

JANUARY 2026

Fish Farmer

TILAPIA

Looking at two case studies in
Egypt and Saudia Arabia

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spark UK seafood revolution?

Are Spaniards giving up
their favoured seafood
for the pink fish?

Iceland

How are politics impacting its fish farming prospects?

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Editor's welcome

WELCOME to the first Fish Farmer of 2026, and Happy New Year! As another year in aquaculture kicks off, politicians are making their presence felt in Scotland and Iceland.

In Scotland, two reports looking into the economic impacts of Scotland's salmon farming industry were published this winter, but with contrasting conclusions. Sandy Neil explores the findings from both, to help you decide.

Meanwhile, Iceland's star may be on the rise, as it looks to be one of the top five Atlantic salmon producers in the next decade. But, having produced a major report on the future of fish farming last year, the Icelandic government has already signalled the direction it wants the industry to take. Vince McDonagh asks how Iceland's politics are affecting its prospects for fish farming.

And something big is happening in Norwegian aquaculture. Benedikte Ranum looks at why the Norwegian government is promoting closed containment now, and the potential impact these new structures could have on the entire fish farming sector.

Elsewhere in the magazine, Vince McDonagh asks why Spanish consumers are eating less seafood – but can't seem to get enough of the pink fish – and he talks to researchers at the University of Exeter to find out if the development of British King Prawn land-based farms could potentially signal the start of a seafood revolution.

On the international front, we hear about two case studies showing cutting-edge tilapia farming in Egypt and the Middle East.

And in her column this month, Nicki Holmyard explains why the new UK Coastal Growth Fund has failed to impress the fishing and aquaculture industries in Scotland, and why low trophic aquaculture should be prioritised in the EU budget.

We hope you enjoy reading this month's issue, and wish you a safe and successful 2026.

Best wishes
Susan Windram

Susan Windram

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Cover: Nile tilapia fish
swimming.

Photo: Adobestock

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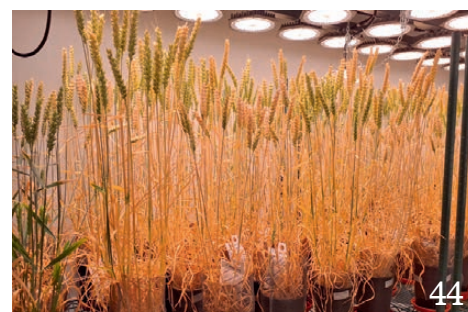
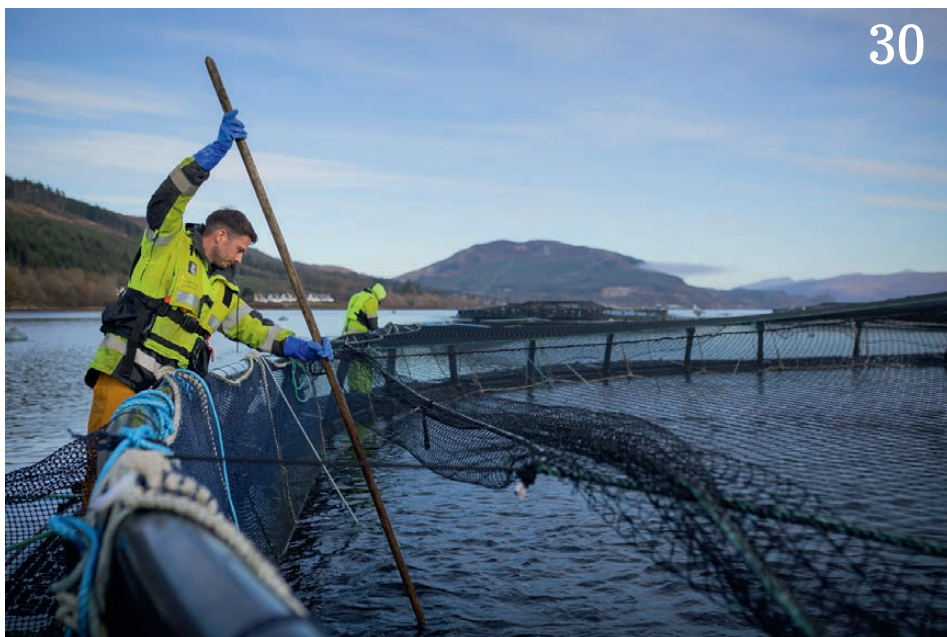
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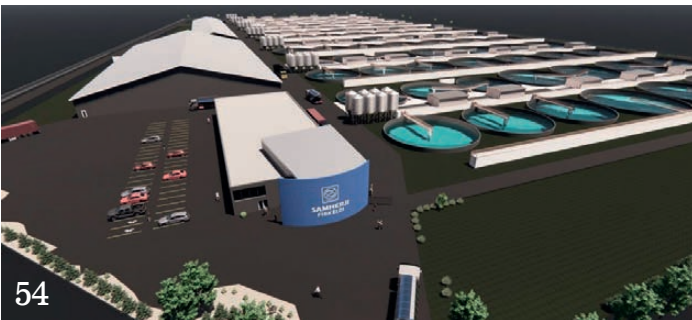
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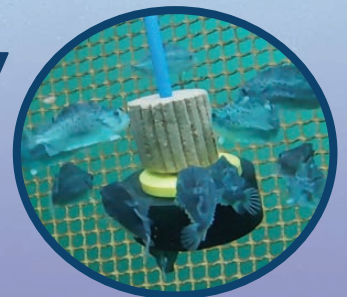
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England announces intention to improve farmed fish welfare

AN Animal Welfare Strategy for England has been published by the Department for Environment, Food and Rural Affairs that will see the government proposing, for the first time, to consult on introducing standards for fish slaughter.

The measure, to be implemented by 2030, would include a proposal to ban boiling lobsters alive, recognising their capacity for pain, and would also apply to crustaceans and cephalopod molluscs, including octopuses, all of which are recognised as sentient beings under British law.

In the foreword, The Rt Hon Emma Reynolds MP, Secretary of State for Environment, Food and Rural Affairs, and Baroness Hayman of Ullock, Parliamentary Under-Secretary of State for Biosecurity, Borders and Animal Welfare, confirm the government's commitment, "to delivering the most ambitious animal welfare programme in a generation.

"We sincerely thank everyone who took the time to contribute their views and expertise. This collaborative approach – bringing together government, industry, scientists, charities and civil society organisations – will continue throughout implementation, because lasting change requires shared commitment and collective action.

"Rather than piecemeal legislation, we will take a more strategic approach, one that targets intervention where it's most needed. This means tighter regulation where standards are weakest, effective enforcement, and working with the sector to provide support where they need it."

The paper, published on December 22, sees the government proposing, for the first time, to consult on introducing standards for fish slaughter: "There has been growing attention paid recently to the welfare of farmed fish, including those raised using recirculating aquaculture systems ... as well as calls for new legislation to set down detailed requirements at the time of killing. Whilst existing legislation on the protection of animals at the time of killing requires that farmed fish be spared avoidable pain, distress or suffering during their killing, unlike terrestrial livestock, farmed fish have no further detailed protections in domestic law (such as no



Above: Trout

requirement to stun fish pre-slaughter).

"A joint government and industry working group on farmed trout has been exploring options for more detailed welfare at killing requirements for farmed fish. This co-design work has made good progress. To increase the protections, detailed requirements on killing farmed fish should now be brought into legislation.

"We also want to work with stakeholders to build the evidence base as to how fish can be farmed to ensure their welfare is safeguarded."

Following the publication of the paper, the RSPCA welcomed the news, saying the measures could be an "important first step" in farmed animal welfare.

RSPCA Head of Public Affairs David Bowles said: "Lower welfare farming is the single biggest animal welfare issue we face in the UK and around the world. The government's new strategy sets us on an important path to address some of the cruel practices which cause pain and suffering to millions of animals every year.

"This plan will need to be backed by strong laws and enforcement and, where necessary, trade solutions, as well as support for the farming industry, to ensure it delivers real change for animals."

Inverlussa takes delivery of new hybrid support vessel

THE latest addition to Scotland's aquaculture fleet is a 25-metre hybrid support vessel, delivered to Inverlussa at the beginning of December 2025.

Built by Macduff Shipyards, the vessel has been named the *Naomi Jennifer*. It has been designed to meet high environmental and operational standards, incorporating modern hybrid technology, and increased lifting capability.

The accommodation has also been built to a very good standard.

Naomi Jennifer is fitted with IMO Tier 3-compliant engines, supported by a hybrid system that can store electrical energy for use during operations. This contributes to reduced fuel consumption, lower emissions, and quieter running.

Inverlussa says *Naomi Jennifer* has been developed in response to the

increasing use of larger and heavier equipment on modern fish farming sites. These demands require more power, additional bollard pull, and higher lifting capability. The vessel has been designed to support these requirements, and is equipped with upgraded cranes, additional thrusters, and the latest SHM deck equipment to assist with safe and efficient anchor handling, towing, and general farm operations.

Crew welfare has remained an important focus, and the vessel offers



Above: The *Naomi Jennifer*

five ensuite cabins, with significant attention given to reducing noise in the accommodation areas during operations, creating a quieter and more comfortable environment for crew onboard.

Ben Wilson, Managing Director of Inverlussa Marine Services, said: "We are pleased to welcome *Naomi Jennifer* into the fleet. She represents a steady progression in our investment in modern and environmentally-responsible vessels.

"Macduff Shipyards has delivered a very good build, and this project reflects the value of our ongoing partnership.

"The vessel will strengthen our ability to support customers across a wide range of operations while continuing to provide a safe and dependable working environment for our crews."

David Richard McCarthy: Tribute

FORMER Managing Director of Marine Harvest, David Richard McCarthy, has died.

He passed away on 3 December 2025. Mr McCarthy was MD of Marine Harvest from 1988-1994.

As witness to the impact he had on the business and its people, the tributes that flowed for him at the time of his funeral were numerous and enlightening.

“He was an inspiring version of a senior leader: authentic and engaging.”

“Always charismatic and affable even in the most difficult times.”

“All of us at Marine Harvest owed him a big debt of gratitude for his decisive leadership over a number of years.”

“He will be remembered not only for taking the business forward, and establishing it as the world leader, but also for the manner in which he did so, with a wonderful mixture of humour, compassion and, above all, incisive thinking.”

David McCarthy took over as Chairman of Marine Harvest, Unilever’s aquaculture enterprise, in 1988 at a time when the business was experiencing significant losses. Prior to arriving at the company, David had enjoyed a wide and distinguished career within Unilever,



Top right: David inspecting hatchery tanks at Inchmore Above: David Richard McCarthy

which he had joined in 1961 straight from Oxford University and National Service.

Starting in Elida Gibbs he moved swiftly through the ranks to become Marketing Director. He was then promoted to Chairman of Unilever Malaysia, where he swiftly made his mark, before further promotion to Chairman of Unilever Chile. That was where he first became involved with salmon farming, as Marine Harvest were proposing to set up Atlantic Salmon farms in the country.

As chairman of the local company, he swiftly became enthusiastically committed to the project. A number of key staff had been sent to Chile from Scotland, and David provided them with all the support that was necessary to bring the project to a relatively swift conclusion, with the very successful transfer of the technology.

The impact of his arrival in Scotland in 1988 cannot be overstated; fish health issues and an over-supplied international market had resulted in troubling financial results. At the time Marine Harvest had around 30 sites on the west coast of Scotland.

In an interview with Fish Farmer Magazine for Mowi’s 50th anniversary special, published in 2015, David said: “When I joined things were very problematic. Marine Harvest had a dominant position within the Scottish industry, but the company had been expanding rapidly and had all the problems associated with that. I felt that my remit was, effectively, to turn the company around.”

What David brought to the company was a wealth of experience of managing fully-integrated businesses comprising factories, distribution, marketing and sales. So, he was quick to grasp the fundamentals of salmon farming and the problems the company faced.

In managing the business over seven years, David proved to be an inspiring boss, in the



sense that the whole management team and staff were happy to follow his lead.

The reason was, and is, clear. Firstly, he was an incisive thinker and rarely failed to see the wood for the trees; he was sympathetic and compassionate to all who worked with him, which, combined with his easy nature and a wonderful sense of humour, made him a man with whom it was good to be around.

The consequence of this, plus a bit of luck that usually surrounds success, he turned the company completely around, so that when it came time to sell the business in 1992, the company was the leading salmon farmer in the world and poised for further achievements.

The key to turning the company around was, as David said: “a matter of getting out and speaking to the troops. I was also helped by having very good people, men such as my colleagues on the Board, John Lister and Angus Morgan, and Ralph Baillie and Steve Bracken on the ground.”

David left Marine Harvest in 1995 when Booker McConnell bought the business, having decided to retire.

David McCarthy’s funeral took place on 16 December 2025.

• With thanks to Angus Morgan for his contribution to this article.

Bakkafrost to appeal over Lewis planning decision

BAKKAFROST Scotland has said it will lodge an appeal after planning consent was refused last month for its proposed salmon farm in North Gravir, off the east coast of the Isle of Lewis.

A spokesperson for the company said: “We are disappointed by the Planning Board’s decision and intend to appeal. Bakkafrost has a long and proud history of operating in the Western Isles. We have engaged extensively with stakeholders and carefully considered all feedback. This development would support the long-term sustainability of our operations in the area.”

