lower trophic species, EU imports will reduce.

**Impact 2:** Businesses aim to demonstrably reduce environmental footprint assessing potential impacts of integration of low-trophic species by LCA approach. Policy-makers create conditions to incorporate low trophic species to complement high trophic species.

**Impact 1:** Project successful, all risks to project overcome.

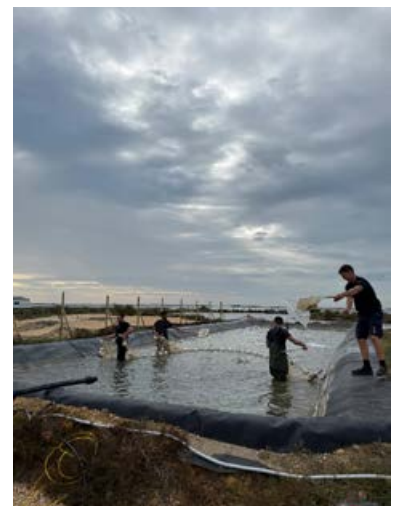
explore and use the great variety of biological systems offered by aquatic biodiversity to improve farming efficiency and diversify production, exploiting key nutrient cycles and circular use of waste streams.

The protagonists of these activities will be low-trophic species such as algae and plants, bivalve filter-feeders, benthic invertebrates and herbivorous or omnivorous fish. These will be farmed alongside established aquaculture species in different aquatic environments across the partnership vast geographical range.

For the first time a concerted effort covering all environments and production system will explore the potential of the Integrated Multitrophic Aquaculture concept to reverse the negative effects of climate change induced land salinization, explore the production and use of key seaweed species, reduce the environmental impact of traditional farming methods and develop new sustainable blue food and feeds.



**PhD Student Sandra Salcedo harvests clams in IMTA ponds, IRTA, Spain**



**Sampling flathead grey mullet from IMTA ponds, IRTA, Spain**

### Key Objectives and advances:

- ◆ To demonstrate on a pilot scale the feasibility to culture low trophic species, fish, bivalves and macroalgae together in coastal ponds in the Mediterranean environment affected by salinisation. In IRTA Spain, IMTA in coastal ponds is combining the culture of flathead grey mullet, flat oyster, Pacific oyster, clams and seaweed, *Ulva* sp. All species obtained promising results in terms of growth. Notable positives were that during an 11-month culture cycle, mullet biomass increased 4-fold in both IMTA and monoculture, clams grew to harvest size in 7 months with 80% survival and *Ulva* shows exceptional growth potential.
- ◆ To demonstrate on a pilot scale culture of *Ulva* sp. in effluents from Atlantic coastal land-based finfish production ponds. At S2AQUA, Portugal IMTA integrates *Ulva* sp. with pilot-scale land-based production of several fed fish species, mainly seabream and seabass.



**Manila clams from IMTA coastal ponds, IRTA, Spain**



**Flathead grey mullet from IMTA coastal ponds being weighed, IRTA, Spain**



**Ulva sp. biomass produced in nutrient-rich water from fed fish ponds. S2AQUA, Portugal**

The system, where the Ulva culture pond receives processing water from fed aquaculture, is currently operational. During summer, Ulva showed overall good growth and nutrient uptake, while winter conditions led to reduced biomass. Ongoing monitoring focuses on optimising seasonal performance and system resilience.

- ◆ To demonstrate sustainable production of freshwater low-trophic species through pond-based freshwater F-IMTA, to reduce impact of freshwater aquaculture on downstream ecosystems, and to upcycle common farm side streams to produce valuable blue food and feed. In ZUT Poland, freshwater IMTA is being demonstrated in a carp farm, integrating carp with narrow-claw crayfish and watercress. The system improved nutrient reuse, water quality, and diversified production. ZUT delivered extensive training and on-site demonstrations, engaging farmers, public authorities, industry representatives, researchers, and students, positioning the farm as a key hub for sustainable, resilient, and innovative pond aquaculture development and knowledge transfer across Poland.
- ◆ To evaluate the productivity and logistics, and to provide environmental and economic data on the performance of a near shore open cage IMTA system to produce new knowledge on the farming methods of still underdeveloped low-trophic species. In IMC Italy, IMTA operated in commercial-scale sea cage farming of seabass and seabream combined with native oysters. Oyster seed was produced in the experimental hatchery and deployed in suspended nets around cages. The first production cycle reached market size in 18 months despite exceptional summer heat waves. The second cycle is ongoing, showing 80% survival and similar growth.
- ◆ To demonstrate the IMTA of a range of low trophic species in a shrimp biofloc system to control and reduce effluent solids and nutrients from commercial production systems. In FURG Brazil, IMTA in landbase tanks evaluated the production of shrimp, mullet, Brazilian oyster, sea cucumber, and Salicornia in a biofloc technology system. The IMTA system efficiently controlled solids and reduced sludge by 40 %, mullet performed well, while shrimp production was not affected by IMTA compared to shrimp monoculture.
- ◆ To demonstrate the culture of low trophic species in IMTA cage systems in the near shore environment in the South Atlantic (27° S latitude - Brazil). In UFSC, in partnership with UNIVALI, Brazil, an IMTA system was established using nearshore net cages. *Sardinella brasiliensis* showed a 57.6% biomass increase and 82% survival during eight months. During this period, *Perna perna* mussels reached commercial size (>8 cm) with 76% survival, while the red seaweed *Kappaphycus alvarezzi*, cultivated in 45-day cycles, exhibited high growth rates 4.8% day<sup>-1</sup>.
- ◆ Produce and evaluate new blue products, blue feeds and foods that can provide markets for low trophic species.



