

Conference

BALTIC STATES – CHALLENGES FOR INLAND AQUACULTURE

ORAL PRESENTATIONS ABSTRACT BOOK

JŪRMALA, LATVIA, NOVEMBER 7-8, 2024

Institute of Food Safety,
Animal Health and Environment, BIOR

International Organization for the Development
of Fisheries and Aquaculture in Europe, EUROFISH



Co-funded by
the European Union



Ministry of Agriculture
Republic of Latvia



BIOR

INSTITUTE OF FOOD SAFETY, ANIMAL HEALTH
AND ENVIRONMENT



EUROFISH
INTERNATIONAL
ORGANISATION



Rural Support Service
Republic of Latvia

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Foreword



If we ask, how important is aquaculture today, the answer is unequivocal. It is an extremely significant sector, and global food security can no longer be conceived without it. It cannot be expected that natural fish resources will be able to recover and meet the growing consumer demand for fish and seafood. Fish and other species cultivated in aquaculture are increasingly sought by consumers, replacing once-popular protein sources of agricultural animal meat in their diets.

However, in Europe, including the Baltic region, the volume of local aquaculture production is quite small. It is not capable to fully meet consumer requirements. It has a limited ability of providing access to very fresh and high-quality local products in broader variety at an affordable price. Therefore, for the past few decades, the European Union has been actively discussing the paths to bring aquaculture out of its prolonged stagnation, increase production volume and diversity, ensure competitiveness with producers from other world countries, and actively employ innovation and science. There is also a focus on raising awareness about aquaculture products among the public and involving industry representatives as “aquaculture ambassadors” in this effort.

I believe that the contribution of the industry, scientists, technologists, educators, and marketing experts in the name of common interests is very significant. At present, the main goal should not be competition but fostering cooperation and raising the prestige, competitiveness, and sustainability of aquaculture production in the Baltic Sea region, securing a stable place in European markets and beyond.

Aquaculture faces numerous challenges, including geo-climatic situation (temperate climate) for production in open-air conditions, rising production costs, especially in recirculating systems, and small, inconsistent production volumes, insufficient for large buyers or retail chains. Further barriers arise due to producers' reluctance to form closer collaboration and a limited range of farmed species. So far, there has been limited engagement of scientific contribution and innovative solutions in stimulating the growth of aquaculture. Furthermore, I believe we could successfully implement cross-border and international cooperation projects to solve common problems, thereby stimulating and developing aquaculture production.

In all our countries, support is available from the European Maritime, Fisheries, and Aquaculture Fund to help address the challenges in the sector, involve the brightest minds and those willing to collaborate in implementing such projects. The key is to correctly identify obstacles to growth and capacity of aquaculture production.

I hope that this conference will provide new insights and inspiration to all of us, granting aquaculture in the Baltic region a more prominent place than it has had to date, and drawing the attention of aquaculture product enthusiasts beyond Latvia, Estonia, and Lithuania. I would like to express particular gratitude to the conference organizers and presentation authors for their active involvement, and welcome all the participants.

May the event be a great success!

NORMUNDS RIEKSTIŅŠ

Director of Fisheries Department,
Ministry of Agriculture of the Republic of Latvia

- 2 Foreword from the Director of the Fisheries Department of the Ministry of Agriculture of Latvia, NORMUNDS RIEKSTIŅŠ
- 6 **Baltic Inland Aquaculture Sector – Challenges and Opportunities**
- 6 Conference programme
- 9 The International Organization for the Development of Fisheries and Aquaculture in Europe (EUROFISH), MARCO FREDERIKSEN
- 10 **Session I — Plenary Session**
- 10 Aquaculture industry and economics in Latvia
- 11 Market situation of aquaculture products in Europe with a focus on Baltic Sea Region
- 12 Future pond systems with certified environmental benefits
- 14 The mission of the Institute of Food Safety, Animal Health and Environment (BIOR) in aquaculture development of Latvia
- 16 **SESSION II — BEST PRACTICE & EXPERIENCE STORIES**
- 17 An introduction to the new environmentally friendly and highly productive closed fish farming systems: A Guide to Recirculation Aquaculture – 2022 edition
- 18 Pond aquaculture – introduction of the new guide. Advances and recent developments in new species in ponds
- 19 Seawater-based RAS experience in Lithuania

20 Enhancing habitat restoration in the Baltic Sea through integrated low-trophic aquaculture: a novel approach to nutrient sequestration

22 RAS - how the world is rotating in Latvia

23 **SESSION III _____ EXPERIENCE STORIES**

23 Aquaculture experience story of “Kalatalu Härjanurmes”, Estonia

24 Evolution and adaptation in farming of salmonids for small enterprises: A case study of market development and strategic shifts (1994–2024)

26 The evolution of Lithuanian aquaculture: From traditional practices to organic farming

27 European Maritime and Fisheries Fund (EMFF) support in capacities building for aquaculture animals health and welfare in Lithuania