The company had been consulting on the proposed farm, but last month, the planning board of the local authority, Comhairle nan Eilean Siar, said the company “had failed to demonstrate that the proposed development would not result in an unacceptable exclusion of commercial fishing activity from a historically important and economically productive fishing ground”.

The decision overturned a recommendation of approval for the development, subject to conditions, by planning officials.

The Western Isles Fishermen’s Association (WIFA) had lobbied against the proposed farm, arguing that its location would restrict access for its members to important fishing grounds.

WIFA said the development would impose the biggest ever loss to the Scottish fishing industry of prolific commercial fishing grounds

that have been harvested sustainably for generations, and that the North Gravir site “has consistently provided large volumes of prawns, scallops, and brown crab that are all landed locally, creating long-term sustainable employment opportunities both at sea and ashore at the modern MacDuff shellfish factory that has been built at Goat Island at a cost of £3 million.”

The North Gravir farm would have comprised one group of five pens, each of 200-metre circumference, arranged in one row, with a linked feed barge.



Photo: Bakkafrost Scotland

Above: The North Gravir

NEWS IN BRIEF

Mowi's Salmon Wagon rolls on

MOWI Scotland's fundraising Salmon Wagon (pictured) has raised over £22,000 for good causes since it was launched. The



initiative brings Scottish salmon to local festivals and events, raising funds for community causes across the country – and beyond. In total, the Salmon Wagon has attended almost 40 events and served over 5,500 portions of salmon. In July 2025, the Salmon Wagon ventured beyond Scotland for the very first time, making its debut in Ireland at the Eyeries Family Festival in County Cork.

SSQC becomes Shetland Analytical Services



SHETLAND-BASED analytical services company, SSQC, will now be known as Shetland Analytical Services. The business has also increased its laboratory team by 30%, with two laboratory technicians, two analysts and a laboratory assistant joining the team.

Managing director, Steven Laidlaw, said: "Shetland Seafood

Quality Control – SSQC – was rooted in the seafood sector, with a particular focus on the aquaculture industry. Today, our business has evolved to serve a much wider UK market seeking a range of microbiology, chemistry, and water quality testing ... at the same time, we are growing our team to meet the increased demand for our services.

He continued: "The next major step is that we are working towards employee ownership. We expect to share more news on that early in the new year."

Billy Baa set for May stocking

SCOTTISH Sea Farms' Billy Baa site, to be located to the west of South Whiteness, Shetland, is set to launch in May, the company has said. SSF has consent for nearly 4,100 tonnes of fish and the development will be made up of nine 160-metre pens – the first of their kind in Shetland –

as well as one at 120 metres.

The development represents a total investment of £7.5 million, including a £1.8m workboat, which is being built by MacDuff Ship Design.

At a depth of 45 metres it will also be one of the deepest fish farms operating off Shetland.



Chris Hempleman: tribute



Above: Chris Hempleman

AVETERAN of the fish farming industry, Chris Hempleman, sadly passed away shortly before Christmas, following a brief period in hospital.

Chris, who worked for Otter Ferry Seafish Ltd, based in Tighnabruaich, Argyll, was on the point of retirement, having spent all of his working life in the fish farming industry.

He will be fondly remembered by many.

Having studied Fresh Water Fisheries, Chris joined Glenkens Fish Farming LTD, before moving to Otter Ferry Salmon for the first time. He had three spells at Otter Ferry, interspersed with career-development opportunities at Mull Salmon Ltd, feed suppliers EWOS, seafood software provider Maritech, as well as Scottish Sea Farms.

Between 2008 and 2018, Chris worked for Scottish Sea Farms as a production biologist, heading up the use of cleaner fish for the control of lice.

In 2018, he re-joined Otter Ferry Seafish Ltd as Production Director, overseeing the production of both lumpfish and wrasse for the salmon industry. Chris brought with him the best practices of working for a big company, and combined them with the strengths and dynamism of a small company.

With over 40 years' experience in the industry, Chris saw its extraordinary progress, and contributed greatly to its success.

We at Otter Ferry were very privileged to have Chris working with us for more than 50% of his career.

He was part of the team that oversaw the development of Otter Ferry, including land-based salmon, the broodstock programme, and sale of salmon eggs at home and abroad, the development of fresh water cages for salmon smolts, the early days of halibut culture, the development of cultivated wrasse and lumpfish, the teaming up with Agritech UK, and finally, the sale of the company to Amar Seafoods.

Chris's attributes were many, and, underpinned by his attention to detail and his awareness of both fish and human welfare, his final role of Compliance Advisor played to all his strengths. Above all, Chris was a very decent go-to person and a friend to many. He will be greatly missed.

We remember his wife, Julie, and their families at this time.

There will be a Service of Thanksgiving at Strachur Parish Church, Argyll, on Thursday 15 January, at 12.30pm.

• Contributed by Alastair Barge, Otter Ferry Ltd.



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Salmon's contribution to the Scottish economy rose by nearly a third in one year

TRADE body Salmon Scotland says the latest figures charting the country's marine economy highlight the importance of aquaculture.

A new government report has revealed that the Scottish Government's marine economic statistics for 2023, the most recent to be made available, show that the direct economic contribution of Scotland's fish farming sector increased by almost a third in the space of a year.

The report shows that GVA (gross value added) rose by 30% from £361m to £468m between 2022 and 2023. Over the longer term, aquaculture's GVA increased by 37% between 2014 and 2023, while employment increased by 3%. Of the aquaculture total, 95% is accounted for by the salmon sector.

The figures also show aquaculture is one of the most productive parts of the marine



Above: Cooke Scotland economy, with more than £212,545 GVA generated per employee. Turnover accounted for £1.2bn, almost 10% of the total. Scotland's entire marine economy generated £5.6bn in 2023, which is dominated by oil and gas (£2.4bn), followed by marine tourism (£699m), shipbuilding (£540m), and aquaculture, which

contributes more to the economy than fishing (£394m). The figures for the salmon sector do not include the wider supply chain, which adds hundreds of millions of pounds to the economy. There are around 2,500 direct jobs in Scottish salmon and around 11,000 indirect jobs.

A more up-to-date economic report, commissioned by Salmon Scotland from consultants BiGGAR Economics and published last month, estimated the Scottish salmon sector is adding £1bn a year to the economy.

The analysis found Scottish salmon's GVA was £231.2m in 2024, with a further £589.9m generated through the supply chain.

Tavish Scott, Chief Executive of Salmon Scotland, said: "These figures confirm Scottish salmon continues to generate vital wealth for the country."

Scottish salmon sector welcomes South Korea free trade deal

SCOTLAND'S salmon farmers are hopeful that a new free trade deal between the UK and South Korea, announced last month, will lead to increased trade between the two countries.

The deal secures permanent tariff-free access for UK goods to the market, and follows high-level talks between the UK and South Korean governments.

It also sets out modernised rules of origin, and continued, permanent tariff-free access across 98% of South Korean tariff lines,

protecting £2 billion in exports which, the UK Government says, could otherwise be at risk of incurring additional duties.

Scottish salmon exports to South Korea rose more than tenfold, from £214,000 in 2015 to £2.25m in 2019, before trade was hit by the global pandemic.

With export levels in 2024 of £366,000, the new trade deal is expected to help Scottish salmon farmers capitalise on the recent boom in the Asian market. Exports to China were up 60 per cent in 2024 and volumes to Taiwan more than doubled. This contributed to record international sales of more than £840m and helped confirm Scottish salmon's place as the UK's biggest food export.

Tavish Scott, chief executive of Salmon Scotland, said: "We welcome the developments and the close ties on trade with South Korea."

"This deal will increase support in accessing the market and provide the opportunity for our exporters to deliver fish in pristine condition, with confidence, to consumers in South Korea."

"South Korea represents an important market within Asia, where Scottish salmon has seen significant growth in recent years."

More broadly, the new trade deal is also expected to help UK manufacturing industry.



UK Seaweed to help capitalise on new opportunities

THE UK has a new organisation representing the seaweed industry nationwide, and its founders hope that it will help participants in the sector capitalise on emerging opportunities.

The launch of UK Seaweed was teased at the Scottish Seaweed Industry Association Conference in Oban last November, where the SSIA also announced a change of name to "Seaweed Scotland".

Now the name of the UK-wide body has also been confirmed.

Working with Seaweed Scotland and the World Wide Fund for Nature (WWF-UK), the UK Agri-Tech Centre played a key role in bringing together industry players and refining the role of UK Seaweed.

The UK Agri-Tech Centre said: "The launch marks a pivotal moment for farmed and sustainable wild harvested

seaweed in the United Kingdom and, with the global seaweed market projected to grow exponentially, the UK is uniquely positioned to become a leader in sustainable ocean crops.

"The new body will serve as the central hub for growers, processors, researchers and technology providers, streamlining the path from research to commercial reality and acting as one voice for the UK Seaweed sector outside of Scotland."

Martin Sutcliffe, Head of Agri-Systems at the UK Agri-Tech Centre, said: "The potential of the UK seaweed sector is vast, however, potential requires structure to become power, and we are incredibly proud to have led the initial work that brought these diverse stakeholders together."

While the new body will operate

independently, the UK Agri-Tech Centre has confirmed it will remain a close strategic partner.

The new body officially begins in early 2026 with a primary focus on establishing a national roadmap for sector growth and opening dialogue with government regarding marine licensing reform.



Above: Sea lettuce

£1.4m grant for groundbreaking salmon health study

A RESEARCHER at the University of Stirling is leading a study into tissue remodelling processes in salmon – with hopes that it will transform our understanding of salmon health and disease resilience.

The project, which aims to address one of the biggest issues in UK aquaculture, has been awarded more than £1.4m from the UKRI Biotechnology and Biological Sciences Research Council (BBSRC).

The lead scientist in the study is Dr Rose Ruiz Daniels, a lecturer in Aquaculture Genomics.

Scottish salmon farming faces typical smolt mortality rates of 15% to 20%, with gill and skin conditions being major contributors to illness.

The research, hosted at the university's world-renowned Institute of Aquaculture, also benefits from £120,000 of in-kind support from Benchmark Genetics – a global leader in aquaculture innovation.

Researchers will study salmon during smoltification – a key stage when young fish adapt from freshwater to seawater. This critical process involves major changes in the body, making it valuable for understanding how fish both repair and strengthen their tissues.

Dr Ruiz Daniels explained: "When smoltification fails to proceed normally, the fish become more vulnerable to stress and disease. By examining smoltification as a biological remodelling event, we can identify how salmon repair tissues, resist disease, and adapt to changing environments.

"The findings will help inform improved breeding and health management strategies that enhance resilience across the



Above: Dr Rose Ruiz Daniels

industry." The study has three core objectives:

To develop phenotyping tools, tools that look at the visible traits or characteristics of a salmon and measure how effectively fish can repair and rebuild their body tissues during smoltification

To determine whether this healing capacity has a genetic basis and evaluate its potential to support better-informed future breeding strategies

To discover the key biological processes inside salmon cells that enable tissue repair, and link these processes to the fish's ability to both heal and maintain long-term health.

By identifying key genes and biological processes involved in successful smoltification, the research team aims to deliver practical tools that support fish health and productivity, whilst also improving the sustainability of this vital contributor to the Scottish economy.

Dr Ruiz Daniels added: "This work will help transform how we understand salmon biology. Recognising remodelling as a selectable trait will support breeding strategies that enhance survival and welfare across aquaculture."

The study builds on existing data and continues the university's long-term collaboration with Benchmark Genetics and other aquaculture partners.

Andrew Preston, Lead Trait Development & Land Based, Benchmark Genetics, said: "By broadening our understanding of the biological processes behind cell repair, our goal is to harness this knowledge to enhance robustness in salmon farming, supporting healthier fish at all stages during production."

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Norway salmon hits new export record in 2025 despite tariffs



Above: Norwegian salmon

DESPITE low prices during most of last year, Norway exported salmon worth a record £9-billion plus in 2025.

Figures from the Norwegian Seafood Council today show that the country's salmon exports were worth NOK 124.7 billion (£9.1bn).

In total, Norway exported 2.8 million tons of seafood of all types, worth 181.5 billion kroner (£13.4bn), last year.

This is a record in value, and corresponds to 38 million meals every single day, year-round, says Seafood Norway.

Seafood Council CEO Christian Chrøner said: "2025 was a demanding seafood year, with lower quotas and catches at record prices for all our most important wild-caught species. The year was also characterised by strong volume growth for salmon. Despite a significantly lower salmon price, it was a record year in value for Norwegian seafood exports."

Fisheries Minister Marianne Sivertsen

added: "The record value is impressive in a year marked by increased turmoil in world trade. It says a lot about the seafood industry's strong competitiveness internationally."

"The government is committed to strengthening market access for the seafood industry and will continue to prioritise this work in the New Year."

Despite problems over tariffs, the United States, along with Poland and China were Norway's largest markets, with salmon sales dominating in all three countries.

CEO Chrøner continued: "Last year, Norway sold seafood to more than 150 countries, so we are completely dependent on good market access and efficient flow of goods."

"The new US tariffs created a lot of noise and unrest for Norwegian seafood exports. From being a market with record growth and an almost insatiable appetite for salmon and crab from Norway in the first half of

2025, US trade was characterised by tariffs, a weakened dollar and weaker development throughout the year."

Salmon exports showed strong volume growth and an increase of 13% on 2024 to 1.415 million tons, and was worth NOK 124.7 billion (£9.1bn), a rise of 2%, or NOK 2.2 billion, on the previous year.