**IMTA system with shrimp in biofloc feeding tanks of mullet, oysters and sea cucumber in FURG, Rio Grande, Brazil**

### Sustainability assessment of novel IMTA systems

In this part of BLUEBOOST the aim is to ensure that the developed systems are designed to be as sustainable as possible, both from an environmental and economic point of view. The six systems will be evaluated first in a monoculture state and then with low-trophic species added to evaluate both benefits and potential tradeoffs involved in adding more species. Initial results will be used in the further development of the systems, e.g. in terms of choice of materials and energy sources. For the environmental analyses, we will use Life Cycle Assessment (LCA) and complementary methods to quantify nutrient flows and circularity in IMTA. Finally, principles for how to go from modelling an experimental case study to a fully optimized commercial production will be developed. The most environmentally sustainable system will not be used unless it is also economically viable. The economic analysis will shed light on the viability of the six IMTA systems, their investment requirements and economic performance relative to those of monoculture aquaculture systems, hence drawing a baseline. The economic resilience of the IMTA systems will then be evaluated, by developing a sensitivity analysis based on scenarios capturing realistic combinations of price and production risks.

The work has started with the collection of data for both monoculture and IMTA. Although data sets are not complete, preliminary Cost Benefit Analysis tend to find that IMTA outperforms monoculture and this thereby challenges the common perception that the reason for low uptake of IMTA is low profitability. However, despite indications that IMTA changes nutrient cycles and capture more carbon, the environmental benefits of IMTAs have not yet been robustly demonstrated in LCAs. A BLUEBOOST literature review has found that combined economic and environmental assessments of IMTA are rare to absent, thereby demonstrating the novelty of this approach that combines culture systems, economics and environmental assessments. Together, these analyses will demonstrate how sustainable the IMTA systems are at present as well as their future potential.

Key objectives:

- ◆ Develop novel methods for the assessment of circularity in IMTA systems.
- ◆ Use life cycle assessment (LCA) and complementing approaches to assess and optimise the environmental and economic sustainability of integrating low trophic species into existing systems.
- ◆ Assess the environmental impacts of a wide range of IMTA systems and publish LCA data for both IMTA and non-IMTA systems.

## BLUEBOOST Impact

BLUEBOOST outputs disseminated through the communication plan following the theory of change aim to improve the aquaculture industry's societal services and economic value. At the heart of the required changes is the industry's ambition to sustainably intensify production activities and maximise economic return, together with society's legitimate expectations to see the environmental footprint of goods and services being reduced. The same focus has accelerated change in European core industries such as the automobile industry, where both consumer and industry desire for more sustainability was pushed by legislation to favour sustainable products (electric cars) and prohibit unsustainable products (prohibit sales of fossil fuel combustion engine).

BLUEBOOST proposes the same approach to accelerate change in the aquaculture industry by addressing significant knowledge gaps that exist in the conceptual development, practical implementation and regulation of integrated aquaculture systems (Problem analysis) to provide outcomes and a clear pathway to change.

BLUEBOOST outcomes predict the aquaculture industry will improve environmental credentials of businesses and products, consumers will demand low-carbon impact products and business investments and policymakers will provide a positive environment for the co-culture of low trophic and established species and deploy regulation to capture waste and reduce pollution. Therefore, Government policy and changing expectations of investors and consumers will drive aquaculture transition to carbon neutrality as shown in the impact pathway in the Theory of Change figure. This win-win scenario will deliver improved diversification of blue food / feed products and, at the same time, will increase production volumes to improve business economic returns combined with a reduced environmental footprint. Therefore, BLUEBOOST can deliver a concrete roadmap for the aquaculture industry to demonstrably reduce its environmental impact and increase sustainable blue food and feed production that can lead to societal transformation.



**IMTA oyster culture with commercial cages used for sea bream and seabass managed by IMC, Sardinia, Italy.**

This societal transformation would expect changes such as: large increase in production of low trophic species, sustainable carbon neutral aquaculture, less pollution, less eutrophication, more wealth in rural coastal areas, improved coastal environment, restored ecosystems, more species diversity and healthy diets.

BLUEBOOST partners estimate that these changes can increase European aquaculture (similar for Brazil) production by an additional 15-20 % (above expected increases) in the first 10 years after the project.

The EU aquaculture sector today employs around 75,000 persons and a 15-20% increase would mean 11-15,000 new jobs would be created by such an expansion of production. The increase would be primarily production of low trophic species that would be estimated to lower greenhouse gas emissions for each kilo of aquaculture production by 8%. While if these low trophic species replace beef, a 97% reduction in emissions is achieved per kilo consumed, which gives an indication of the degree of impact BLUEBOOST proposes. In addition to environmental benefits, such a dietary shift would mean important improvements in human nutrition and health.

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WP3 LCA and economics leader, Friederike Ziegler, RISE, Sweden

WP4 Dissemination and communication leader, Elvira Fatsini, IRTA LA Ràpita, Spain

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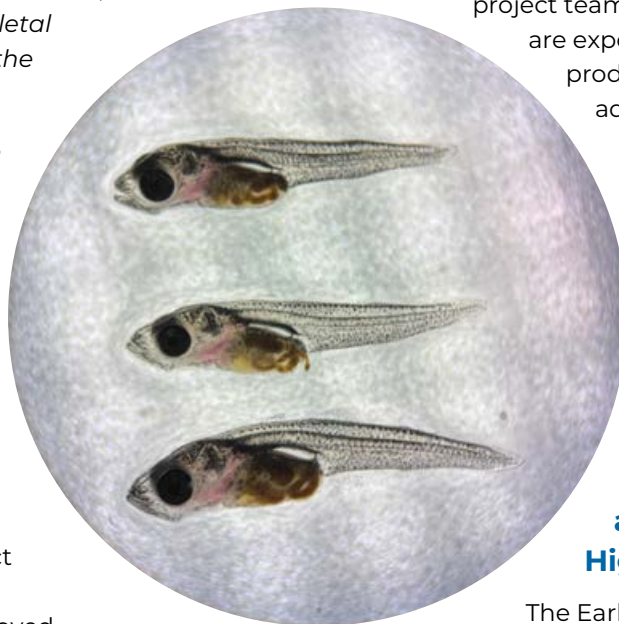
# EarlyCOD Showcases Breakthroughs in Early Nutrition for Cod Aquaculture



The EarlyCOD project has concluded with a final webinar that brought together an international audience to share groundbreaking results in Atlantic cod aquaculture. This collaborative research initiative – led by **SPAROS** in Portugal with partners **CIIMAR** (Portugal) and **Planktonic AS** (Norway) – has developed innovative early-life feeding protocols to improve cod farming success. The webinar highlighted how **tailored microdiets and cryopreserved plankton** can sustain cod larval growth potential and health, dramatically reducing skeletal deformities and boosting the quality of juvenile cod.