28 **SESSION IV _____ AQUACULTURE FOR HUMAN HEALTH AND ENVIRONMENT QUALITY**

28 Reduction of energy consumption within RAS

29 Utilizing waste streams from pond systems

31 Fish products for food - assessment of risks and benefits for human health

32 Notes

BALTIC INLAND AQUACULTURE SECTOR – CHALLENGES AND OPPORTUNITIES

7 November

Location: Hotel Jūrmala Spa & Conference Centre,
Jomas iela 47/49,
Address: Jūrmala, LV-2015, Latvia

8:00 Arrival of participants, coffee

8:30 Registration and placement of posters on poster panels

CONFERENCE OPENING

9:00 Opening remarks, **ARMANDS KRAUZE**,
Minister of Agriculture of the Republic of Latvia

9:10 Welcome address by **MARCO FREDRIKSEN**,
director of International Organization EUROFISH

SESSION I, PLENARY SESSION

9:20 Aquaculture industry and economics in Latvia. **NORMUNDS RIEKSTIŅŠ**, Ministry of Agriculture of Latvia, Fisheries Department

9:30 Market situation of aquaculture products in Europe with a focus on Baltic Sea Region. **FRANCESCA BARAZZETTA**, EUROFISH

9:45 Future pond systems with certified environmental benefits. **URBÁNYI BÉLA**, Hungarian University of Agriculture and Life Sciences

10:00 The mission of Institute of Food Safety, Animal Health and Environment (BIOR) in aquaculture development of Latvia. **AIVARS BĒRZIŅŠ**, institute BIOR

10:15 Q&A session

10:35 Coffee and poster session

SESSION II - BEST PRACTICE & EXPERIENCE STORIES

11:00 Recirculation aquaculture guide - introduction of the updated guide. Advances and recent developments in new species in RAS. **JACOB BREGNBALLE**, AKVA group

11:30 Pond aquaculture - introduction of the new guide. Advances and recent developments in new species in ponds. **URBÁNYI BÉLA**, Hungarian University of Agriculture and Life Sciences

12:00 Seawater-based RAS experience in Lithuania. **NERIJUS NIKA**, University of Klaipeda

12:15 Enhancing habitat restoration in the Baltic Sea through integrated low-trophic aquaculture: a novel approach to nutrient sequestration. **JONNE KOTTA**, Tartu university

12:30 RAS - how the world is rotating in Latvia. **LAURIS APSIS**, BlueCircle

12:45 Q&A session

13:00-14:00 Lunch

SESSION III - EXPERIENCE STORIES

14:00 Aquaculture practice, catfish rearing. **VLADAS VICKUNAS**, Akvapona

14:15 Aquaculture experience story of "Kalatalu Härjanurmes", Estonia. **MARTIN LIIV**, Härjanurme Kalatalu

14:30 Evolution and adaptation in salmonid farming for small enterprises: A case study of market growth and strategic shifts (1994-2024). **ARMANDS ROZE**, FAPS

14:45 Experience in organic carp aquaculture of Lithuania. **ROLANDAS MORKŪNAS**, National Aquaculture and Fish Product Processing Association of Lithuania

15:00 Q&A session

15:15-15:30 Coffee and poster session

SESSION IV – AQUACULTURE FOR HUMAN HEALTH AND ENVIRONMENT QUALITY

15:30 European Maritime and Fisheries Fund (EMFF) support in capacities building for aquaculture animals health and welfare in Lithuania. **DARIUS NIENIUS**, National Food and Veterinary Risk Assessment Institute

15:45 Reduction of energy consumption within RAS. **MICHAEL BECH**, Nordic Aquaculture Consulting

16:00 Utilizing waste streams from pond systems. **PIOTR ELJASIK**, West Pomeranian University of Technology in Szczecin

16:15 Fish products for food – assessment of risks and benefits for human health. **JĀNIS RUŠKO**, Institute BIOR

16:30 Q&A session

POSTER SESSION

17:00 Poster session

19:00 Welcome reception & dinner

8 November

9:30 Departure from hotel

10:30–14:00 Visit to the fish farm “Tome” and Aquaculture Research and Innovation Center (BIOR)

16:00 Return to hotel



MARCO FREDERIKSEN holds a master's degree in fishery technology from Aalborg University and a PhD in seafood traceability from the Technical University of Denmark. He has been working at EUROFISH since 2008. Since he joined the organization, he has been involved in project acquisition and execution, a vital source of the organization's funding, and the means to provide benefits to the EUROFISH

member countries. Before joining EUROFISH, he worked at DTU National Food Institute, a department at the Technical University of Denmark for several years with secondments to Japan and Australia. He developed the first sea packing system onboard fishing vessels to label and fully document fish in crates before sale (today - standard equipment worldwide). He also developed and tested/documentated the first internet-based traceability system for seafood in the world from fishing vessel to retailer. He has been coordinating several EU and other large projects within Fisheries and Aquaculture subjects in Europe.