France, the US and Poland were the largest markets for Norwegian salmon. But China had the largest value growth last year, with an increase in export value of NOK 3 billion, or 59%.

Seafood Council analyst Paul T. Aandahl said: "Favourable production conditions, including high sea temperatures, led to strong (salmon) growth in production in 2025."

"In addition to the total volume increasing, the average size of the fish also increased. This led to a shift in exports towards markets that want large fish."

The Chinese growth is due to a combination of a sharp increase in salmon consumption, which led to Norway gaining market share.

New sales channels and improved distribution in smaller Chinese cities have also contributed positively, says the Seafood Norway's envoy to China, Sigmund Bjørge.

Through November last year, China imported a "whopping" 48% more salmon than the year before, from all salmon-producing countries, he added.

Norway's market share increased from 41% to 57% during this period compared to the previous year.

Former Grieg Seafood fish health manager moves to DNV

INGEBJØRG Sævareid, the fish health manager at Grieg Seafood, has left the company to take up a similar post with international risk management provider DNV.

Sævareid (pictured), has over 15 years experience from leading roles in the aquaculture sector and will bring "deep professional expertise and strategic understanding into an area that the company describes as crucial for sustainable growth," says DNV.

The company said fish health is a key factor for both fish welfare, biosecurity and profitable operations, adding: "Appointment signals a clear commitment to expertise and innovation in the aquaculture industry."

DNV provides comprehensive health assessment and monitoring services, helping producers detect underlying fish health issues, prevent disease outbreaks, and optimise fish performance.

At Grieg, Sævareid was responsible for strategic work within biosecurity and fish welfare globally. Previously, she was head of fish health at the Salmon Group, and held key leadership roles at MSD Animal Health Norway.

She has broad experience with interdisciplinary projects, biosecurity groups and FHF-funded research projects.



She is also experienced in combining professional expertise with a sound commercial understanding.

Sævareid said: "I am looking forward to starting the position. My first reaction when

I received the offer was – how incredibly lucky I am to work with such a star-studded team!

"It will be exciting to contribute to development, both internally at DNV and in the industry in general. I look forward to offering customers a wide range of services, driving service development, and building on the strong trust the company has."

UK investor buys into Norwegian aquaculture technology business

A BRITISH investment company has taken a major stake in the Norwegian-based aquaculture technology company Aquabyte.

Aquabyte announced in December that it had entered into a partnership with the Vitruvian Partners to help it drive future growth.

Vitruvian Partners, which is taking a majority stake in the business, is a global private equity firm focusing on growth buyout and growth capital investments in middle-market companies. It invests throughout Europe, the United States and Asia.

The London-based firm also has offices in several cities in Europe, Asia and the United States, including Munich, Shanghai, and San Francisco.

Founded in 2017, Aquabyte has grown into a major player in advanced aquaculture technology, providing innovative, AI-powered solutions to improve efficiency, sustainability, and better fish welfare.

Steve Tucker, CEO of Aquabyte, said: "Our mission is to transform aquaculture by improving fish welfare, productivity and sustainability through the use of artificial intelligence and machine learning.

"I am incredibly proud of the Aquabyte team and what we have built together. Our progress is a direct result of their dedication, innovation and strong focus on customers.

"We have had the pleasure of having very supportive owners with us on the journey, and Vitruvian is an ideal partner for the next phase – with its Nordic presence, deep experience in scaling leading technology companies and long-term partnership perspectives."

Vitruvian partner Jussi Wuoristo, added: "Aquabyte has built an exceptional platform that addresses key challenges in global food production.

"We are impressed by the team, the maturity of the technologies, and the value Aquabyte delivers to some of the world's leading salmon farmers. We look forward to supporting the company's continued innovation."

Chilean team doubles

Meanwhile, Aquabyte says it is further strengthening its commitment to the Chilean market by adding substantial resources to its team, which is now growing to a total of 12 employees across sales, customer support, customer insight, and field operations.

Ignacio Oñate, Country Manager of Aquabyte Chile, said: "As more and more farmers adopt our AI-based technology, we are reinforcing our already strong local presence in Chile. This is a fast-growing market for Aquabyte, and to ensure we can support both existing and new customers, we are making significant investments in our team in Puerto Varas."

Karina Gajardo has recently joined Aquabyte Chile as Senior Sales Manager. A veterinarian by training, with a Doctorate in Philosophy, she has previously worked at Skretting and BioMar.

She said: "I've been following Aquabyte for years and have seen how they've developed tailored solutions unique for the Chilean market ... When this opportunity arose, it was an easy decision."

Ignacio Oñate concluded: "It's been quite a journey since our first local Chilean employee joined back in 2021. We're now adding seven new team members here in Puerto Varas, bringing us to a 12-person team. This latest expansion comes at the perfect time and will enable us to continue playing a strong role in the development of the Chilean aquaculture industry. No two customers are alike, and having a large, robust local organisation is crucial to meeting each customer's unique needs."



Above: Aquabyte camera

Big reward offered for salmon Vitamin D research

NORWAY'S seafood research fund is offering more than £1m for data on the link between sunlight and vitamin D for fish.

The Norwegian research and development organisation FHF is offering up to 15 million kroner (£1.2m) to provide knowledge about salmon's need for vitamin D under farming conditions.

Vitamin D is an essential nutrient for salmonids. It is crucial for good fish health, growth, skeletal development and a well-functioning immune system. Results from research on salmon's need for vitamin D vary, but may suggest higher needs than previous recommendations.

FHF notes that unlike mammals, which can produce vitamin D from sunlight in their skin, salmonids have been thought to rely largely on dietary sources to meet their needs.

It has previously been thought that

the production of vitamin D from UV light exposure is a negligible source of vitamin D for fish. However, studies now show that many fish species can use this metabolic pathway for vitamin D production to a greater extent than previously thought. Consequently, FHF says, there is a need for knowledge that can ensure that farmed

salmon's vitamin D needs are met, especially in growing salmon in production systems with limited or no access to natural light, but also as a result of seasonal variations in sunlight access for conventional farming in open cages.

The objective of the call is to provide knowledge about salmon's need for vitamin D under relevant farming conditions.

No decision has been made on the number of projects that will be financed; both larger and smaller projects may be considered for financing.

The duration of project proposals must be adapted to the problem, but continuous dissemination of results for the fastest possible implementation in the industry will count positively.

The call is limited to project proposals aimed at Atlantic salmon farming.



Above: The link between vitamin D and sunlight is known for mammals, but how about fish?

NEWS IN BRIEF

New Kingfish CEO quits unexpectedly

YELLOWTAIL fish farmer The Kingfish Company announced in December the surprise resignation of its newly appointed chief executive.

Karl Buiks, who was due to take up his post at the end of 2025, said the decision was for personal reasons.

The outgoing CEO, Vincent Erenst, has agreed to postpone his retirement and will continue

to lead the company for an additional year.

Jeroen Scheelbeek, chairman of the Supervisory Board, said: "On behalf of the Supervisory Board, I would like to thank Vincent for agreeing to continue in his role for the coming 12 months. This ensures continuity in the company's leadership and operations during this period."



Far left: Karl Buiks
Left: Vincent Erenst

AlgaEurope 2025 hailed a success

INTERNATIONAL experts in one of the marine economy's most promising fields gathered in Riga, Latvia last month for AlgaEurope 2025.

The conference was dedicated to exploring the latest academic

research and commercial possibilities in algae biomass. Riga welcomed 382 delegates from 38 countries and 236 organisations.

Jointly organised by the European Algae Biomass Association (EABA) and DLG Benelux, the conference continued to build on its reputation as a pivotal gathering for experts across science, technology, and industry.

"Each year, AlgaEurope brings together the people and ideas that push our sector forward, driving innovation and real-world impact," said Carlos Unamunzaga, President of EABA.



Above: Tālis Juhna, Rector of Riga Technical University, at AlgaEurope

Nova Sea chief in move to AquaGen

AQUAGEN, one of the leading players in breeding and genetics for salmon, has appointed the boss of salmon farmer Nova Sea as its new Chief Executive. Tom Eirik Aasjord took up his new role on 1 January as part of the restructuring of the Group.

The position of Group CEO is newly created, and AquaGen's

current leader, Knut Røflo, will continue in the company, with responsibility for AquaGen Norway.

AquaGen said Aasjord brings broad, proven leadership experience across the aquaculture industry.

He has held several senior positions at Nova Sea, one of the largest producers of farmed salmon in Northern Norway, where he served as CEO for the past six years. Nova Sea was acquired by salmon giant Mowi earlier this year.

Chair of the Board, Odd Magne Rødseth, said: "We are very pleased to welcome Tom Eirik Aasjord as our new Group CEO."



Above: Tom Eirik Aasjord, incoming CEO AquaGen

Dogfish joins list of salmon farm threats

FIRST it was bluefish tuna (aka "mackerel sturgeon") breaking into salmon cages and causing problems. Now dogfish, a member of the shark order, has joined the intruder list.

In Norway, dogfish attacked a facility in Namsos municipality in Trøndelag in December, causing damage and injuries, and leading to escapes.

The Norwegian Directorate of Fisheries describes the damage as being quite extensive. It says the salmon in the cage in question are about two kilos in size. The company has had a recapture net out, but this fishery has been terminated, among other things, because dogfish were being caught up in the net too.

The Directorate adds: "It is too early to say anything about the extent of the escape."

It says it is following up on the matter with supervision, and has inspected the facility. It is also asking fish farmers in vulnerable areas to ensure they have good control over the collection of dead fish.

"Fish treatment should also primarily take place during the day as dogfish are more active and aggressive at night," it adds.

In the London fish market, dogfish (Squalidae) are referred to as "rock salmon". They were frequently sold in city fish and chip shops in the 1930s and 1940s – and even later than that.

They usually grow to the size of a small shark (100cm-125cm) and are very powerful, which is why they are able to break into salmon nets in search of food, along with sturgeon and other large fish. Dogfish apparently got their name from their habit of hunting in packs.

Large predator fish, of which there are a number of different types, have become an added problem for fish farmers over the past couple of years.

Meanwhile, there is better news on the general escape front. The Directorate says that a new study shows fewer escaped farmed fish from hatcheries have been detected compared to previous similar research projects. The results indicate that stricter technical requirements, and increased attention to escape prevention, have had the desired effect.

On behalf of the Directorate, NORCE LFI carried out electrofishing in 2024 and 2025 at 32 hatchery facilities in Rogaland and Vestland. Compared to similar surveys in 2015 and 2017, fewer discoveries of escaped fish were made this time.

Electrofishing is a suitable method for demonstrating that escapes have occurred, but a lack of findings cannot be used to rule out that escape incidents have occurred, the Directorate warns, and it emphasises that there is still continued potential for improvement.



Above: Dogfish seem to have turned their attention to salmon cages

Shock as former Mowi chief dies after short illness



Photo: Mowi

Above: Alf-Helge Aarskog

FORMER Mowi chief executive Alf-Helge Aarskog has died at the age of 58, following a short illness.

He is reported to have died at the end of November 2025.

Former colleagues were profoundly shocked and saddened by the news.

Alf-Helge Aarskog, who spent most of his working life in aquaculture, joined the company when it was known as Marine Harvest.

He was the inspiration behind much of its early growth and development into what was to become the world's largest producer of Atlantic salmon, expanding into several countries beyond its Norway home base.

He worked for several businesses, including Mowi for the first time, Fjord Seafood, and Lerøy, where he also served as CEO, before returning to Mowi as CEO.

He was instrumental in developing and integrating the various operations within Marine Harvest, and is thought to have made a bid for Cermaq before it was bought by the Japanese industrial giant Mitsubishi.

He stepped down as CEO of Mowi in 2019, handing the baton to Ivan Vindheim, saying that he felt he had served the business for long enough.

A year ago Alf-Helge Aarskog joined the board of Smir Group, a company which specialises in sea lice treatment, waterborne feeding, and cage systems. He held various board positions within the industry and worked part-time for NMBU (the Norwegian University of Life Sciences).

Mowi put out a statement, saying: "We are deeply saddened by the passing of our former CEO, Alf-Helge Aarskog.

"Alf-Helge led Mowi from 2010 to 2019 and played a pivotal role in shaping the company we are today. Known for his industry knowledge, hands-on leadership, and commitment to responsible farming, he helped advance aquaculture standards across the sector.

"Colleagues remember him as warm, direct, energetic, and dedicated to the people around him. His leadership, passion for innovation, and focus on sustainability leave a lasting legacy within Mowi and the wider aquaculture community.

"Our thoughts are with his family, friends, and all who worked closely with him."

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TWO VERSIONS

Offshore salmon farmer loses key north Norway site approval



Above: Arctic Offshore farm (Illustration: Norway Royal Salmon)

AN offshore fish farm company has suffered a setback to its development plans for northern Norway, after the authorities criticised its treatment of the fish at the site.

The Norwegian Food Safety Authority has decided to withdraw approval for the fish farming location known as 40217 Fellesholmen, which was due to take effect from 1 January.

The location is operated by Arctic Offshore Farming AS, which is part of the SalMar group.

Arctic Offshore Farming was first granted a development permit almost eight years ago in 2018, under its original ownership, Norway Royal Salmon – now part of the SalMar group. The food safety authority said the reason for the withdrawal was a significant violation of regulations related to fish welfare, animal health and biosecurity.