## Pioneering Solutions for Cod Farming Challenges

Cod farming has faced persistent challenges, including slow juvenile growth and high mortality due to stress and disease, leading to variable quality and increased costs. The EarlyCOD project was launched to address these issues through improved nutrition and breeding innovation. Over the course of the project, researchers developed a new range of aquafeeds and an early feeding regime that combines novel inert microfeeds with live cryopreserved plankton. This approach strengthens cod larvae during the critical weaning stage, reducing mortalities and stress while improving overall juvenile quality and reducing production costs. By integrating nutrition research, experimental trials, and industrial-scale validation,



EarlyCOD has delivered feed protocols that markedly enhance cod larval performance and survival.

Importantly, project trials demonstrated tangible benefits: **tailored diets resulted in substantially fewer skeletal deformities in cod larvae**, better organ development, and more robust juveniles. “These innovative nutritional strategies not only enhance early development and maturation, but also lead to juveniles of superior quality,” the project team reported. Such outcomes are expected to help cod hatcheries produce healthier young fish, addressing a key bottleneck in the industry. As Norway’s cod farming sector experiences rapid growth, these results come at a crucial time, providing advanced protocols to support the production of high-quality cod juveniles at scale.

## International Collaboration and Final Webinar Highlights

The EarlyCOD final webinar, held on 12 December 2025, exemplified the project’s international and collaborative spirit. Co-organised by Norway’s Cod Cluster and the EarlyCOD consortium partners (SPAROS, Planktonic, and CIIMAR), the online event drew participants from three countries – Norway, Portugal, and Iceland – reflecting the broad engagement across Europe’s aquaculture community. Attendees included 28 researchers from leading research organisations such as the Institute of Marine Research (IMR),

NOFIMA and NTNU – Norwegian University of Science and Technology in Norway, the Marine and Freshwater Research Institute (MFRI, Iceland), along with 40 experts from aquaculture sector companies, as well as representatives from industry associations and government agencies. In total, 76 participants joined the webinar, representing a broad stakeholder mix. Notably, nine cod farming companies were represented among the industry participants, including leading Norwegian cod producers Ode, Norcod, Vesterålen Havbruk, KIME Akva, Havland, Elska Austevoll, Lofotyngel, and Ísfélag (Iceland). This broad participation underscores EarlyCOD's extensive reach across public, private, and academic sectors.

Key presentations during the webinar spotlighted the project's findings and their practical implications. Dr. Luis Conceição, EarlyCOD project coordinator from Sparos (Portugal), opened the event with an introduction and project overview. He outlined EarlyCOD's objectives and set the stage for partners to present detailed results of the research. From Planktonic AS in Norway, Nils Tokle discussed the successful use of cryopreserved plankton ("cryoplankton") as a live feed alternative, sharing how this innovation contributed to improved larval growth and health. João Henriques of Sparos presented results on co-feeding protocols, including insights from larval histology studies and the reduction of skeletal deformities observed when combining cryoplankton with the new microdiets. Luis Conceição of Sparos also presented showed that early co-feeding protocols of cryoplankton with microdiets, can lead to superior cod growth performance. Representing CIIMAR (University of Porto, Portugal), Dr. Benjamin Costas highlighted analyses of the immune and oxidative status of cod larvae reared on EarlyCOD diets, indicating enhanced larval resilience and condition under the optimized feeding regimes.

Industry perspectives added depth to the discussions. Kristine Drage of Akvaplan-NIVA (Norway) spoke on the practical larval quality parameters monitored at cod hatcheries, addressing which metrics are most useful on the farm and where external support or new innovations might further improve juvenile quality. From Ode, a Norwegian cod farming company, Frank Mlingi tackled the issue of batch variability in larval robustness, exploring why some groups of cod larvae perform better than others and how consistent feed quality and protocols can mitigate those differences. These talks were followed by a lively discussion session, moderated by Antonio

Coli (Planktonic), in which speakers and attendees debated questions on larval deformities, live feed types, breeding effects, and long-term performance of cod – all pointing to the need for continued knowledge-sharing in this growing sector.

## A Milestone for Sustainable Cod Aquaculture

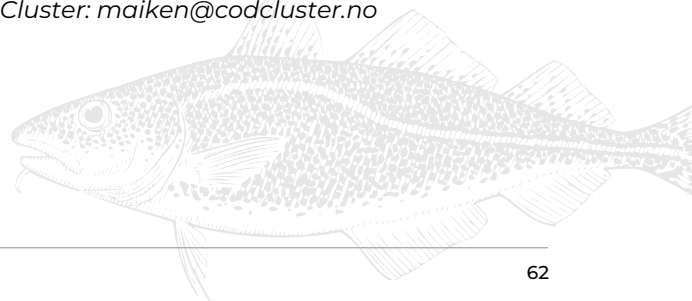
The final webinar marked a milestone conclusion to the EarlyCOD project's collaborative efforts. EarlyCOD (2023–2025) was led by SPAROS in partnership with CIIMAR (Interdisciplinary Centre of Marine and Environmental Research, Portugal) and Planktonic AS (Norway), with significant support from Ode, and Nord Universtiy in Norway. This partnership exemplifies how cross-border cooperation can drive innovation in aquaculture. By pooling expertise from marine biologists, feed technologists, and industry practitioners, the project addressed complex biological challenges in cod rearing and delivered solutions ready for industry adoption.