The International Organization for the Development of Fisheries and Aquaculture in Europe (EUROFISH)

MARCO FREDERIKSEN

Director of International Organization for the Development of Fisheries and Aquaculture in Europe, EUROFISH

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The International Organization for the Development of Fisheries and Aquaculture in Europe (EUROFISH) is a non-profit intergovernmental organization that contributes to the development of the fisheries and aquaculture sectors in Europe - from harvest/catch to consumer. EUROFISH has thirteen member countries: Albania, Croatia, Denmark, Estonia, Hungary, Italy, Latvia, Lithuania, Norway, Poland, Romania, Spain, and Turkey.

EUROFISH is based in Copenhagen, Denmark, and publishes "Eurofish Magazine" that is distributed across Europe in printed as well as online format. EUROFISH is currently involved in several EU projects to develop the fisheries and aquaculture sector in Europe - visit www.eurofish.dk for more information.



NORMUNDS RIEKSTIŅŠ is a high level Latvian fisheries expert with extensive, long-standing experience in national and international fisheries management. He graduated from the University of Latvia Faculty of Biology in 1986 and has completed numerous professional trainings in fisheries technology, leadership, and EU-related matters. Riekstiņš has been actively involved in representing Latvia in international organizations, including the International Council for the Exploration of the Sea (ICES), the UN's Food and Agriculture Organization (FAO), the Northwest Atlantic Fisheries Organization (NAFO) and the North-East Atlantic Fisheries Commission (NEAFC). His career began as an ichthyologist in 1986, and from 1989, following the Latvian way to independence he has held multiple leadership roles in several ministries and the National Board responsible for fisheries sector in Latvia's Ministry of Agriculture, including his current position (since 2009) as the director of the Fisheries Department of Latvia's Ministry of Agriculture. Throughout his career, he has significantly contributed to development of fisheries' policy, resource sustainability, and international cooperation on fisheries' rights and environmental concerns.

Aquaculture industry and economics in Latvia

NORMUNDS RIEKSTIŅŠ

**Ministry of Agriculture of the Republic of Latvia,
Fisheries Department**

Normunds.Riekstins@zm.gov.lv

In this presentation, the author intends to give an overview of the situation of the Latvian aquaculture. The presentation includes a short review of the history of aquaculture, its place and meaning in the overall economic situation. Also, the main strong and weaker points of the current state of the Latvian aquaculture will be highlighted. The further development possibilities, current challenges and possibilities will also be touched upon in the current presentation.



FRANCESCA BARAZZETTA is a project manager at the EUROFISH International Organization. She has developed her proficiency in market analysis of seafood products working extensively with EUMOFA, an initiative of DG-MARE. She has experience in studying small scale fisheries livelihood and their adaptive capacity effected by climate change. She has collaborated with local stakeholders in the Mediterranean

to promote marine protected areas as nature-based solutions to climate impacts. Her experience also includes delivering various training sessions, both in person and via webinars. She holds a bachelor's degree in Natural Science from the University of Milan and a master's degree in Climate Change from the University of Copenhagen.

Market situation of aquaculture products in Europe with a focus on Baltic Sea Region

FRANCESCA BARAZZETTA, EVA KOVACS

International Organization for the Development of Fisheries and Aquaculture in Europe, EUROFISH

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The presentation will provide an overview of the market situation of aquaculture products in Europe with a particular focus on the Baltic Sea Region. As aquaculture continues to play a crucial role in meeting the growing demand for sustainable seafood, this region faces unique opportunities in providing a valuable and high-quality protein source, but also encounters challenges due to the rapidly changing environmental, social and economic conditions and the pressure from consumer demand. The presentation will encompass the recent trends in production, consumer preferences, and trade dynamics. By examining the competitive landscape and market drivers, this session will offer valuable insights for those interested in making the most of the changing market conditions in the EU, with a special focus on the Baltic Sea Region.



BÉLA URBÁNYI is a full-time professor at the Hungarian University of Agricultural Sciences. He holds a PhD degree in freshwater fish reproduction and fish genetics, and his academic doctoral (DSc) thesis was dedicated to aquaculture. His current professional interests are focused on general development of freshwater fish farming, practical implementation of innovation and R&D results, and the circular economy of aquaculture sector.

He has published his research results in 235 peer-reviewed journal articles, the number of independent citations to his articles to date: 3184, his Hirsch index is 28. He is a co-author of 6 utility model applications. Previously, he has been technical leader of two EU projects, currently leads one EU project, and a coordinator of 36 completed and 4 ongoing national R&D&I projects.

He is a member of several Hungarian and international organisations, and regularly participates in national and international expert work. Active participant in several national and intergovernmental development and innovation investments.