The construction and exposed location of the facility had made the facility inaccessible for up to three months, meaning essential fish handling, delousing and slaughtering have not been possible.

The announcement added: “The Norwegian Food Safety Authority believes the company has not been able to provide sufficient guarantees that the serious deficiencies related to operations and emergency preparedness will be rectified.

“The Norwegian Food Safety Authority also believes that the proposed system improvements will not be sufficient.”

The decision, it said, is based on the Food Act, the Animal Welfare Act and underlying regulations on aquaculture operations.

Arctic Fish Farm has the right to appeal the decision.

Originally known as SalMar Aker Ocean, the Aker group pulled out of the offshore venture nine months ago.

In order to strengthen and concentrate its efforts in the area of offshore aquaculture, SalMar created the subsidiary SalMar Ocean AS, with the purpose of creating a world-leading offshore farming company.

The segment has currently two semi-offshore units in operation, Ocean Farm 1 and Arctic Offshore Farming. Ocean Farm 1 completed its third production cycle in 2024 and Arctic Offshore Farming completed its first production cycle early 2024.

Andfjord Salmon raises a further £22 million in equity

THE Arctic fish farming company Andfjord Salmon, which has been involved in a major row with its former main contractor, last night boosted its financial position by around £22m.

The company announced the issue of a NOK 300 million private placement, which was fully subscribed. It involved the issue of just over 11.5 million shares at NOK 26.7 per share.

Last week, Andfjord Salmon dismissed the main contractor at its facility at Kvalnes, Andøya, in northern Norway, AF Hæhre & Contur An, and then announced it planned to sue the builder for more than a billion kroner (£74 million plus). Andfjord has now engaged a new main contractor to finish the development.

Today, Andfjord issued its delayed third quarter financial results. The company has reported “stable biological conditions, high survival rates and healthy growth”.

Andfjord restarted fish farming operation at Kvalnes, during September and October. A total of approximately 1.1 million smolt were released in pool K0 (350,000) and pool K1 (750,000). Both pools had a survival rate of almost 100%.

The company had no revenues during the period.

CEO Martin Rasmussen said: “The biological conditions have remained stable in both pools following smolt release. In pool K0, the fish growth is more than 30% ahead of Skretting’s growth table for ocean net pen.

“Solid growth in combination with high survival rates result in rapid ramp-up of biomass. We are very pleased with our fish farming performance so far.”

Located at Andøya on the Arctic Archipelago of Vesterålen, Norway, Andfjord Salmon is developing what is describes as the world’s most sustainable and fish-friendly aquaculture facility of its kind.



20,000 farmed fish die after power failure

AN electricity power outage in Iceland is reported to have led to the deaths of at least 20,000 farmed fish.

The police chiefs in the Westfjords were notified of the incident. It was said the electricity had been cut off in the area after a failure in the Tálknafjörður line during a period of bad winter weather.

The site reported to have been affected is Tungusilung, a small independent land-based fish farm. The losses on 18 December were estimated at ISK 50 million (£300,000), according to the broadcaster RÚV.is

A company spokesman said they still had not received a proper explanation for what caused the failure and says they have been referred to



Above: Thousands of fish died in the power outage

their insurance company. The spokesman said the next step is to compile data on the case and work it forward with the company’s lawyer and the insurance company.

He added that energy security in the area was severely lacking, which had the effect that when the family decided to expand production, they invested in a backup power plant and other equipment to be able to respond.

He said: “One of the worst energy security areas in the country is in the southern Westfjords, and it has been that way for as long as I can remember.”

The company has described the situation that has arisen in the region as being “very strange” and expressed concern that another incident is likely to happen again sooner rather than later.

The spokesman said: “Voltage has been too low for many hours, and when the electricity has been on for a considerable time, I plan to turn off my backup power. Then there will be some failure where I won’t be able to connect to the Westfjords Power Plant again.”

The weather in Iceland was particularly bad in December, affecting traffic movements and also creating power problems.

Hofseth closed system construction underway

HOFSETH, which operates an entire value chain in salmon and trout from farming to processing and distribution, has started constructing its closed sea-based system.

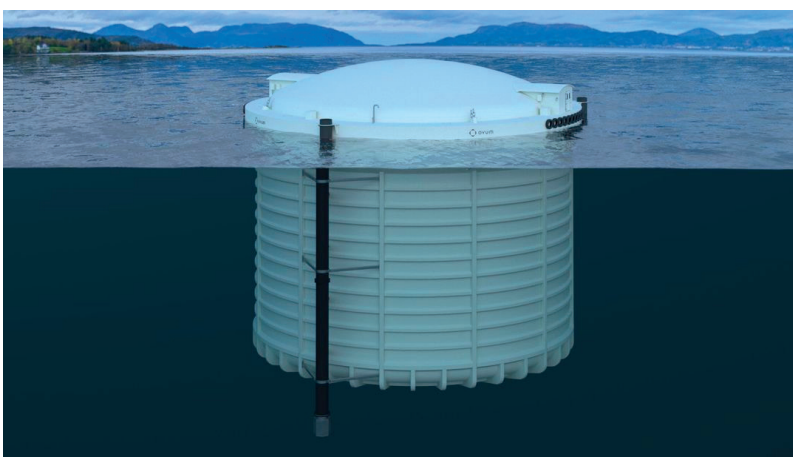
The Norwegian company says the first moulds for five closed cages for salmon production, to be deployed in Storfjorden, Møre og Romsdal county, are currently being manufactured in Måløy, Vestland.

Hofseth holds six development licenses linked to the closed-system concept Egget®, which was developed by Ovum.

After several generations of fish being produced in the pilot facility, which has been in operation since 2023, the company said it has gained valuable experience, and this knowledge has now formed the foundation for a new-and-improved design of the closed system, now under construction.

Hofseth said its investment in closed sea-based systems is an important step in addressing several of the challenges facing the aquaculture industry.

The goal is to support sustainable growth



Above: How the Hofseth closed system will look

through solutions that reduce challenges related to sea lice and fish escapes, while also enabling the collection of sludge.

Project Director, Ole Nordal said: “At Hofseth, contributing innovation that enables sustainable growth in seafood production is a key driver for us.

“Our investment in closed sea-based systems is an important step in addressing several of the challenges facing the aquaculture industry. Our goal is to support sustainable growth through solutions that reduce challenges related to sea lice and fish escape, while also enabling the collection of sludge.”

He added: “With the design phase behind us, we are now entering the execution phase. It will be exciting to see the solutions and concepts we have developed perform as intended in practice.

“We are looking forward to good progress in the construction work, with the goal of stocking the first fish in Egget in Storfjorden in just over a year ago.”

Several key stakeholders in the project participated in an initial meeting to clarify roles, areas of responsibility, and the further project schedule.

Once the moulds are completed, they will be transported by ship to Latvia, where the components for the closed-containment systems will be produced. Upon completion, the systems will be shipped back to Norway for assembly. If the project proceeds as planned, fish will be stocked in the first Egget® unit in early 2027.

Hofseth has also been developing submersible cages for its trout and salmon, as part of a programme to find ways to protect fish from sea lice.

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Skretting seals strategic Tibet-China deal



Above: Skretting and Longyang signing

THE global feed company Skretting and Longyang Fresh, China's largest trout producer, have signed a new strategic cooperation agreement.

Skretting says the goals of the enhanced partnership will be to deliver precision nutrition, create supply chain synergies, and advance sustainable aquaculture practices for trout farmed on the Qinghai-Tibet Plateau. The People's Republic of China has occupied Tibet since 1950 and the Tibetan Autonomous Region was established in 1965.

Situated in Longyangxia Reservoir, on the northeastern edge of the Qinghai-Tibet Plateau, Longyang Fresh farms trout in glacial meltwater from the Yellow River's headwaters – an exceptionally pure, pollutant-free environment that, Longyang says, enables antibiotic-free farming.

It is hoped the three-year agreement will inject new momentum into the development of China's cold-water fish industry.

Skretting and Longyang Fresh say they have established a productive, long-standing collaboration in feed innovation, nutritional management, and farming practices for trout farming on the plateau.

The announcement adds: "Over the years, the two companies have accumulated extensive experience on plateau aquatic ecosystems, trout physiology, and farming efficiency – laying a strong foundation for this strategic upgrade."

"With a shared commitment to the development of China's plateau trout industry, the renewed partnership will build a closer, mutually beneficial partnership, developing precision nutrition tailored to high-altitude ecosystems."

The unique plateau environment in Qinghai Province – characterised by low temperatures, high dissolved oxygen, and low pathogen pressure – offers natural advantages for trout farming, the companies said.

Leveraging these ecological traits, the two companies will jointly develop a precision nutrition system optimised for high-altitude farming conditions.

Key initiatives include developing nutrition models adapted to high-altitude water ecosystems, addressing the specific physiological needs of trout in unique environments and utilising global databases to optimise growth performance, health indicators, and feed efficiency, enabling more scientific and efficient farming.

Another move includes implementing raw material traceability systems, reducing the environmental footprint by lowering nitrogen and phosphorus discharge, and minimising environmental impact, promoting greener aquaculture practices.

This will further unlock the ecological and nutritional value of plateau cold-water fish, synergistically driving the industry's value to new heights, says Skretting.

Skretting CEO Maarten Bijl, said: "This partnership reconfirms our market-leading position as a nutritional and functional partner for sustainable farming within the high-value sector, and demonstrates our commitment to increasing Skretting's presence in China and in the wider Asian region."

Miyan Ying, Chairman of Longyang Fresh, added: "This strategic upgrade builds on years of successful collaboration and a shared long-term vision. Together, we will develop precision nutrition solutions tailored to high-altitude ecosystems, strengthen supply chain cooperation, and Skretting's global strengths will be our effective support."

Japan's Nissui buys fish farming business

THE Japanese marine products corporation Nissui is entering the Chilean salmon sector, following its purchase of the fish farmer Pesquera Yadrán SA.

Nissui said the move was realising the company's aim to establish "a stable business portfolio by 2030 in which the food products business and the marine products business were well-balanced, with overseas marine products and food products businesses, aquaculture business, and fine chemicals business serving as growth drivers."

The statement added that strengthening the aquaculture business is a key factor, not only for the marine products business but

also for improving the entire group's profitability.

Nissui says Pesquera Yadrán possesses expertise in farming and processing fresh products of Atlantic salmon, and has sales channels to overseas markets, including the US.

Through this acquisition, Nissui plans to expand the scale of aquaculture operations together with enhanced processing and sales networks, and pursue efficiency improvements, such as optimising the balance between fish species and farming sites.

Pesquera Yadrán was created in 2002 and three years later it became one of the pioneering companies in salmon farming and processing in Chile.



Above: Fish farm staff (photo: Pesquera Yadrán)

Mount Fuji salmon company issues “extraordinary update”

PROXIMAR Seafood, the Norwegian-owned salmon farmer, which has built a large land facility at the foot of Mount Fuji, Japan, issued an “extraordinary production update” in December to say that fish growth was picking up.

The company said the biomass at the end of November was 1,800 tonnes.

Proximar said: “In the Q3 report, Proximar communicated a strong biological performance since end of the third quarter, when the biomass stood at 1,379 tonnes. The company is pleased to report that the biomass uptick has continued, reaching 1,804 tonnes at the end of last month. Hence, Proximar reiterates the goal of reaching 2,000 tonnes in biomass by the end of 2025.”

The company said the system is performing very well.

CEO Joachim Nielsen said: “I am very pleased to see that the positive biomass development with improved growth rates is continuing. We see good results of the improvements done over recent months, as communicated in our recent quarterly



Above: Proximar says it will reach its goal of 2,000 tonnes biomass by the end of this year

presentation. We expect this to transfer to increased harvest weights and improved price realisation for 2026.”

The company inserted its first batch of eggs in October 2022 and carried out its first harvest on 30 September 2025.

Proximar’s new brand and logo (Fuji Atlantic Salmon) were officially launched in October at the headquarters of its partner Marubeni Corporation, in Tokyo.

In other news, Proximar announced last month that its chairman Kjell-Erik Ostdahl would be stepping down from the

company’s board as of January 1, 2026.

Ostdahl, an investor, has served as the chairman of the board since 2024.

Following his departure, Viggo Halseth assumed the position of chairman until the next General Meeting.

Halseth has served as a member of the board since 2022 and brings nearly four decades of expertise in the aquaculture feed industry.

Grieg Seafood closes sale to Cermaq

GRIEG Seafood has closed the NOK 10.2 billion sale of its salmon farming operations in Finnmark and Canada to Cermaq Group.

Last July, Fish Farmer reported that the troubled seafood company had agreed to sell to its rival in a deal that valued the transferred assets at £740m.

The company will maintain its existing dividend guidance and are expected to outline distribution details in early 2026.

A statement from the company this week said that Grieg Seafood ASA has successfully completed the previously announced sale of its salmon farming operations in Finnmark and Canada to Cermaq Group AS, in a transaction valuing the divested assets at NOK 10.2 billion on a cash- and debt-free basis, assuming normalised working capital.

The company confirmed that its existing dividend guidance from the third quarter remains unchanged, and said it will clarify the timing and mechanics of upcoming dividend distributions in early 2026, signalling a continued emphasis on disciplined capital allocation and potential cash returns to shareholders following the portfolio streamlining.