As the cod farming industry looks to scale up production sustainably, EarlyCOD's outcomes offer promising tools: new feeds and feeding regimes that improve juvenile quality, survival rates, and farm profitability. The knowledge shared in this final webinar will enable fish farmers, feed producers, and researchers beyond the consortium to apply these findings, accelerating improvements in cod hatchery practices.

The EarlyCOD consortium expressed optimism that these innovations will bolster the supply of high-quality cod juveniles for aquaculture, helping to meet growing demand while improving cod welfare and reducing losses. The collaborative success of EarlyCOD also sets the stage for future R&D initiatives in aquaculture nutrition and breeding. By reinforcing the link between scientific research and industry application, EarlyCOD has contributed to advancing sustainable growth in the marine aquaculture sector.

### Media Contact:

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 or Cod Cluster: [maiken@codcluster.no](mailto:maiken@codcluster.no)



# FEEDING FOR RESILIENCE:

## How Proven Mineral Nutrition Can Proactively Support Aquatic Health

**DR. CLAUDIA FIGUEIREDO SILVA**

Global Technical Services Aquaculture, Zinpro Corporation

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### Introduction

The aquaculture industry is entering a new phase, one that is shaped by climate variability, rising sea temperatures, and increasing biological stressors. A 0.85 °C increase in the mean surface temperature of global waters since the early 1800s is expected to rise at least another 3.5 °C by the end of the century (Scafetta, 2021). Projections also point toward an escalation in the frequency and intensity of heatwaves across Europe and Asia. The Mediterranean Sea is particularly susceptible to warming due to its semi-enclosed structure and limited exchange with oceanic waters. Over

the past 50 years, while a 0.11 °C per-decade rise in water temperature has been observed for the world's oceans, the Mediterranean has observed an upswing of 0.61 °C each decade (Belkin et al., 2009; Oliver et al., 2018). These environmental shifts are occurring rapidly and at an accelerating pace. Aquatic species are being pushed beyond their thermal comfort zones, leading to reduced feed intake, impaired growth, and increased disease susceptibility. This cascade of stressors contributes to significant economic losses for aquaculture producers.

**01**

#### Strengthen Immune Barriers

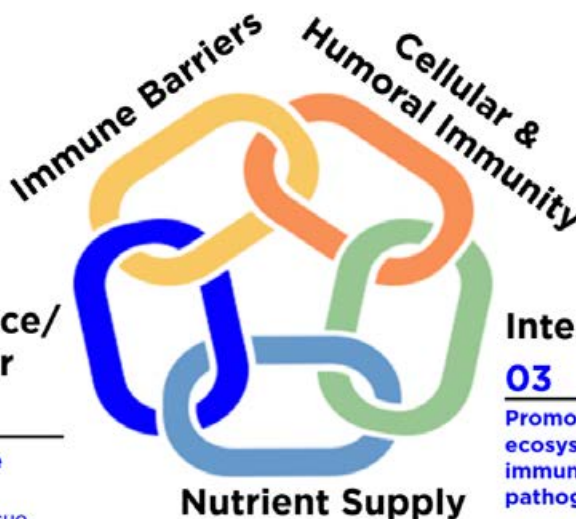
Proper nutrition maintains mucosal integrity and barrier function

#### Stress Tolerance/ Cellular Repair

**05**

#### Enhance Anti-oxidative Response

Essential nutrients fuel tissue regeneration and stress recovery



#### Nutrient Supply

**04**

#### Optimize Metabolic Efficiency

Balanced nutrition reduces energy costs of stress response

**02**

Enhance fish resilience to disease through targeted nutrient support

#### Intestinal Health

**03**

Promote a healthy gut ecosystem to support immune function and pathogen resistance

**Figure 1: Influence of Nutrition on Disease Resilience**

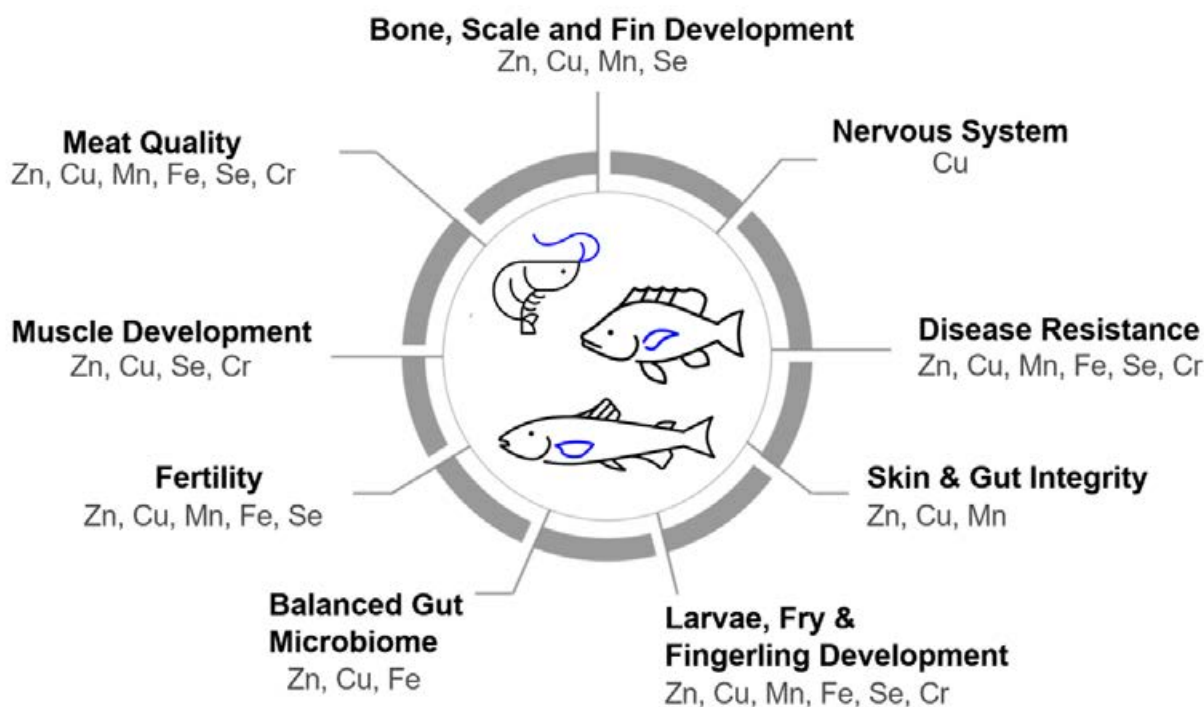
Disease	Pathogen	Species Affected	Temperature Impact
Salmon louse infestation	<i>Lepeophtheirus salmonis</i>	Atlantic salmon	Increased infestation and resistance to treatments at higher temperatures
Vibriosis	<i>Vibrio spp.</i>	Abalone, shrimp, oysters	Increased virulence and mortality with elevated temperatures
Gill disease	Multiple pathogens	Atlantic salmon	Higher prevalence and severity in late summer/autumn
Sparicotylosis	<i>Sparicotyle chrysophrii</i>	Gilthead Seabream	Lethargy due to the hypoxia, necrosis of gill filaments, changes gill microbiome, and causes severe anemia