Future pond systems with certified environmental benefits

URBÁNYI BÉLA

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Future pond systems with certified environmental benefits are likely to focus on sustainable, efficient, and ecologically balanced approaches to water management. These systems can play a vital role in promoting biodiversity, water purification, and climate resilience. The key aspects of these future pond systems include:

1. Natural Filtration and Water Purification: Biofiltration systems and Phytoremediation.
2. Biodiversity and Habitat Enhancement: Ecological ponds and Wetland integration.
3. Stormwater Management and Climate Resilience: Rainwater harvesting ponds and Permeable ponds.

4. Aquaculture with Environmental Certifications: Sustainable aquaculture systems and Integrated multi-trophic aquaculture (IMTA).
5. Carbon Sequestration: Carbon-capturing algae ponds.
6. Water Efficiency and Recycling: Closed-loop water systems and Greywater ponds.
7. Renewable Energy Integration: Solar-powered aeration and pumps and Floating solar panels.
8. Water Quality Monitoring with IoT: Smart Pond systems and AI-driven management.
9. Green Certifications and Environmental Impact Assessment: Certified Pond systems and Impact monitoring and reporting.

These future pond systems would combine ecological design with modern technology, helping to address global challenges like water scarcity, biodiversity loss, and climate change, while contributing to sustainability and human well-being.



AIVARS BĒRZIŅŠ, DVM, PhD, is the Chair of the Scientific Board at Institute of Food Safety, Animal Health and Environment (BIOR) since June 2023, after serving as the institute's director from 2013 to 2023. He is a professor at the Latvia University of Life Sciences and Technologies, a vice-chair of the Senate of the Academy and a member of the Latvian Academy

of Sciences. His scientific career spans over 20 years, focusing on foodborne pathogens, molecular epidemiology, and antimicrobial resistance (AMR). He led key research during the COVID-19 pandemic and played a major role in establishing One Health research in Latvia.

The mission of the Institute of Food Safety, Animal Health and Environment (BIOR) in aquaculture development of Latvia

SANTA PURVIŅA, AIVARS BĒRZIŅŠ

Institute of Food Safety, Animal Health and Environment (BIOR)

aivars.berzins@bior.lv

Institute of Food Safety, Animal Health and Environment (BIOR) plays an important role in supporting the development and sustainability of aquaculture in Latvia. Institute's mission is to ensure the replenishment of natural fish resources, support aquaculture sector, and promote innovative approaches in fish health and welfare. Since aquaculture is one of the most important fields of work at BIOR, it is also closely interconnected with other fields such as veterinary sciences, food and environmental safety, and others. Fish plays an important role in its ecosystem, thus various aspects are studied to better understand the problems and challenges for fisheries and aquaculture. Institute's competences are rooted in its extensive experience in breeding various fish species juveniles for restocking and aquaculture needs. BIOR has broad experience in long-term maintaining artificial propagation of salmonid species, particularly through the hatchery "Tome" vital for compensating natural salmon population losses in the major Latvian river Daugava and in other rivers.

BIOR focuses mainly on applied aquaculture research, collaboration with other scientific institutions, and fostering innovation in the sector. Current research efforts are directed toward addressing challenges such as climate change,

antimicrobial resistance, environmental health and its impact to fish health. Institute collaborates with various organizations and stakeholders in Latvia and abroad to adopt best practices in fish farming and apply cutting-edge technologies for disease control and stock improvement. Recently established “National Innovation Infrastructure Center for Aquaculture” opens new horizons for cooperation with aquaculture developing further technologies and innovation. BIOR’s research extends its efforts to improve fish health and boost production efficiency, ensuring the industry’s sustainable growth while addressing the challenges posed by environmental changes.



JACOB BREGNBALLE is sales director for the Land Based Division at AKVA group since 2007. He is a well-known expert in recirculation aquaculture systems (RAS) and holds a MSc degree from Copenhagen University, Denmark. He has a strong background from designing and engineering aquaculture projects around the world, spanning 40 years. He has gained extensive experience from research and development projects working closely with universities and institutions in several programs for aquaculture. He has strong commercial background, acquired in managing his own land based and cage farming business for 20 years before joining AKVA group. Furthermore, he has worked as an international aquaculture consultant for the FAO under the United Nations. He is a Danish citizen and lives near Copenhagen in Denmark.

Positions in professional bodies:

- Chairman of the Association of Danish Aquaculture Technology Suppliers, 2010–2018
- President of The Danish Aquaculture Producers Organization, 1999–2008
- Appointed Member, SCIENCE, Educational Board, Copenhagen University, 2013–2017
- Advisory Board Member DTU Aqua, Danish Technology University, 2008–2016
- Board Member, The Danish Agricultural Council, 2005–2008
- Appointed Member, Educational Board, Danish Technology University, 2006–2010
- Board Member, The Danish Fisheries Research Inst., DIFRES, 2006–2008
- FEAP App. Member. EU Adv. Comm. of Fisheries and Aquaculture (ACFA), 2006–2008
- Member of the Danish National Committee for Marine Fish Farming, 2002–2004

- Appointed Member of the Danish EU Aquaculture Fund Committee, FIUF, 1999–2008
- Appointed Member, Committee of European Convention on Farmed Fish, 1999–2008
- Appointed Member, Animal Feed Committee, Ministry of Food, 1997–2005

An introduction to the new environmentally friendly and highly productive closed fish farming systems: A Guide to Recirculation Aquaculture – 2022 edition

AKVA GROUP

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The guide focuses on the techniques for the conversion from traditional farming methods to recirculated aquaculture and advises the farmer on the pitfalls to be avoided along the way.