Grieg Seafood ASA is one of the world’s leading salmon farmers, headquartered in Bergen, Norway, and listed on the Oslo Stock Exchange since 2007. Following the completion of its divestment to Cermaq Group, the company’s farming operations are now concentrated in Rogaland, Norway, and underpinned by a strategy focused on sustainable practices, low environmental impact and strong fish welfare as key drivers of long-term profitability.



Above: Grieg farm, Finnmark

Murray Cod Australia wins BAP certification

MURRAY Cod Australia (MCA) has successfully obtained three-star Best Aquaculture Practices (BAP) certification for its farm, feed and its processing facility.

This marks a significant milestone in sustainable aquaculture, the company said, and will open new avenues in international markets.

Murray Cod Australia produces premium, farm-grown Aquana Murray cod in the Riverina region of New South Wales. Despite its name, the fish is a freshwater species native to Australia and no relation to Atlantic cod.

BAP is the world’s most comprehensive third-party aquaculture certification, covering the entire production chain, including farm, hatchery, feed mill, and processing plant – and the four pillars of responsible seafood: environmental responsibility, social accountability, food safety, and animal health and welfare.

BAP certification not only supports responsible sourcing goals for retailers and foodservice providers worldwide, but it also builds consumer trust. Aquana’s

BAP certification demonstrates dedication to responsible growth, product quality, and ethical aquaculture practices, offering confidence to both customers and consumers in every bite.

MCA’s recent achievements include a 298% year-on-year increase in biomass and a 33.5% rise in customer receipts for Q4 FY25. The company also expanded its Australian retail footprint, doubling its presence in Woolworths stores in New South Wales and Victoria.

The BAP certification is expected to further enhance MCA’s Environmental, Social, and Governance strategy, appealing to investors focused on sustainable and ethical business practices. Additionally, it positions MCA to meet the growing global demand for certified sustainable seafood, particularly in markets such as Southeast Asia and the Middle East.

MCA’s CEO, Ross Anderson said: “Obtaining BAP certification is a testament to our dedication to responsible aquaculture and opens doors to new markets that value responsible farmed seafood production.”



Above: Murray Cod

NEWS IN BRIEF

Tanzania to host world conference

DAR es Salaam, Tanzania (pictured) will host the World Aquaculture Conference (WA26T) next December, in conjunction with Aquaculture Africa 2026 (AFRAQ2026), the largest aquaculture meeting



in Africa for 2026. The venue will be the Julius Nyerere International Convention Centre (JNICC), one of the largest convention centres in Tanzania. The WA26T/AFRAQ2026 Conference will take place over 1-4 December 2026, and is composed of an Opening Ceremony, Plenary Sessions, Technical/Scientific Parallel Sessions, Student Sessions, Training Workshops, various Side Events and Meetings and an Exhibition/Trade Show.

Proximar names new CFO



Above: Tetsuya Kobayashi

PROXIMAR Seafood, which farms salmon at a facility near Mount Fuji, Japan, has appointed

Tetsuya Kobayashi as Chief Financial Officer of Proximar Ltd, as of 1 December 2025. He has extensive experience in finance and banking, including senior roles in Mizuho Securities, HSBC Securities and RBS Securities. He has held roles as head of both debt- and equity capital markets, and most recently, as CFO in a start-up company. The hire completes the planned organisational shift of resources from Norway, as Proximar's entire management team will be located in Japan.

Thailand turns to Norwegian salmon

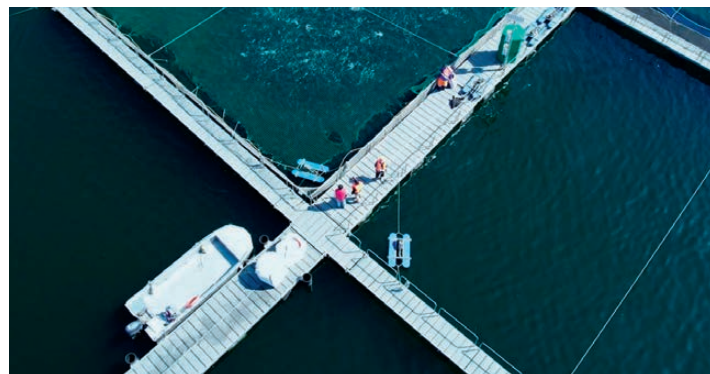
THAILAND is emerging as one of the most important overseas markets for trout and salmon, new data shows. The Norwegian Seafood Council said that sales to the country have surpassed those to long-established markets, such as Japan and South Korea. The combined exports of salmon and trout make the country the second largest market in Asia, measured in volume.

Åshild Nakken, the Norwegian Seafood Council's envoy to Southeast Asia, said: "Thailand's appetite for Norwegian salmon does not seem to be stagnating. Thanks to good preference and competitive prices, Norway has increased its market share to over 73%."



Above: Bangkok, Thailand

Trout farmer is first African customer for Ace Aquatec's stunning system



Above: SanLei trout farm

A TROUT farmer based in Lesotho is set to take delivery of Ace Aquatec's humane stunning system. It will be the first time for an installation of the system in Africa.

SanLei Premium Trout is Africa's largest trout producer. The company hopes the in-water Humane Stunner Universal (A-HSU®) will help it set a new benchmark for fish welfare, while enhancing operational efficiency across its production processes.

The A-HSU renders fish unconscious within one second and will allow SanLei to humanely process 10–15 tonnes of fish per hour. This, Ace Aquatec said, provides precise stunning, improved welfare compliance, reduced labour demands, and more consistent product quality.

In southern Africa brailing – removing fish from the water with a dip net – remains common practice, Ace Aquatec said. This method of harvesting fish often involves suffocation and can be quite slow, leading to stress and suffering for the fish.

Scottish-based Ace Aquatec said it has worked closely with SanLei to ensure the stunner system complements the established way of working, rather than replacing it. By working alongside more traditional methods, the A-HSU® system will help the producer increase welfare and improve operations by reducing fish handling by the company's 110 employees. The introduction of Ace Aquatec's A-HSU® will also reduce the onset of rigour in the fish, increasing the quality of the product and reducing stress.

This, Ace Aquatec said, comes at a time when greater demand for fish from certified farms in the region is anticipated, driven in part by the imminent arrival of retail giants, like Walmart in neighbouring South Africa. Currently the only BAP certified producer in the region, this system is intended to position SanLei alongside leading producers globally in meeting rising consumer demands for quality fish and fish welfare.

An overwhelmingly positive experience

Dewald Fourie, CEO of SanLei Premium Trout, said: "Working with Ace Aquatec has been an overwhelmingly positive experience. Their flexibility and attention to detail with regards to our specific operating conditions and need to accommodate hand netting meant the design of this game-changing technology has been as smooth as possible. The system will support our growth, and strengthen our ambitions to further enhance our welfare and certification standards."

Nathan Pyne-Carter, CEO of Ace Aquatec, added: "Southern Africa's aquaculture industry is undergoing rapid growth, and Ace Aquatec is uniquely equipped to support producers with the high-welfare technologies global markets now expect. Our collaboration with SanLei showcases innovation at its best."

Change of power in Chile could have implications for salmon

CHILE has elected right-winger José Antonio Kast as its next president by a sizeable majority – and the incoming government could prove friendlier to the country's substantial salmon industry.

Kast beat his left-wing opponent, Jeannette Jara, by around 58% to 42%. She had been a minister in the cabinet of the outgoing socialist president, Gabriel Boric.

As well as running on an anti-migrant ticket, Kast has stressed he supports deregulation for business, and believes that government red tape is stifling growth.

For the salmon industry in particular, he has been critical of the “Lafkenche Law”, legislation that was intended to hand back control of specific areas of the coast, those they have traditionally fished, to Chile's indigenous people, who make up around 13% of the population.

The law establishes a mechanism for Indigenous communities to request the designation of a Marine Coastal Space for Indigenous Peoples (ECMPO).

Once that process is started, commercial projects such as new salmon farms or port facilities must be put on hold until the ECMPO is in place. Although the law is supposed to protect existing commercial operations, the Lafkenche process can in effect block expansion for upgrades for existing facilities, and it has proven

very unpopular with the salmon farming companies.

Kast has described the operation of the law as “institutional sabotage” and is on record as saying, “What began with a legitimate purpose has been distorted into a tool of political blackmail.”

He has said that reform is possible without compromising environmental standards, however.

His position is strongly aligned with

the salmon farming industry's desire to reduce regulatory burdens and streamline processes for expansion, particularly by reforming the laws that empower indigenous groups and environmental bodies to block or delay new developments.

It will not be welcomed, however, by those advocating for indigenous rights or the anti-fish farming lobby in Chile.



Above: José Antonio Kast, president-elect, Chile (centre)

Canadian Atlantic provinces overtake BC in salmon production



SALES of Canadian aquaculture products and services rose 8.8% year over year to CAN \$1.4 billion (£760m) in 2024, while costs increased by 7%, according to a new report from Statistics Canada.

Higher aquaculture sales in Newfoundland and Labrador, which were up by 41.9%, and New Brunswick, up by 11.2%, accounted for most of the national increase.

The report says Canadian production of farmed finfish increased 11.6% year over year, while the total value of farmed finfish (mostly salmon and trout)

was up 8.4% to \$1.2 billion, despite a 2.9% decline in the average farmed finfish price.

Over the same period, Canadian farmed shellfish production declined by 2.2% to 37,904 tonnes.

The value of farmed shellfish increased to \$134.6m (+6.2%), due to an 8.5% rise in average price.

Statistics Canada says farmed finfish production in the Atlantic provinces rose 18.5% year over year in 2024, with the biggest increases in Newfoundland and Labrador (+48.0%) and New Brunswick (+9.1%).

For the first time since 1991, the Atlantic provinces combined produced more farmed finfish than British Columbia. However, farmed finfish production in British Columbia in 2024 increased 6.3% compared with the previous year.

Nevada salmon farm project folds

A PLAN to build a large land-based salmon farm in the Nevada Desert has hit the buffers.

West Coast Salmon, the Norwegian company behind the project, is reported to have filed for bankruptcy.

The project, supported by several leading aquaculture backers, was unveiled some three years ago, but has now ceased trading.

It is thought that almost NOK 100 million (£7.5m) has been lost by some leading industry investors.

The news has cast a shadow over land-based projects in general, some of which have been struggling.

West Coast Salmon's plan consisted of three development phases for up to around 50,000 tons HOG.

Now, unless a rescuer comes along, that dream looks to be shattered.



Above: How the West Coast Salmon site would have looked

UK seafood facing tough new EU export rules



BRITAIN'S seafood sector – both farmed and wild caught – is facing major changes in the New Year for exports to the European Union.

The changes mainly concern the data companies must submit to enable their exports to flow smoothly, and will affect Scotland more than any other part of Britain.

The upcoming regulations will apply to every link in the supply chain, from fishers and merchants to processors and exporters.

The key changes around farmed fish include an Expanded Processing Definition, which means any preparation, including cutting, filleting, smoking, cooking, or even just packing, requires a formal processing statement if the fish was processed in the UK before export.

Everything from catch to processed products such as salmon or shellfish,

requires processors and exporters to provide more details on the fish's origin and processing, or risk being blocked from the EU market.

All UK devolved administrations are working in partnership and have launched the new #FishTraceShip campaign to help industry prepare.

With seafood exports, accounting for 70% of Scotland's total seafood industry, the Marine Management Organisation (MMO) is working with the Scottish government and urging businesses to act now to prepare for new EU import rules around traceability coming into force on 10 January 2026.

Robert Watson, Operational Lead (onshore), Marine Directorate, Scottish Government, said: "Scotland's seafood sector supports thousands of jobs and communities across our coasts. These new requirements, introduced by the EU, represent a significant change

for businesses. We're urging Scottish processors and exporters to act now; understanding the new EU rules and using our support tools will be key to meeting the new requirements.

"The Fish, Trace, Ship campaign is here to help the industry meet these obligations and maintain Scotland's reputation for quality and traceability.

The UK Government is updating the Fish Export Service (FES) to ensure the IT system can provide the catch certificates, processing statements and non-manipulation documents required by the EU from 10 January 2026.

Nick Greenwood, MMO's Head of Marine Protection and Operations Services, said: "Scotland's seafood industry plays a vital role in both the UK and Scottish economy and the livelihoods of thousands of people in coastal communities. These changes will affect many businesses that haven't previously needed to supply processing statements.

The UK Government has already launched the first in a series of webinars and engagement events to support the industry to prepare for the significant changes.

"The upcoming regulations will apply to every link in the supply chain"

Police raid offices of key salmon exporter

NORWEGIAN Police have swooped on the offices of a key salmon exporter, making a number of arrests.

North Tandem exports fish to Kazakhstan and nearby east European countries such as Armenia and Georgia.

The company has declined to comment on the arrests other than to say it will fully co-operate with the police investigation. It says on its website: "We work with the best professionals in the fish industry, monitor the quality of fish and final product and organise timely delivery to your market. We care about your success as our own."

In November, the Arctic salmon company Nordlaks told NRK that it planned to report North Tandem for,

among other things, forgery, fraud and violations of the Food Act.

Nordlaks told the broadcaster: "We interpret what has now happened as the police taking this seriously, just like us, and we think that is very good."

NRK says it has documentation and images of labels associated with a number of other companies, in addition to Nordlaks.

The name of the world's largest salmon farmer, Mowi is also on a label that may be counterfeit, it adds.