**Table 1. Examples of Climate-adapted Disease Outbreaks in Aquatic Species**

### Economic Impact of Thermal Stress and Disease

Farmed fish are often reared outside their natural habitat, where they are vulnerable to temperature extremes. Species such as gilthead seabream naturally inhabit deeper waters than those in which they are typically cultured. Exposure to heat stress disrupts their metabolism, growth, and immune function. Elevated water temperatures also increase oxidative stress and inflammation in both Atlantic salmon and seabream. Oxygen demand and susceptibility to hypoxia rise in warmer water, where climate change alters microbial ecosystems, promoting pathogen proliferation and weakening fish microbiomes.

The proliferation of *Vibrio spp.*, *Aeromonas spp.*, and *Flavobacterium spp.* heightens the risk of vibriosis, hemorrhagic septicemia, and columnaris disease. Parasitic infections such as *Enteromyxum leei*, *Sparicotyle chrysophrii*, and *Argulus spp.* are likewise exacerbated by higher temperatures. These parasites can cause anemia, cachexia, and mortality rates approaching 100% in susceptible stocks. Despite improvements in disease surveillance and management, economic losses from disease outbreaks in aquaculture are estimated to exceed 9.5 billion USD per year (Shinn et al., 2015). These findings are summarized in Table 1 and reinforce the urgency of promoting strategies to address climate-adapted disease.



**Figure 2: Essentiality of Trace Minerals in Aquaculture**

## Nutrition as a Strategic Solution: The Power of Trace Minerals

While environmental management and therapeutics play a role, nutrition remains a powerful and underutilized tool for building resilience in fish. Nutritional interventions are especially critical before and during periods of thermal stress, when metabolism is altered and immune defenses are compromised. A targeted nutritional approach can also help counteract microbiome disruption caused by warming waters. Dietary strategies designed to support fish during these conditions can (Figure 1):

- Strengthen the immune barriers of the skin, gills, and intestine
- Support immune system function
- Enhance anti-oxidative responses and cellular repair mechanisms
- Reduce the energetic cost of the stress response
- Promote a gut microbiome that resists parasites and infections

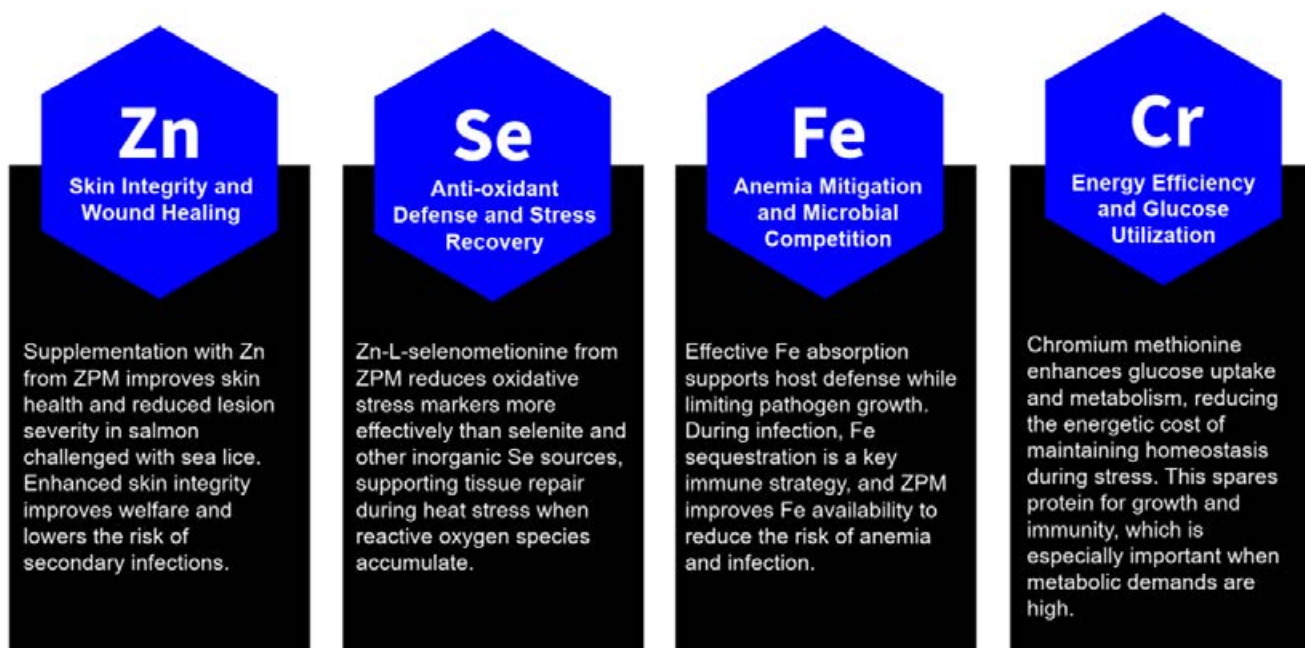
Trace minerals are essential for hundreds of biological functions throughout the aquatic life cycle (Figure 2). Minerals such as zinc (Zn), selenium (Se), iron (Fe), and chromium (Cr) play important roles in maintaining physiological stability under stressors associated with climate change, especially rising water temperatures. Optimizing mineral nutrition represents an important opportunity to improve fish resilience during thermal stress. The effectiveness