Environmental restrictions to minimize pollution from hatcheries and land-based aquaculture facilities in northern European countries have prompted a rapid technological development, investment and innovation in recirculation systems in many parts of the world. Recirculation secures a higher and more stable aquaculture production with fewer diseases and better ways to control the parameters that influence the growth and wellbeing of farmed fish.

Key features of the guide:

- Assisting farmers to convert to recirculation aquaculture
- Introducing the technology and the methods of management
- Advising on good practice shifting to recirculation aquaculture
- Specifying running a recirculation system, staff education and training
- Providing case stories from different recirculation projects

The guide is based on the experience of one of the foremost experts in this area, Jacob Bregnballe from the AKVA group, and is widely used for introductory support for fish farmers, project developers, government officials and other people getting acquainted with the technology of recirculation fish farming systems.



Pond aquaculture – introduction of the new guide. Advances and recent developments in new species in ponds

URBÁNYI BÉLA AND MARCO FREDERIKSEN*

Hungarian University of Agriculture and Life Sciences-Hungary

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A new EUROFISH industry guide on “Pond aquaculture” is to be published at the end of 2024.

Based on ancient traditions, the production technology of fish farming in ponds has evolved significantly in recent years. This has been generated partly by consumer demands and expectations, partly by the economic environment and competition from the food industry in the sector.

Pond fish farming is carried out in a natural environment in purpose-built fish-ponds. The efficiency and success of production are seriously affected by weather conditions, and it is the responsibility of the fish farmer to manage these impacts and mitigate adverse effects.

The effects of climate change are already being felt in pond fish production. This production system is facing severe challenges; therefore, informed responses and improvements will fundamentally determine the sustainability of fish production in ponds.

It is impossible to predict what the future holds for pond fish farming. However, the requirements for rational and wise management of natural values and circular economy fit well with the general technology of pond fish production.

Pond fish farming certainly has a right to exist, however, the answers to the challenges must be found together. This guide has been created to help find those answers, and we trust that thinking together will lead to real solutions.



NERIJUS NIKA is a senior researcher at Marine Research Institute of Klaipeda University and the head of Fisheries and Aquaculture Laboratory. He holds a PhD degree in Ecology and Environmental Sciences defended on reproductive ecology of sea trout. Most of his career is based on fisheries biology and river ecology, while during the last 6 years he is mostly involved in aquaculture projects and activities in RAS technology research and development.

Seawater-based RAS experience in Lithuania

**NERIJUS NIKA, GINTAUTAS NARVILAS, JONAS LELYS,
MARIUS DIADYK, GERDA PETREIKYTĖ**

**Fisheries and Aquaculture Laboratory of Marine Research Institute,
Klaipeda University**

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Recirculating Aquaculture Systems (RAS) are advanced aquaculture technologies that offer a sustainable method for fish or other aquatic organisms farming. In Lithuania, the aquaculture is traditionally freshwater, mostly based on cyprinids production in pond systems and African catfish in RAS sector. However, modern Fisheries and Aquaculture Laboratory of Marine Research Institute of Klaipeda University is developing and optimising marine RAS technology. Laboratory have unique access to brackish Baltic Sea water which is applied in experiments with eurihaline fish species like rainbow trout. While potentialy cultivation of such species in brackish RAS can result in better nutritional profile, better flavor and firm texture of meat, faster growth rates, the practical sea water application is restricted due to limited access and salinity of the brackish Baltic Sea. From the other hand, there are very good geothermal resources in western Lithuania with highly mineralized brine, which could be used as a source for artificial seawater preparation.

Saltwater RAS for whiteleg shrimp development and optimisation, rainbow trout and Nile tilapia cultivation in brackish conditions, geothermal brine-based artificial sea water application experience, results and perspectives will be presented.



JONNE KOTTA is an active member of many of the world's leading research communities, specializing in disciplines such as the ecology of marine algae and benthic invertebrates, species interactions, spatial modelling, alien species, and linking ecosystem functioning to services, the bio-economy and climate change. His work bridges theoretical science with practical management through various modelling techniques.

He is currently developing regional web-based spatial decision support tools to promote the blue bioeconomy (e.g., algae, mussel farming and multi-purpose solutions), support mitigation processes (e.g., assessing cumulative impacts of management scenarios, quantifying habitat restoration potential) and improve marine management and maritime spatial planning decisions. This expertise is essential for current management plans and is likely to lead to clearer perspectives and strategies for the future.