Above: Atlantic salmon

Bidfood appoints Culinary Director

BIDFOOD has announced the promotion of its long-standing and highly-regarded Food Innovation Manager, Martin Eshelby, to the role of Culinary Director. This appointment, the company said, recognises Eshelby's many years of dedicated hard work and reflects Bidfood's continued commitment to culinary excellence, innovation, and leadership within the foodservice industry.

As Culinary Director, Eshelby will play a key role in shaping and overseeing Bidfood's culinary vision. Drawing on his extensive experience, Bidfood said he will showcase the business's strong food credentials, whilst continuing to work closely with manufacturing brands, leading new product innovation, and supporting the development of Bidfood's annual food and drink trends.

Nicola Holden, Sales Director at Bidfood, said: "Martin's passion, creativity, and deep understanding of our customers' evolving challenges make him the ideal person to lead our culinary direction."

"During his time at Bidfood, Martin has demonstrated that he is among the



Above: Martin Eshelby

best in the industry, seamlessly bridging his creative flair for food together with the needs of our customers. We're excited to see how he will continue to innovate, inspire our teams, and help shape the future of foodservice."

Commenting on his appointment,

Martin said: "I'm incredibly excited to take on this new challenge. Bidfood has always been passionate about championing great food, and I'm looking forward to shaping the future of our culinary offering while continuing to support our customers."

The reliable cold chain solution

Introducing the IF200-HC ice flake machine, for fisheries & seafood businesses



FOR UK fish farmers, fishmongers, and seafood processors, maintaining product quality isn't just important — it's essential. That's why Ice Cool Servicing Ltd is proud to introduce the new IF200-HC Ice Flake



Machine, a robust, high-performance solution designed specifically for businesses that rely on fresh, perfectly chilled produce every day.

The IF200-HC produces soft, mouldable flake ice ideal for maintaining the freshness, appearance, and shelf life of fish and seafood. Unlike traditional cube ice, flake ice spreads evenly and gently across produce, ensuring rapid cooling without bruising or damage. For fish farms, it's perfect for harvest handling, transport, and temperature-controlled storage. For fishmongers, it offers clean,

attractive, and easily shapeable ice that keeps displays looking pristine while preserving peak freshness from morning to close.

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With Ice Cool Servicing Ltd, you're not just buying equipment — you're backed by expert engineers, responsive support, and full aftercare.

If your business depends on fresh, high-quality ice, the IF200-HC helps deliver it every time.

Upgrade your cold chain today.

Visit www.icecoolservicing.co.uk/if200 or call our team on **01869 247 947** for expert advice and pricing.



Top left: IF200-HC single unit behind a fish counter
Above: IF200-HC double unit in a fishing port



A matter of taste

The fish and seafood sector already has a difficult job ... so it is not helpful to promote one form of product by implying a negative image of other formats, says **Dr Martin Jaffa**

EVERY year as Christmas comes around, the mainstream newspapers publish the results of their reviews of different ranges of festive foods. This year, The Guardian asked their in-house eco-chef to sample a range of the 'most sustainable, delicious and well-priced smoked salmon' for the Christmas table.

Every year, I see similar reviews and feel that the comparisons made do not exactly compare like with like. It's like saying I would like to review a range of cars, from the most expensive petrol engined BMW to the smallest electric Renault Zoe. They are both cars, but are they comparable?

The same question could be asked of The Guardian's smoked salmon review in December 2025, as the products tasted ranged from wild sockeye salmon to organic farmed-raised, to smoked salmon flavoured with maple syrup. However, it seems that in this taste test, eco-chef Tom Hunt appeared more interested in the sustainability credentials of the salmon than the taste.

Tom began by saying that smoked salmon is one of Christmas's purest pleasures, yet salmon farms have a 'well-earned reputation for poor welfare and environmental damage'. Clearly, Tom was pinning his colours to the mast. He continued that his main guide was the Marine Conservation Society's Good Fish Guide, which rates wild-caught Alaskan salmon as the best choice, and ranks Aquaculture Stewardship Council's certified salmon as a good choice.

Tom then said that if the reader is interested in the wider impacts of salmon farming, they should check out 'Off the Table'.

I wouldn't be surprised if Tom is unaware that 'Off the Table' is a campaign run by

anglers who blame salmon farms for the demise of the wild salmon they want to catch.

He then went on to rate ten smoked salmon offerings. Unsurprisingly, his choice for best overall smoked salmon was 'Leap' wild smoked sockeye salmon (£8.00-£9.25/100g), which he awarded four stars out of five. He highlighted the sustainability credential whilst saying that it has dark flesh and a rich smoky aroma, adding that it is deeply flavoured and satisfyingly firm.

I am not a great fan of the Leap brand because it comes with the slogan 'Free, not farmed'. The fish and seafood sector has an already difficult job getting consumers to eat fish and seafood, so it is not helpful to promote one form of product by implying a negative image of other formats.

Whilst Tom says in the review that Leap sockeye with four stars is the best smoked salmon overall, he has awarded four other smoked salmon four stars out of five, the same as his best overall. Yet, there is no clarification as to why one four-star rated

salmon is better than any other with the same rating, except the salmon is sockeye not Atlantic.

Those awarded four stars include M&S's smoked sockeye salmon (£6.40/100g), Sainsburys 'Taste the Difference' Hebridean smoked salmon (£4.75/100g), The Coop's Irresistible beech and oak smoked salmon (£6.30/100g), and 'London Smoke & Cure' smoked salmon (£9.45/100g) – a small company smoking fish and other foods in south London.

Tom awards three stars to Jon Ross smoked salmon (£7.95/160g), Mowi superior smoked salmon £5.75/100g), Tesco organic smoked salmon £5.75/100g), and Forman's smoked salmon (£6.25/100g). Finally, Morrisons, The Best maple cured smoked salmon (£4.50/100g) is given just two stars, despite Tom saying it has excellent flavour and presentation for this price.

I'm not sure I agree with all his pricings, as I know I can buy cheaper if I shop judiciously. Certainly, Leap smoked sockeye salmon could be bought in the run-up to Christmas for £5.95, saving £3.30, which is an interesting level of saving. This is because it was possible to buy a 100g pack of smoked salmon for as little as £3.30, or less, and probably have as good or even better experience than Tom.

Every supermarket offers their customers a standard pack of own-label smoked salmon and I thought it would be an interesting exercise to taste test and compare them at the same time. It was a tough job, but someone had to do it!

Whilst Tom Hunt seemed more concerned about sustainability of the fish, the taste comes more from the cure and the smoke. This means that there were subtle differences between each smoked salmon, but all had been smoked with a mild smoke rather



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Opposite: 'Leap' wild
smoked sockeye
salmon

Above: Smoked salmon



than the strong smoked used in some supermarket products. The differences were either due to the smoke, with some being bland whilst some had a slight acid taste, or due to the oil content, with some greasy and some dry. But I stress the differences were very subtle, and in my opinion not sufficient to make any shopper want to travel to another supermarket to buy a different own-label smoked salmon.

The smoked salmon tasted were:

- Aldi £2.49/100g – No origin but smoked in Scotland.
- Asda £3.00/100g – Norwegian salmon but could have been Scottish smoked in Scotland.
- Lidl £2.99/100g – Norwegian salmon smoked in Poland.
- M&S £5.00/100g – Scottish salmon smoked in Scotland.
- Morrisons £2.30/60g – Norwegian or Scottish smoked in England.
- Sainsbury's £3.75/100g – Scottish salmon smoked in Scotland.
- Tesco £3/ 100g (saving 75p) – Norwegian salmon but could have been Scottish smoked in Scotland.
- Waitrose £5.50 /100g – Scottish salmon smoked in Scotland.

The smoked salmon that edged ahead were from Asda, Aldi and Morrisons, but the margins were small. The combination that seemed to work was with flesh that was a little oily, and a smoke that could be tasted, but not enough to mask the taste of the salmon. I would have had no hesitation in serving most of these salmon at Christmas rather than paying out much more for what is judged to be more of a premium offering. It is a testament to the quality of farmed salmon that smoked salmon can be sold for comparatively so little.

The big question is how do these smoked salmon compare with Tom Hunt's overall winner?

The trouble here is that Atlantic salmon is a different fish to sockeye salmon, and the difference is not just farmed or wild as many consumers seem to believe. Sockeye salmon are more closely related to rainbow trout than Atlantic salmon. The five species of Pacific salmon, of which sockeye is just one, have a different taste and texture profile to Atlantic salmon, and this can catch consumers out. The fish are less oily and have a much tighter texture, and thus have a very different eating quality. This is very much reflected in the smoked sockeye salmon sold under the Leap brand.

When the smoked sockeye is tasted against smoked Atlantic salmon, the Atlantic salmon wins every time. Of course, eating smoked sockeye salmon on its own is probably a different experience because the difference is not apparent. However, when tasted alongside even the cheapest smoked Atlantic salmon, the different nature of sockeye makes it a less pleasant experience.

I might be tempted to say that those more used to eating Pacific salmon might have a different preference, but then seeing the amount of farmed Atlantic salmon for sale in the US, perhaps the preference there is for Atlantic salmon, too. ●

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Consenting reform should make life simpler, not harder

Tavish Scott, chief executive of Salmon Scotland, argues that proposed changes to fish farm consenting risk rearranging the system rather than fixing it

If you wanted to design a system that discouraged investment, confused communities, and exhausted regulators, it could well look something like Scotland's current approach to fish farm consenting.

That is not for lack of effort. Reviews have been written, strategies launched, and consultations run. But for all the activity, the experience on the ground remains stubbornly familiar.

The process is lengthy, responsibility is spread across multiple bodies, and it is often unclear who is actually in charge.

Delays and bureaucracy have become part of the landscape, creating frustration not just for producers, but for regulators and communities trying to engage with the system.

The Scottish Government's recent consultation on environmental discharges from fish farms, which closed in December, was an opportunity to change that.

It could have been the moment to reset consenting in line with what we already know needs to happen.

Instead, it risks reinforcing a pattern that has become all too common in aquaculture regulation: adjusting parts of the system without fixing the system itself.

The proposal to designate the Scottish Environment Protection Agency (SEPA) as the single responsible authority for regulating

environmental discharges between zero and 12 nautical miles is presented as simplification.

On paper, consistency has an obvious appeal. In practice, whether this change makes consenting easier to navigate, quicker to deliver, or clearer in accountability is far from certain.

This matters because Scotland already has a clear diagnosis of what is wrong with aquaculture consenting. Professor Russel Griggs' independent review found the system was not fit for purpose. It was fragmented, slow, and confusing.

Accountability was unclear and duplication was built in. Everyone he spoke to agreed it needed to change.

Salmon producers across Scotland know it needs to change too. But as Griggs made clear, recognising failure is only the starting point. The real test is delivery.

Griggs was explicit about what a better system should look like. Fewer moving parts. Clear leadership. Proportionate, evidence-based decision-making. A framework that people could understand, trust, and operate within.

Ministers accepted those conclusions at the time, including the recommendation to establish a short-term project board to drive reform at pace and ensure momentum was not lost.

Left: Farm worker feeding fish
Opposite: Salmon farm



Cutting red tape does not mean lowering standards



Nearly four years later, it is reasonable to ask where that momentum has gone.

We are still waiting for real reforms

There has been activity since the review was published, including useful work through the Consenting Task Group to test more efficient approaches and reduce duplication. But the wider structural reform Griggs envisaged has yet to materialise in a way that businesses, regulators, and communities can clearly recognise.

The Ministerial Aquaculture Strategy Forum that followed was not what was recommended, and while the Vision for Sustainable Aquaculture, published in 2023, set out welcome ambitions, it falls well short of the systemic change needed to fix consenting in practice.

That is the backdrop to the current consultation. Yet, strikingly, it makes no reference to implementing Griggs' recommended regulatory improvements. Instead, it focuses narrowly on transferring responsibility for one element of the system.

Centralising responsibility for environmental discharges could form part of a genuinely integrated approach.

But taken in isolation, it does not create a one-stop shop, nor does it remove the overlap and duplication that continue to slow decisions and blur accountability.

A single authority is not the same thing as a simple system, particularly if the wider framework remains fragmented.

There is also a strong case for pausing before this change is embedded. Once regulatory responsibilities are moved, they are difficult to unwind.

Proceeding without a clear view of how this proposal fits within a wider reform programme risks locking in complexity rather than reducing it. Reform done in the wrong order can be as damaging as reform not done at all.

Streamlining should not be confused with deregulation. Cutting red tape does not mean lowering standards. In practice, clearer and more coherent systems tend to deliver stronger and more robust regulation, not less.

When roles are well defined and processes predictable, regulators can focus on environmental performance rather than process management.

What Scotland does not need is an additional layer of confusing bureaucracy that makes consenting harder to navigate and harder to deliver well.

Elsewhere, salmon-producing nations have already shown that consenting can be both rigorous and efficient. Clear leadership, fewer overlapping processes, and predictable decision-making have delivered high environmental standards alongside greater confidence for

communities and investors alike. Scotland should not assume that complexity is the inevitable price of ambition.

The real prize here is much bigger than the current proposal. Scotland has the opportunity to design a consenting system that genuinely leads the world.

Not simply one that reallocates responsibilities, but one that is coherent, proportionate, evidence-based, and capable of commanding confidence from everyone who has to engage with it.

That would mean aligning assessment, licensing, and enforcement within a single, well-led framework. It would mean clear accountability, transparent decision-making, and a process that is rigorous without being unnecessarily slow or opaque.

Above all, it would mean finishing the job that Griggs started, rather than circling around it.