of trace minerals depends strongly on their source, as chemical forms vary widely in bioavailability and physiological impact. Inorganic mineral sources (e.g., sulfates, oxides, hydroxychlorides) are often poorly absorbed and highly reactive in the gut, where they readily bind or compete with other dietary components and are frequently excreted before they can be utilized. Research using Zinpro® Performance Minerals® (ZPM) has demonstrated the distinct physiological contributions that Zn, Se, Fe, and Cr each provide to metabolic, immune, and antioxidative defenses (Figure 3), making them a promising nutritional package for addressing climaterelated challenges in aquaculture.

### Zinc (Zn): Skin Integrity & Wound Healing

Zinc is a first line of defense mineral, essential for maintaining epithelial integrity, particularly in the skin, the fish's largest organ and a primary barrier against pathogen entry. In a 60-day feeding trial with post-smolt Atlantic salmon challenged by sea lice, fish supplemented with Zinpro® Availa® Zn showed significantly improved skin outcomes: 88% had no lesions compared with 78% in the control group. This underscores zinc's role in wound healing and barrier protection.

Zinc also supports immune cell development in key organs such as the head kidney and spleen. By stabilizing thymic hormones and promoting the proliferation of immune cells, zinc strengthens both innate and adaptive immune responses.



**Fig. 3 A Four-mineral Approach to Optimizing Fish Health: Functional Roles Under Thermal and Disease Stress**

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**Selenium (Se): Antioxidant Defense & Stress Recovery**


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Selenium plays a pivotal role in oxidative stress management through its involvement in glutathione-dependent antioxidant pathways. Zinpro® Availa® Se consistently outperforms inorganic selenite in reducing oxidative stress markers. In gilthead seabream exposed to acute stress, Availa Se increased total glutathione (TGSH) and reduced oxidative stress indices more effectively than inorganic sources. These effects contribute to faster tissue repair and improved physiological resilience during thermal challenges.

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**Iron (Fe): Anemia Mitigation & Microbial Competition**


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Iron is essential not only for hemoglobin synthesis and oxygen transport but also for modulating microbial dynamics in the gut. Efficient absorption of Fe from Zinpro Performance Minerals helps maintain host defense by ensuring adequate iron availability while limiting the iron accessible to pathogens. In Nile tilapia, replacing inorganic Fe sources with Zinpro Availa® minerals led to a 75–96% reduction in harmful *Streptococcus* species and a 124–126% increase in beneficial *Bacillus* populations. Gut morphology also improved, with longer villi and increased goblet cell density, enhancing mucosal immunity and nutrient absorption.

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**Chromium (Cr): Energy Efficiency & Glucose Utilization**


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Chromium methionine (CrMet) enhances glucose uptake and metabolic efficiency, helping fish redirect energy toward growth and immune function during periods of thermal stress. By lowering the energetic cost of maintaining homeostasis under stress, Zinpro Availa® Cr (also known as Zinpro® MICROPLEX®) supports improved feed conversion and overall performance. This makes chromium methionine a valuable component in nutritional strategies aimed at supporting fish during climate-related metabolic challenges.

**Conclusion: Feeding for the Future**

Climate-driven stressors are reshaping aquaculture, challenging the metabolic stability, immune function, and overall performance of farmed fish. Building resilience must therefore begin from within. This review demonstrates that targeted mineral nutrition, particularly bioavailable forms of Zn, Se, Fe, and Cr, provides a proactive and proven foundation for strengthening skin integrity, antioxidant defenses, microbial balance, and energy efficiency during thermal stress. Research using Zinpro Performance Minerals highlights how each mineral contributes uniquely to supporting aquatic health under climate-related pressures. By integrating advanced mineral nutrition strategies, producers can enhance fish welfare, reduce losses, and move toward a more resilient and sustainable aquaculture future.

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# NANOBUBBLES: Elevating RAS Water Treatment and Fish Welfare

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**MOLEAER**  
ADVANCING NANOBUBBLE TECHNOLOGY

Oxygen is fundamental in recirculating aquaculture systems (RAS), but operators running tight systems know it's rarely the only factor that determines performance.

As RAS designs move toward tighter loops and higher stocking densities, what stays in the water, and how it moves through the system, starts to matter just as much.

Most operators recognize a familiar pattern. Mechanical filters need more frequent biofilters and downstream treatment requires more frequent adjustment to maintain consistent water quality. Each component

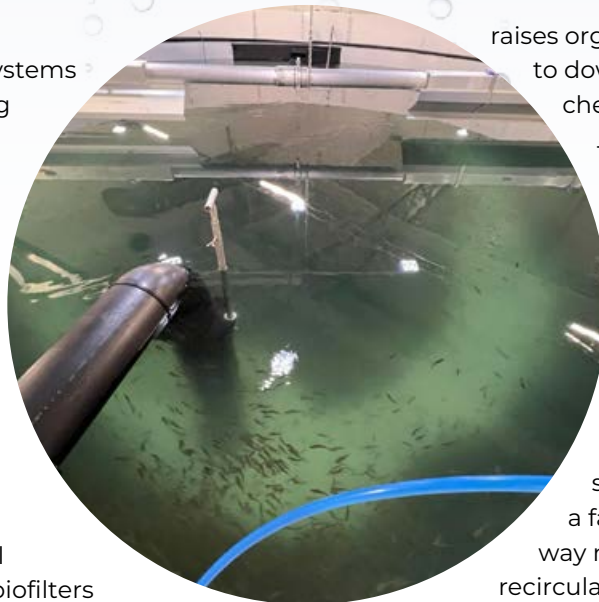
Across Moleaer's installations, the same issue shows repeatedly: fine material that never really leaves the loop.