Enhancing habitat restoration in the Baltic Sea through integrated low-trophic aquaculture: a novel approach to nutrient sequestration

**JONNE KOTTA, ANTONIO AGUERA GARCIA, ILJA MALJUTENKO,
ANTS KAASIK, MIHHAIL FETISSOV, ØIVIND STRAND, MORTEN SKOGEN**

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The urgent challenge of eutrophication in the Baltic Sea requires innovative solutions beyond traditional nutrient management strategies. This study explores the untapped potential of low-trophic aquaculture as a nature-based solution (NBS) for nutrient sequestration, focusing on the integration of mussel and seaweed farming. Despite the recognized benefits of such aquaculture systems in terms of nutrient sequestration, their application has been limited by the lack of robust assessment tools. To address this gap, our research uses environmental data from the pioneering farm combining the native drifting brown seaweed, *Fucus vesiculosus*, and the blue mussel, *Mytilus trossulus*, in the low salinity waters of the Baltic Sea. By incorporating Dynamic Energy Budget (DEB) models within a 3D hydrodynamic framework, our farm model assesses the sequestration

capabilities of these low-trophic species. Results show significant improvements in water clarity and adjacent habitat restoration, highlighting the effectiveness of the method in managing local nutrient accumulation. In addition, the integration of the farm model with a fish farming model demonstrates the viability of net-zero emission fish farming systems. This comprehensive approach promises to improve coastal water quality, and, furthermore, paves the way for more sustainable food production systems. Our results argue for the wider adoption of low-trophic, multiple-use farming solutions in the Baltic Sea and similar environments worldwide, and highlight the critical role of innovative aquaculture in addressing today's environmental challenges.



LAURIS APSIS is the founder and co-owner of the RAS company – Blue Circle SIA (www.zivsuzledus.lv). He has 10 years of experience in banking industry and 10 years' experience in sales industry.

RAS – how the world is rotating in Latvia

LAURIS APSIS

Blue Circle

lauris@bluecircle.lv

This presentation explores the journey of the Latvian recirculating aquaculture system (RAS) company Zivs uz Ledus. Lauris Apsis, from Blue Circle SIA, will provide insights into the challenges and milestones of the company in its initial years, navigating the complexities of RAS technology. The talk will address the company's current position in the global fish market and the competitive landscape. Additionally, Lauris Apsis will share a personal and industry-wide "to-do" list, outlining the steps necessary for continuous innovation and growth in the aquaculture sector. Join us to learn how Latvia is making waves in sustainable fish farming.



MARTIN LIIV. The Chairman of the Board of the Estonian Fish and Crayfish Farmers Association, with over 18 years of experience in freshwater aquaculture. Specializes in species like noble crayfish, trout, carp, sturgeon, pikeperch and has done trials with catfish farming. The COO of family-owned Kalatalu Härjanurmes fish farms, focusing on aquaculture technology, culture, and sales.

He holds a MSc degree in Aquaculture from the Estonian University of Life Sciences and has furthered his knowledge at Ghent University and University of Tartu.

Aquaculture experience story of “Kalatalu Härjanurmes”, Estonia

MARTIN LIIV

Kalatalu Härjanurmes

martin@kalatalu.ee

Kalatalu Härjanurmes is a family-owned aquaculture farm that has been in development since 1976, spanning 76 hectares. The company also manages a cold-water flow-through trout farm. The main species grown by the company include rainbow trout, common carp, and sturgeon, with additional efforts in raising noble crayfish, pikeperch for restocking, and trials with catfish farming. The fish are raised using a mix of technologies, from traditional earth ponds to modern recirculation aquaculture systems (RAS). While rainbow trout is hatched in RAS and grown to market size in river-based flow-through farms, carp and pike-perch are cultivated semi-intensively and extensively in ponds.

Currently, both live and processed fish are offered for sale by the company. While the Estonian government aims for a near tenfold increase in aquaculture output by 2030, the company remains cautious about making large-scale investments due to the fragile economic climate. With 10 consecutive quarters of poor economic performance, the company anticipates challenges in consumer purchasing power, especially as fish is considered a premium food product. Additionally, shifting environmental policies, which may render past investments obsolete, further complicate long-term planning.



ARMANDS ROZE (MSc Biol.) is the founder and leader of SIA FAPS (Trout Breeding and Research Limited Ltd.), which has been operating since 1994. With over 30 years of experience in breeding and raising 11 different salmonid species and their hybrids, Armands has made significant contributions to aquaculture. His work includes breeding European grayling, brook trout, Arctic charr, lake trout, brown trout, sea trout, whitefish, splake, sparcctic char, and tiger trout. He has successfully led projects aimed at enhancing natural populations of brown trout and European grayling in Latvian rivers. In addition to his extensive work in fish farming, he has spent 13 years in scientific research of Latvian rivers and lakes. Currently, SIA FAPS focuses on producing rainbow trout juveniles for the Estonian market and provides consultancy services.