All parts of the sector agree the current system is not working. The question now is whether reform will finally address that reality, or whether Scotland will continue to mistake movement for progress.

This moment still offers an opportunity to get consenting right. It should be used to simplify the process in practice, not just reorganise it on paper.

Tavish Scott is Chief Executive of Salmon Scotland ●



Shellfish showdown

Nicki Holmyard reports on the EU audit of the UK SPS, why low trophic aquaculture should be prioritised in the EU budget, and why the new UK Coastal Growth Fund has failed to impress



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Give
shellfish
producers a
chance and
they’ll give
Europe
cleaner
seas, better
jobs, and
healthier
food

THE EU audited the UK’s Sanitary and Phytosanitary (SPS) system for live bivalve molluscs in mid-2025, to assess official controls on traceability and harvesting areas for mussels, oysters, clams and scallops, to ensure compliance with EU standards.

The audit was part of ongoing efforts to manage the export trade for class B live bivalves, which has faced significant barriers since the UK’s exit from the EU.

A draft audit report was issued to the UK on 29 September 2025, with a deadline for responses by the end of December. The findings of the report, which are expected to influence recommendations for aligning UK controls with EU requirements, and thereby reduce trade barriers and re-start exports, have been kept under tight wraps by the government.

Meanwhile, industry has welcomed news from a joint EU-UK statement issued in December 2025, that the two sides are fully committed to implementing, in a timely manner, the outcomes of the May 2025 Summit, at which an agreement was reached to strengthen cooperation through a new strategic partnership and to start talks on a new SPS agreement.

In particular, by the time of the next EU-UK Summit, the aim

is to conclude SPS negotiations, which are expected to remove routine border checks and simplify trade for perishable seafood. Although the date of the Summit has yet to be confirmed, the UK Government is working towards the first half of 2026. As a result, negotiations are expected to move quickly. Industry is holding its collective breath...

EU urged to prioritise low trophic aquaculture in budget

The European Mollusc Producers Association (EMPA), which represents more than 90% of Europe’s shellfish farming sector, has called on the European Commission to deliver simplification, accessibility and prioritisation for low trophic aquaculture in its 2 trillion post-2027 Multiannual Financial Framework (MFF), which is

Above: Oyster farming
Opposite from top: Mussel
farm; Cockle; Scallops



currently under discussion.

Low-trophic aquaculture has repeatedly been identified by the EU as a strategic, nature-positive food system, but access to funding has been complex, uneven, and often out of reach for the micro and small producers who are the mainstay of the sector, according to EMPA.

As a result, the organisation has produced a position paper to address everyone involved in shaping and implementing the next MFF, appealing for concrete change.

The paper points out that shellfish farming is one of the most environmentally beneficial food production systems, requiring no external feed, helping to improve water quality, enhancing biodiversity, and contributing to climate resilience. Shellfish also have a valuable part to play in providing food security for coastal nations. The new funding framework should therefore recognise and reflect these unique contributions, and support the sector's capacity to deliver social, economic and environmental benefits for the EU's coastal regions.

In particular, dedicated and earmarked support for low-trophic aquaculture is required, along with streamlined application and reporting procedure for small operators, technical assistance for micro-enterprises, and a performance framework that reflects producers' realities. In particular, there should

be simplified and rapid access to an emergency response fund that is available in the event of a crisis caused by unexpected events, such as environmental, sanitary, and market-related shocks. This is something that is currently unavailable.

Also required, is harmonisation and guidelines across all EU Member States, and simplified financial instruments suitable for small coastal actors, plus support for collective or cooperative projects that would allow micro-producers to pool administrative capacity. Of paramount importance is the reality of running a small aquaculture business, and being recognised in the set-up and administration of the new funds.

EMPA also joined recently with Members of the European Parliament (MEPs) and other industry experts, to call on EU policymakers to integrate mollusc aquaculture into their 'Vision for Fisheries and Aquaculture 2040.'

Addy Risseuw, EMPA president, underlined the need for shellfish to be fully integrated into the European Commission's future policies, as a pillar of

climate resilience and sustainable diets.

"Give shellfish producers a chance, and they'll give Europe cleaner seas, better jobs and healthier food," Risseuw stated at a high-level conference held at the European Parliament in October.

EMPA argues that shellfish farming is an essential tool that can help to deliver the European Commission's 'European Ocean Pact', which is a comprehensive strategy to better protect the ocean, promote a thriving blue economy and support the wellbeing of people living in coastal areas.

"In particular, the sector can deliver healthy, low-impact food production locally, which will strengthen Europe's food autonomy, support coastal communities and jobs, and provide vital ecosystem services," Risseuw said.

New UK Coastal Growth fund fails to impress

Meanwhile, in the UK, the government has published in a policy paper, details of the annual allocation for the next five years, of the £360 million Fishing and Coastal Growth Fund announced in 2025.

In the first year of the fund, 2026-27, £25 million has been allocated, rising to £35m for 2027-28 and 2028-29. A further £45m has been allocated for 2029-30, and £25m for 2030-31, which is the last year for which future spend can be set, as a General Election is due that year.

The monies will be split between the devolved governments in line with the Barnett Formula, which is based on population size. As a result, 84% is allocated to England, 8% to Scotland, 5% to Wales, and 3% to Northern Ireland. This split has angered the sizeable fishing and aquaculture industries in Scotland, which feel betrayed by the government. Politicians and industry leaders continue to criticise Westminster for the way in which the fund has been split, but no headway has been made so far, and I suspect that none will. ●



A tale of two reports

Sandy Neil reports on calls for an independent review of the salmon sector's economic impact

TWO reports looking into the economic impacts of Scotland's salmon farming industry were published this winter, but with contrasting conclusions. Here we explore the findings from both, to help you decide.

First, analysis from BiGGAR Economics for trade body Salmon Scotland presented "the scale and depth" of economic activity supported by Scottish salmon farming across the country.

Its top headline was the industry delivering a £1bn boost to the economy, and supporting 11,000 jobs, despite its "accounting for a fraction of Scottish marine environment".

"Collectively, the activities of those involved in the sector supported an economic impact worth £953m Gross Value Added (GVA), and 10,850 jobs across Scotland in 2024," it explained.

The new report also found salmon farming jobs "pay an average of about £44,500, around 16 per cent above Scotland's typical salary, generating at least £37m in tax last year, with more through the supply chain".

It concluded the sector is "one of the most important rural economic engines and a vital anchor for jobs, investment, and supply chain businesses across Scotland."

"The year-long, permanent, high-wage, employment opportunities the sector provides, contributes to the liveability of these areas and reduces population decline by attracting workers, contributing to local infrastructure, and enabling other local businesses and services to thrive."

Let's look a little more in detail at the figures behind the headlines.

"Since its beginnings 60 years ago, Scotland has established itself as the third largest producer of Atlantic salmon

globally, producing around 100,000 tonnes in the 2000's," the report began.

"Over the last two decades the sector has grown at a conservative pace, averaging 1.5% per annum. There are over 200 active farms across north and west Scotland that collectively produced 192,000 tonnes of Scottish salmon in 2024.

"A significant portion of this production serves a thriving export market, making Scottish salmon the UK's largest food export. In 2024, over 101,000 tonnes of whole, chilled, salmon, valued at £844m, were exported to customers worldwide.

"Further processed products, such as sides, fillets and smoked salmon, added a further £106m to export valuations in 2024.

"The European Union (EU) remains the primary market, receiving 63,000 tonnes in 2024, with North America also being a key destination. The top three individual markets were France, the USA, and China.

"The direct activities of the Scottish salmon farming sector in 2024 generated £231.2m in GVA for the Scottish economy





and directly employed 2,460 people.” The majority of these, it added, are located in rural and coastal communities.

“Wages and salaries paid to employees totalled £108.6m in 2024. In 2024, staff spending by the Scottish salmon farming sector supported £65.5m in GVA for the Scottish economy and sustained 490 jobs.

“Remote and rural areas of the country have experienced population ageing and decline over a number of years, with a lack of local job opportunities often a key driver. Small increases in secure employment often have large effects on the viability of these local economies.

“As one supply chain operator explained: ‘We are providing very well paid jobs to a young workforce who often have young families. They are helping to keep local schools and shops open.’

“Supply chain companies that make the operation of salmon farms possible are also located in remote and coastal locations. For example, almost all of Inverlussa (140), Migdale (68), and GaelForce (120) employees are based in the Highlands and Islands.

“In 2024, the Scottish salmon farming sector’s spending supported a total supply chain impact of £589.9m in GVA and 7,040 jobs.

“In addition to supporting economic activity, the core operations of the sector generate fiscal revenues. This arises from the employment taxes (income tax and national insurance) associated

with salaries and wages paid.

“Based on total wages and salaries and the number of employees, this was estimated at £44,539 per employee in 2024 (16% more than the median wage for Scotland in the same year).

“Total employment tax revenues for 2024, arising from those directly employed in production activity, were estimated to be worth at least £37.1m. Further tax revenues would be raised from employment associated with the supply chain.

“While producers have a degree of vertical integration, in 2024 they spent around £1.2bn on external goods and services – of which £714m (60%) went to businesses located in Scotland.”

Above: Salmon farm in Scotland
Opposite: Scottish salmon on ice



We are providing very well paid jobs to a young workforce



The BiGGAR Economics' report concluded: "Scottish salmon farming is a vital contributor to the fabric and sustainability of the local communities in which it is based. Without the presence of the sector in these areas, it is likely that many of the services or business community would not exist."

The figures were welcomed by the Scottish Government, with Deputy First Minister Kate Forbes praising the sector's contribution to jobs and growth.

Ms Forbes said: "This is a sector that continues to invest in its people, with average salaries being significantly above the Scottish average. It is also an industry that brings benefits to the country's wider supply chain."

"The Scottish Government will continue to take bold steps to support the sector's ongoing sustainable development and to ensure it remains a Scottish success story."

A critical view

A second report into the economic impacts of Scotland's salmon farming industry, 'Assessing the Economic Impact of Salmon Farming in Skye & Lochalsh: An Exploratory Scoping Study', offered a counter view, however.

This study, by analysts Dr Andrew Moxey and Dr Angela Tregear of the University of Edinburgh, which uses Skye and Lochalsh as a case study, argued that "the industry overplays its economic benefits and downplays its costs".

The report was commissioned by the Sustainable Inshore Fisheries Trust (SIFT) and WildFish, a UK charity campaigning for wild fish and their environment.

Charles Millar, Executive Director of SIFT, summarised: "The salmon industry operating in Scotland may tout itself as a success story, but we now have data on the jobs it costs in other sectors."

"All too often the benefits don't stay in Scotland, the profits flow overseas, and local communities are left with both the bills and the environmental consequences."

Giving further details, a WildFish spokesperson added: "Across

Scotland as a whole, official statistics show that salmon farming production jobs have fallen in the last decade. In Skye and Lochalsh, the report estimates that approximately 137 people currently work in the industry, some 2% of the local workforce.

"However, the report estimates that the negative impacts of salmon farming have cost between 12 and 38 jobs locally in other sectors, including in mussel farming, creeling and marine tourism, all of which have markedly lower environmental impacts than open cage salmon farming."

"Multinationals, which own most of Scotland's salmon farms, also receive substantial UK tax credits and grants, in some years receiving more than they pay in tax."

"Moreover, the industry requires extensive government oversight, which is funded from the public purse, while salmon farms have been exempt from local business rates since 1981."

Andrew Moxey, co-author of the report and former Chief Agricultural Economist

Above: Working on farm
Opposite from top: Tavish Scott; Mairi Gougeon



This industry should now be
required to pay its way

for the Scottish Government, added: "Published official guidance for economic appraisals emphasises the importance of estimating net effects accounting for costs as well as benefits.

"Doing so for salmon farming is hindered by a lack of data, but our findings from Skye and Lochalsh confirm that headline figures exaggerate the net benefit to Scotland and host communities. Better data and more routine analysis would help to inform debate about the magnitude and distribution of net benefits and their relevance to achieving different policy objectives."

Calling for an "independent, Scotland-wide" analysis, SIFT's Executive Director Charles Millar concluded: "At the very least, this industry should now be required to pay its way and make a fair contribution to the parts of Scotland where its harmful effects are most widespread.

"The Scottish Government has spent far too many years touting the benefits of salmon farming and ignoring its costs: we need an independent Scotland-wide economic analysis of this sector before the multinationals get a penny more in state funding or any new planning approvals."

A year on from the Holyrood salmon inquiry, where are we now?

It has been a whole year since Holyrood concluded its critical inquiry into fish farming in Scotland, and dished out an ultimatum for urgent improvement, so now seems a good time to catch up on progress.

Last January, nine MSPs on the Rural Affairs & Islands Committee (RAIC) concluded their follow-up inquiry focusing on four themes of fish health and welfare, environmental impact, interactions between wild and farmed salmon, and the location of fish farm sites.



The committee was checking up on progress from an earlier inquiry in 2018, conducted by its predecessor the Rural Economy & Connectivity Committee, which ruled urgent action was needed to improve regulation and address fish health and environmental challenges. It set out 65 recommendations.

Six years later the follow-up inquiry revealed its findings, which could be summed up in a single word: "disappointingly".

The RAIC's overarching conclusion was that "the slow rate of progress in improving the regulation and enforcement of the Scottish salmon farming industry needs to be addressed as a matter of urgency, to future-proof the industry and enable it to grow sustainably".