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## The part of the system we usually don't design around

RAS infrastructure is very effective at removing large solids. Drum filters, screens and settlers are proven tools and remain essential to system design.

Fine materials behave differently. Small organic and bio-organic particles pass through mechanical barriers, remain suspended, and continue to circulate. Over time, this increases turbidity,



raises organic load, and adds stress to downstream biological and chemical treatment stages.

The system still runs, but operators often find themselves compensating. Treatment intensity increases, chemical dosing creeps up, and adjustments become more frequent.

We see the same dynamics in other closed-loop water systems. The issue is rarely a failed component. It's the way material accumulates and recirculates under tight operating conditions.

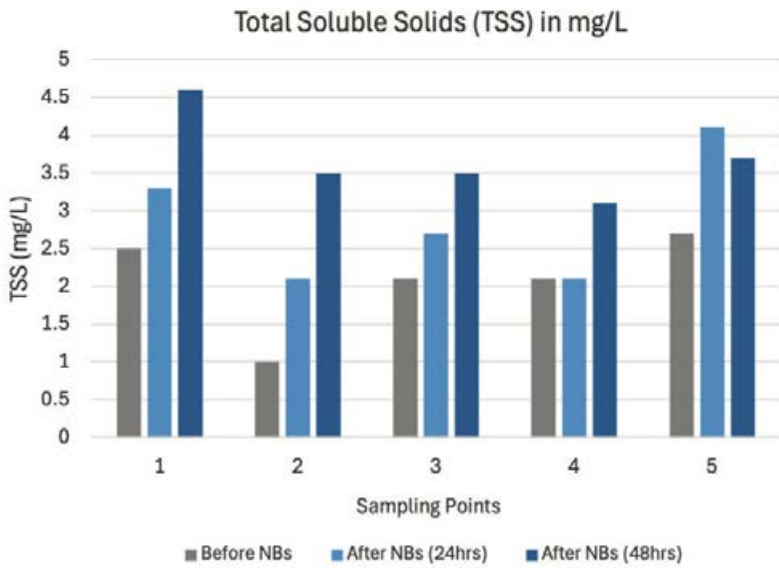
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## Working with the system, not against it

Instead of adding new equipment, many operators are now focused on making existing systems run more consistently. This is where Moleaer's nanobubble technology fits.

When nanobubbles are generated hydrodynamically, they stay suspended and move with the flow. As they circulate through piping, tanks, and process equipment, they continuously interact with internal surfaces and fine material in the system.

This creates a gentle scouring effect along pipes and equipment, helping limit organic and biological buildup. Material that would otherwise attach to



**Figure 1. Concentration of total suspended solids before the start-up of Moleaer’s nanobubble generator and after 24 and 48 hours of operations. The concentration of TSS linearly increased as effect of the cleaning and scouring effect on pipes and hard surfaces of the plant in all sampling points.**  
Source: Moleaer

surfaces stay suspended, where it can be removed by downstream treatment processes.

At Lødingen Fisk’s RAS facility, for example, total suspended solids increased within 48 hours of introducing nanobubbles (Figure 1). This was clear evidence of internal scouring. Over time, turbidity levels became lower and more stable, indicating better control of fine material circulating through the system.

**Helping existing separation processes work better**

Nanobubbles don’t replace mechanical separation. They help it work as intended.

Their negative surface charge and hydrophobicity properties encourage fine suspended and dissolved organic material to aggregate. As water recirculates, this changes how material presents itself to filters, flotation unite, and foam fractionation stages.

Instead of slipping through unnoticed, fine material becomes easier to capture.

This matches what controlled flotation research has shown: smaller bubbles significantly increase collision and

adhesion probabilities with fine particles (Figure 2), improving removal efficiency without changes to system design.

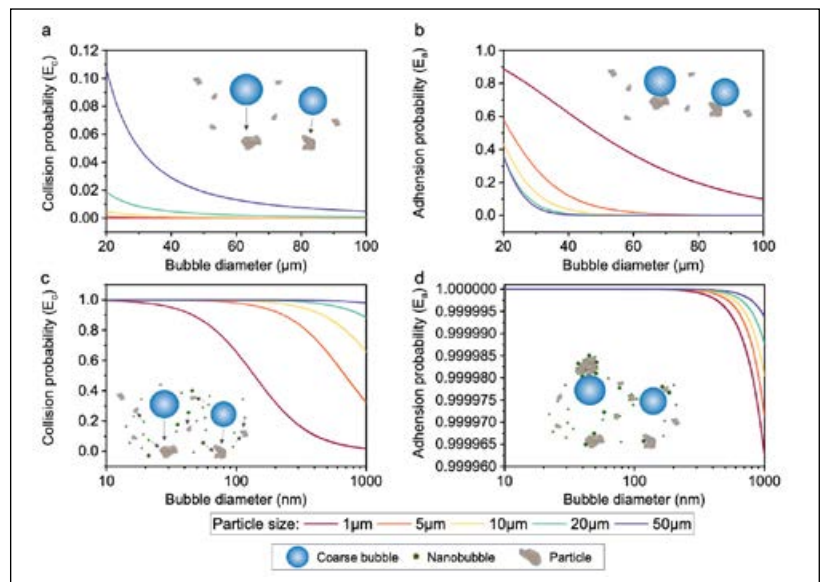
**Letting biological treatment focus on biology**

Nanobubbles are also not a replacement for biofilters, and they aren’t meant to be. Their value is upstream.

Biofilters depend on stable influent conditions to perform well. When turbidity and fine organic loading fluctuate, microbial communities are forced to compensate rather than operate efficiently.

By stabilizing water quality earlier in the loop, nanobubbles help create more consistent conditions entering the biofilter. This allows biological treatment to focus on what it does best.