Evolution and adaptation in farming of salmonids for small enterprises: A case study of market development and strategic shifts (1994–2024)

ARMANDS ROZE

FAPS

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Between 1994 and 2000, Ltd “Faps”. company focused on developing a niche in rainbow trout farming, primarily supplying portion-sized fish to restaurants. During this period, a breeding stock of rainbow trout was established, and the first experiments in breeding of wild grayling and brown trout were initiated. These efforts aimed for restocking needs or creation of natural populations in river basins where these species have weak populations or disappeared. The favourable market conditions supported both the demand for rainbow trout and the natural population enhancement efforts for grayling and brown trout.

From 2000 to 2014, the company shifted its focus away from market-sized fish production to breeding fish fry for restocking of natural populations. This period was marked by experimentation with various salmonid species and hybrids, and the development of rainbow trout fingerlings production for retail. However, the small-scale nature of the aquaculture business made it challenging

to sustain market fish production. Over time, restocking efforts began to decline, and the company gained valuable experience through the shift. The key learnings included the effectiveness of using eyed eggs or larvae for European grayling population enhancement, and fry up to 0.5 g for brown trout, while one-summer-old fry proved less efficient and resource-intensive.

From 2014 to 2024, there was a significant phase of change. Investments made by the company have substantially increased production and opened doors to the Estonian market. Today, despite the drastic climate changes that challenge cold water fish farming, cooperation with Estonian fish farms continues to develop step by step.



ROLANDAS MORKŪNAS graduated from Vilnius University in 1993 with a degree in biology, specializing in ichthyology. He worked as a manager at a carp breeding farm and later served as a chief specialist in a state fisheries company responsible for breeding Atlantic salmon and brown trout.

His extensive experience in managing and operating Recirculating Aquaculture Systems (RAS) contributed to the modernization of other state-owned fisheries, allowing for the successful breeding of grayling, eels, sturgeon, and over 10 other species critical to Lithuania's nature conservation and restocking efforts.

From 2004 to 2019, Morkūnas inspected Lithuanian organic fish farms, gaining significant expertise in organic aquaculture. Since 2019, he holds the position of director at the National Association of Aquaculture and Fish Products Producers, continuing his commitment to advancing the field of aquaculture in Lithuania.

The evolution of Lithuanian aquaculture: From traditional practices to organic farming

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The report will provide an overview of the history of Lithuanian aquaculture, focusing primarily on fish farming in open-air ponds, highlighting key fish species, products, the sector's growth and development trends, explaining the formation of the National Aquaculture Association and its main objectives.

In 2024, the National Aquaculture Association took the initiative in development of ecological aquaculture in Lithuania, achieving significant results. The current presentation will offer extensive data on this subject and discuss the progress of organic aquaculture in Lithuania today, particularly with the financial support of the European Union for organic production during the period 2021-2027.



DARIUS NIENIUS is the deputy director of the National Food and Veterinary Risk Assessment Institute in Vilnius, Lithuania. He is responsible for the biosafety of the laboratory. He is the person in charge of the EU-funded project “Capacity building for aquaculture animal health and welfare” at the institute.

In his day-to-day activities, he often has to consult and advise fish farmers on fish health and welfare issues.

Darius Nienius, who has a veterinary education, belongs to the Association of Lithuanian Veterinary Surgeons. Before joining the institute, he headed the Department of Fisheries at the Ministry of Agriculture for four years.

European Maritime and Fisheries Fund (EMFF) support in capacities building for aquaculture animals health and welfare in Lithuania

DARIUS NIENIUS

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According to many scientists, veterinary specialists, fish farmers, regional and international organizations, fish health and welfare issues constitute significant obstacles to the development of aquaculture in the European Union (EU).

They affect the economic viability of the sector, as well as its social license to operate, environmental sustainability, and alignment with EU regulations and consumer expectations. Addressing these issues through improved practices, technological innovation, and robust regulatory frameworks is essential for the future growth and sustainability of EU aquaculture.

Challenges related with fish health and welfare impact aquaculture sector’s growth and sustainability due to several reasons:

1. Disease management
2. Welfare standards
3. Environmental impact
4. Economic impact
5. Innovation and research needs

In this presentation, I would like to share with you our experience, challenges and achievements which we faced during implementation of the EMFF-supported project “Capacity building for aquaculture animal health and welfare in Lithuania”.



MICHAEL BECH has a total of 34 years working experience with aquaculture including a PhD, 8 years' experience from Southeast Asia, several years as hatchery manager and 20+ years with Recirculation Aquaculture Systems (RAS) working for AKVA group, among others, Veolia. Nordic Aquaculture Consult (NAC) was established to support clients who want to establish aquaculture projects globally. The main driver is to guide project developers through all steps of any aquaculture project. NAC was founded in 2020, and has been busy ever since with aquaculture projects worldwide. His continuous desire to follow the new development in aquaculture has resulted in a very comprehensive base of knowledge, a huge network of people and the ability to communicate with anyone from fish farmer to scientist.

Reduction of energy consumption within RAS

MICHAEL BECH

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One of the challenges of Recirculation Aquaculture Systems (RAS) is to reduce the consumption of electricity. The presentation will focus on the main contributions of power consumption in RAS such as lift pumps, oxygenation, degassing, chilling, etc. and the approaches to reducing the power consumption by design, location of the farm and selection of species.

The presentation will also highlight some specific design features from various RAS suppliers and the effect on power consumption in relation to production measured as kWh per kg produced fish per year.



PIOTR ELJASIK is a postdoc researcher at the Faculty of Food Sciences and Fisheries, West Pomeranian University of Technology, Szczecin, Poland (ZUT in Szczecin) with 8 years of experience in aquaculture. His research helps to achieve sustainability in freshwater aquaculture sector. Previously, he has been actively participating in two H2020 projects (GAIN and SEAFOOD^{TOMORROW}), and currently works in Horizon

Europe projects (SAFE) and Sustainable Blue Economy Partnership (BLUEBOOST), focused on valorisation of aquaculture side streams to foster inland aquaculture viability. Besides feeling the rush of science and trying to obtain the answers to sustainability problems, he gets adrenaline from road cycling. He also loves nerdy conversations with fellow researchers about science communication and social media presence of science.

Utilizing waste streams from pond systems

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Globally, more than a half of the 94.4 million ton annual seafood supply comes from freshwater aquaculture, which alone shows the potential for further intensification and can significantly contribute to improving global food security. In European Union (EU), production has been stagnating for the last few years, and freshwater aquaculture products are not on the forefront of species portfolio, yet the inland aquaculture sector shows highest potential for ecological intensification. Semi-intensive pond aquaculture faces numerous challenges (e.g., soaring production costs, subsidies-dependent production) that significantly affect profitability of the farms. To overcome this difficult situation, farmers must diversify produced species or seek for solutions to use waste streams already available at a farm. At the same time, to mitigate the environmental impact of common carp (*Cyprinus carpio*) farming, producers adhere to official regulations that limit carp production to 1500 kg increased biomass per hectare, considering the nutrient release effects. One of the objectives of SAFE project is to minimize

the impact of pond farm on environment and improve the viability of the freshwater aquaculture by valorising solid and liquid waste streams from aquaculture systems. A good example of solid waste stream are suspended solids, widely available in discharged water, when ponds are annually emptied to harvest market-size fish for the market or to transfer fish between the ponds for grading or wintering. Emptying the ponds is a traditional on-farm procedure. However, it releases a significant pulse of organic and inorganic matter to the creeks downstream the farm. EU Water Framework Directive targets also the nitrogen and phosphorus reduction in open water systems. Therefore, to meet the reduction targets, liquid waste streams from common carp were valorised to produce watercress (*Nasturtium officinale*) and duckweed (*Lemna* sp.). This talk will introduce circular economy approaches to reduce the environmental impact and improve the viability of the freshwater aquaculture.



JĀNIS RUŠKO is a senior expert in Food Safety Risk Assessment at the Institute of Food Safety, Animal Health and Environment (BIOR).

With extensive experience in evaluating food safety risks, he participates in various national and EU-level projects focused on assessing chemical hazards in food, including contaminants like heavy metals and dioxins. His expertise encompasses the development of comprehensive risk assessments and communication with stake-holders to ensure food safety across different sectors.

Fish products for food – assessment of risks and benefits for human health

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Fish are a valuable source of essential nutrients such as omega-3 fatty acids, vitamin D, iodine, and selenium, which are vital for cardiovascular health, brain development, and immune function. Consumption of 1-3 servings per week, particularly of fatty fish like salmon and mackerel, is associated with reduced risks of cardiovascular disease, dementia, and overall mortality.

However, fish also contains environmental contaminants like methylmercury, dioxins, and PFAS, which pose health risks, particularly for vulnerable populations like pregnant women and children. Recent assessments, including Norway's 2022 risk-benefit analysis, indicate that the health benefits of consuming fish at recommended levels outweigh the risks for most age groups. Contaminants are of greater concern in larger, predatory fish species such as tuna and swordfish, where exposure limits may be exceeded.

To optimize benefits while minimizing risks, it is advised to consume a variety of fish, focusing on smaller, less-contaminated species. Our ongoing GreenAgroRes project (No. VPP-ZM-VRIIIILA-2024/1-0002) evaluates risk-benefit profiles of inland and smoked fish, enhancing dietary recommendations. Additionally, the Total Diet Study (TDS, No. 24-00-S0INZ03-000041) collects data on household consumption patterns and contaminant exposure, providing comprehensive insights to support population-specific health guidance, especially considering fish intake.