**Figure 2. Conventional flotation model illustrating the effect of bubble size on collision and adhesion probabilities (microbubble-scale radii vs nanobubble-scale radii). Source: Jia et al., Nature Communications (2024), Fig. 6.**





**Moleaer Nanobubble Generators**

### Reducing reliance on chemical treatments

Better water quality earlier in the loop directly affects downstream treatment performance.

In many RAS facilities, ozone is used for disinfection, pathogen control, and breaking down fine particles. When water entering the ozone stage carries less suspended and dissolved organic material, operators can often achieve the same outcomes at lower ozone dosages.

By reducing turbidity and fine organic loading upstream, nanobubbles improve the effectiveness of oxidation stages. This can translate to reduced ozone demand, lower chemical use, and more stable system performance.

### Large-scale holding systems

The same principles apply beyond land-based RAS.

At Australis Mar's Dumestre processing facility in Chile, Moleaer solutions were integrated into 1,000 m<sup>3</sup> holding tanks using the existing pumps and piping. Oxygen consumption was reduced by 63%, while stable stocking density increased from 90 to 120 kg/m<sup>3</sup>. Return on investment, based on oxygen

savings alone, was achieved in under six months.

We also saw improved water clarity and more stable holding conditions at higher biomass.

### Stability as the foundation for sustainability and compliance

Sustainability in RAS is often discussed in terms of water and energy use. But long-term sustainability also depends on how predictable and stable a system is to operate.

As systems intensify and regulatory expectations increase, tools that improve how existing infrastructure performs, without adding complexity, become increasingly valuable.

Across Moleaer's aquaculture installations, the same pattern emerges: systems perform best when fine material is managed continuously, rather than chased downstream.

### Looking ahead

In modern RAS, how water behaves in the loop is becoming the differentiator. What stays in the system, and how it moves over time, increasingly determines treatment efficiency, compliance and long-term reliability.

Moleaer's nanobubble technology shows that improving how fine material is managed within existing infrastructure, rather than adding more equipment, can unlock meaningful performance gains. For operators working within tighter margins and higher expectations, improving day-to-day system stability is likely to shape the next phase of RAS design and operation.

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# AQUACULTURE MEETINGS IN EUROPE

Direct links, brochures, registration forms etc are linked to this information in the EAS website calendar module.

## MAY 2026

### Ireland's Edge, Aquahack 2026

Conamara, Co. Galway, Ireland, May 18-21, 2026

[Apply here.](#)

The four-day residential Aquahack invites postgraduate students from the European Aquaculture Society (EAS) to step out of the classroom and into a living aquaculture ecosystem. Here, seaweed, shellfish and salmon are not case studies, but working industries with real challenges, customers and opportunities.

### Thalassa 2026 Marine Science Conference

Larnaka, Cyprus, May 21-22, 2026

[www.cmmi.blue/thalassa-2026](http://www.cmmi.blue/thalassa-2026)

Organised by the Cyprus Marine and Maritime Institute (CMMI) and the PUREEF-Y. This biennial event is recognised as a leading platform for fostering interdisciplinary collaboration and advancing marine science across the Mediterranean region and beyond. The conference aims to bring together expert scientists, researchers, practitioners, and stakeholders from academia, non-governmental organisations, small and medium enterprises, industry, and government agencies to engage in in-depth discussions on interconnected topics.

## JULY 2026

### Fish Physiology in Support to a Sustainable Aquaculture

Namur, Belgium, July 6-9, 2026

Conference website: [fishphysaqua.unamur.be](http://fishphysaqua.unamur.be)

The comprehensive understanding of fish physiology is essential for the advancement of a sustainable aquaculture. This discipline analyses the fundamental biological functions of farmed species, encompassing the respiratory, digestive, immune and reproductive systems, in addition to physiological responses to environmental stress

## SEPTEMBER 2026

### Aquaculture Europe 2026

Ljubljana, Slovenia, September 28-October 1, 2026

Visit the event website

[www.aquaeas.org](http://www.aquaeas.org)

Food systems, including aquaculture, are being challenged by changes resulting from global warming. These affect all forms of aquaculture, in inland and coastal marine regions, and especially small and medium sized operators that may not have the financial and operational capacity to implement adaptation and mitigation measures.

Taking place in the beautiful Slovenian capital of Ljubljana, AE2026 will put the focus on adaptation to climate effects, the latest research on species adaption capacity and the health/welfare/nutrition/breeding factors that underline this. While Slovenia has a low aquaculture production, it has plans for development of existing and new production methods and species and it is at the heart of central/southern Europe - adjacent to Italy, Croatia, Hungary and Austria – and hence providing a regional focus for both inland and marine aquaculture.

The AE2026 parallel sessions will cover the full scope of European aquaculture scientific disciplines and species and will comprise submitted oral and poster presentations. AE2026 will also feature an international trade exhibition, industry forum, student sessions and activities, satellite workshops and updates on EU research.

#### Contact information:

General conference inquiries: [eas@aquaeas.eu](mailto:eas@aquaeas.eu)

Registration, requests for invoices & visa requests [worldaqua@was.org](mailto:worldaqua@was.org)

Exhibitors, sponsors, media & meeting room requests [mario@marevent.com](mailto:mario@marevent.com)



## OCTOBER 2026

### 2026 EIFAAC International Symposium on managing and conserving inland Fisheries and Aquaculture resources in a changing world

Riga, Latvia, 5-7 October 2026

See all info via [FAO](#) and [here](#).

This International Symposium aims to facilitate interaction between European scientists and policymakers and to share inland fisheries and freshwater aquaculture research findings within the European region.

# LJUBLJANA, SLOVENIA SEP 28-OCT 1 2026



Photograph by Aleš Frelj

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Since 1976, EAS has been bringing people together for the sustainable development of European aquaculture. As we celebrate our 50<sup>th</sup> birthday, we look back on key moments and key persons that made EAS what it is today. And we also look forward - continuing to expand our student activities and network and propose benefits for members that are suited to their profile and needs. We will celebrate this milestone throughout the year on social media, and in person at Aquaculture Europe 2026 in Ljubljana, where we invite EAS members to join the celebrations.

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