The committee rejected calls for a moratorium on new and expanded

sites – for now – unless the Scottish Government could show progress on its recommendations, and those from the earlier inquiry, within a year. So how has it been going?

We had two interim updates in September, first from the Cabinet Secretary for Rural Affairs, Land Reform and Islands, Mairi Gougeon MSP, and then from the chief executive of the trade body Salmon Scotland, Tavish Scott.

The minister's update, Ms Gougeon said in a letter to the RAIC, "represents six months of concentrated activity by the government". Here we focus on a few of their key commitments, and how and when they are being met.

On the Scottish Government's commitment to "explore how the presentation and accessibility of existing data collections can be improved", the minister reported that the Scottish Environment Protection Agency (SEPA) had updated the Scotland's Aquaculture website to ensure it has "secure infrastructure and that it is more intuitive and accessible for users".

SEPA, she said, had also secured funding "to undertake scoping work for the design and delivery of a digital platform to support efficient, effective and transparent marine fish farm regulation, including the roll-out of streamlined and integrated consenting, and modernised access to comprehensive multi-agency information about aquaculture in Scotland".

On another government commitment to "analyse mortality data, exploring thresholds for 'persistently high mortality', and whether fish farms with 'persistently high mortality' exist", Ms Gougeon updated: "We have developed a robust analytical framework to determine whether there is 'persistently high mortality' at





Scottish production sites. The framework employs qualified parameters for 'elevated', 'recurrent' and 'persistent' mortality to design a modelling approach that can help identify sites that potentially show 'persistent elevated mortality'.

"Quality assurance is being undertaken on the preliminary analytical model with a view to generating initial results later [in 2025].

"Where there are sites screened as having 'persistent elevated mortality' under the analytical framework, we will engage with those operators to explore what actions are already taken by producers to prevent issues causing mortality persisting from year to year.

"By spring 2026 we will provide a project report to the RAIC detailing both the finalised methods, the results of analysis, and the planned Scottish Government response to these."

The Scottish Government had also committed to a new Environmental Quality Standard for emamectin benzoate, an insecticide used to control parasitic sea lice on salmon.

Ms Gougeon updated the RAIC: "SEPA have taken account of the most up-to-date science and have had an interim standard in place since 2019. All new and

significant changes to emamectin benzoate discharges since then have been permitted in accordance with the interim position.

"SEPA are committed to reviewing all permits for existing operations to ensure that all sites are required to operate under the new standard by June 2028."

The Scottish Government had also pledged "to continue to work with SEPA and the sector to support development of the monitoring strategy underpinning SEPA's Sea Lice Risk Assessment Framework, and to manage the transition of governance of this issue under existing local authority Environmental Management Plans by the end of 2025".

In her update, the minister said: "SEPA has carried out a risk-assessment across all sites and varied the permits for all existing marine pen fish farm operations. These variations include conditions relating to impacts of sea lice on wild fish requiring monitoring across all operations and 'standstill' conditions in terms of sea lice numbers on those sites that have been identified as having the highest relative risk."

However, Ms Gougeon added that "these variations have been appealed by the operators and will not come into force

until the appeals process is complete". Later on, she detailed: "The Scottish Government Planning and Environmental Appeals Division has received 260 appeals relating to SEPA's sea lice risk assessment framework."

Further, under environmental matters, she said: "The finfish aquaculture sector in collaboration with SEPA have completed the first set of pilots for monitoring sentinel pens to test sea lice dispersions models. The results from the monitoring are currently being collated and assessed.

"SEPA has consulted on and now adopted a new charging scheme in relation to monitoring impacts of sea lice from marine pen fish farms. This has allowed the development and implementation of an initial programme of sea trout monitoring on the West Coast, Western Isles and Orkney in 2025. SEPA are in the process of developing a larger ongoing national programme of monitoring that will commence in 2026."

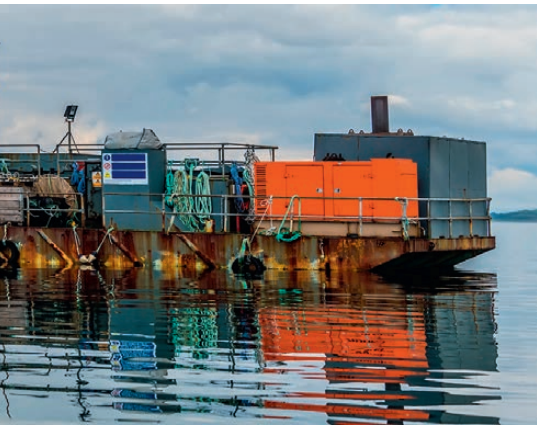
On the issue of fish farm escapes, she updated: "We have committed to prioritise progress on penalties for fish farm escapes in 2026/2027, however some initial scoping work has commenced to consider options for the introduction of penalties."

A week later Tavish Scott, chief executive of the trade body Salmon Scotland, presented the industry's progress update to the RAIC.

Mr Scott began with a long list of headlines, including "record survival figures for January-August 2025 (92.3%)", "record low antibiotic use figures for 2024 (down to 5.1mg/kg)", and "continuing consumer demand, both domestically and internationally, with the sector on track for record exports in 2025".

Mr Scott said: "Alongside improvements in fish health, welfare and survival, salmon farmers are reporting significant improvements in overall biological performance, fish growth, and productivity.

"We previously updated the Committee that fish survival in 2024 had been significantly improved over 2022 and 2023. Our sector recorded an overall improvement in marine survival of 10%, between 2024 and 2023 (82.3% v. 72.3%).



"We are pleased to report that this trend has continued in 2025. Survival in the first half of 2025, and to date, has exceeded expectation, with record figures. The January to August 2025 figure is 92.31%, which is the lowest since we first started publishing in 2018."

The use of antibiotic medicines, he said, had also been significantly reduced: "In 2024, antibiotic use dropped to 5.1mg/kg, a reduction of nearly 80% compared to 2023. Furthermore, use is restricted to a small number of farms. Antibiotics were used on 8% of all farms in 2024 (7.1% of seawater farms and 10.6% of freshwater farms)."

Salmon Scotland told us it expects to publish its revised welfare guidelines in January.

Summing up the sector's progress so far, Mr Scott said: "This is testament to the

hard work of the sector's farmers, veterinarians and fish health professionals, as well as the £1bn invested in fish health and welfare since 2018."

Striving to improve survival rates

The Scottish salmon industry has made significant progress in improving fish welfare and survival over recent years, supported by substantial investment and innovation.

Since 2018, the sector has invested over £1 billion in fish health and welfare, veterinary care, technology, and stock management. This investment has contributed to record survival rates, with monthly survival for farmed salmon reaching an average of 99.12% between January and June 2025 – the highest since voluntary data reporting began in 2018. Overall survival across farms rose to 82.3% in 2024, up from 72.3% the previous year, reflecting a 36% reduction in mortalities.

Key improvements include enhanced monitoring and mitigation measures against environmental challenges, such as jellyfish blooms and warming seawater. The industry has adopted advanced technologies, such as freshwater treatment vessels, underwater cameras, and innovative netting to improve fish health. There is also a focus on reducing medicine use, with antibiotic use falling by nearly 80% in 2024 to the lowest level since reporting began.

Transparency has increased through voluntary publication of detailed farm-by-farm mortality and sea lice data, with survival rates consistently high and sea lice levels at historic lows. Independent audits and certifications, such as RSPCA Assured, cover virtually all Scottish salmon farms, enforcing high welfare standards, including limits on stocking densities and humane slaughter methods.

The industry is also innovating with semi-closed containment systems to improve environmental control and fish welfare further. However, some welfare campaign groups note that there is still room for improvement, particularly in areas like transport, transfer, and enclosure policies, and call for greater transparency and regulatory leadership. ●

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SEPA has
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across all
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permits for
all existing
marine pen
fish farm
operations



Opposite from top: Fish farms in Scotland
Left: Salmon with farm workers

Norway opens the door to closed containment

Something big is happening in Norwegian aquaculture, writes Benedikte Ranum: not just in terms of the sheer size of the looming new structures, but in their potential impact on the entire sector

LAST October, the Norwegian government introduced a regulation that gives fish farmers in three of the most sea lice-challenged production areas a chance to reclaim lost biomass. But only if that biomass is produced in closed or semi-closed aquaculture systems – and those systems must meet strict performance criteria.

The legislation converges with trailblazing new technology being developed by Norwegian entrepreneurs: supply chain companies working hand-in-hand with producers to arrive at ambitious and revolutionary ways of farming.

This article looks at what the new Norwegian scheme actually entails, the pros and cons of the approach, what research is being undertaken in this area, why science and good husbandry will be key to delivering the welfare and sustainability gains everyone is hoping for, and what opportunities this may hold for Scotland.

Why is the Norwegian government promoting closed containment now

This new push from the Directorate of Fisheries was not entirely a surprise: in recent years, pressure has been building around mortality rates and environmental impact. Sea lice levels and mass escapes have frequently featured in the news headlines.

On the back of the government's latest aquaculture policy paper (Havbruksmeldingen, April 2025), this legislation gives a clear political signal: if Norwegian farmers want growth – especially in areas designated 'red' under the traffic light system – this must be delivered through low-impact containment systems.

A colourful political backdrop

The Norwegian government has had a turbulent ride ever since its formation in September 2025. The initial coalition between Labour and the rurally-focused Centre Party fell apart when the

latter left following a dispute about energy policy.

This resulted in a minority Labour government relying on support from four other parties: the Green Party (MDG) and the left-wing SV and Rødt, with the Centre Party occasionally weighing in. These parties are not formal coalition partners, but are essential for passing legislation.

Norwegians call it a "tutti-frutti" coalition; a humorously disparaging term referencing the multicoloured pick'n'mix sweet.

The national budget was finally agreed last December, but not without further drama and negotiation walk-outs.

Against this backdrop, the new aquaculture regulations may have been a useful tool for Labour in its attempts to appease MDG, SV and Rødt, all of whom have explicitly proposed that closed containment should be a requirement for sector growth.

Above: Norway from space

Opposite from top: The Egget; Gael Force Seaqure system



Closed containment systems are fundamentally different

What exactly does the new legislation cover?

Fish Farmer readers will already be familiar with Norway's controversial traffic light system. Green zones allow for biomass growth; yellow means no change; and red zones lose capacity due to environmental pressure – particularly from wild salmonid interactions and (what is perceived to be) the associated lice risk.

Several areas turned red in recent cycles, leaving Norwegian producers frustrated and looking for a way to win back capacity in sustainable ways. The government's answer: allow those operators to regain some lost biomass, but only within verified closed or semi-closed units.

This is not a blanket green light; it's highly targeted. Only three production areas qualify (3, 4 and 5; along the south-west to mid-west coastline, from Stavanger towards Møre og Romsdal), and only for the portion of biomass they previously lost.

And critically, it's not enough to simply buy a shiny new system: you need third-party verification that the facility actually prevents lice intake, stops escapes, and collects a significant portion of waste.

Politically, the move allows the government to show both industry and environmental groups that it's serious about innovation, welfare, and sustainability.

Practically, it gives farmers a clear incentive to invest in technologies that can reduce impact, without abandoning growth.

And promisingly, some of the closed systems can already show evidence of several successful production cycles, with high levels of welfare and protection from lice and escapes.

It's not 'one size fits all'

Norway's new rules are deliberately technology neutral. For verification, what matters isn't the label, it's the performance. If a system prevents natural throughflow, keeps lice out at intake, prevents escapes through double-security measures, and captures waste to a defined level, it qualifies.

Producers will be encouraged to use the system that they



deem the most suitable for their locality. And the idea is not for closed containment to replace traditional farming methods, but to be used alongside them. That flexibility is important, because it leaves room for innovation and avoids the trap of regulators betting on one specific design.

Still, closed systems are not magical silver bullets. While the list of benefits is long, there are some fairly sizeable wrinkles to iron out. Next, let's look at some of the pros and cons.

The upsides...

The good news is that closed and semi-closed farming is something that both the producers, the supply chain and the government want. Even the Norwegian Veterinary Institute, the environmentalists and the wild fish enthusiasts may have cause to feel quietly hopeful at the promise of lice-free salmon and controlled collection of waste.

Closed and semi-closed systems don't just tick a political box; they can solve real operational problems, many of which will resonate with Scottish farmers as much as their Norwegian counterparts:

1. Sea lice reduction

By controlling intake water, these systems can massively cut lice exposure. In fully closed units the reduction is dramatic – and some manufacturers even promise to eliminate the sea lice problem once and for all.

In semi-closed systems, they still see meaningful reductions, because deep-water intake avoids the surface lice bloom. (There is a tentative caveat: sea lice are adaptable creatures, and there is recent research – e.g. Norway's Institute for Marine Research – suggesting that some sea lice may thrive at greater depths than previously thought.)

2. Reduced escape risk

Solid walls and double security make mass escapes extremely unlikely, which – amongst other obvious benefits – is also good for ensuring social licence.

3. More control over water quality

Closed systems allow control over temperature, salinity, oxygen and CO₂. If it's done right, water quality becomes more stable than in open-net pens, which may reduce stress and help fish convert feed more efficiently. Of course, "done right" is the key here:





poor design or insufficient redundancy, for example, can create welfare issues of their own.

4. Sludge capture and reduced benthic impact

Over recent years, Scottish farmers and academics have worked with regulators on modelling the benthic impact of aquaculture waste and monitoring the seabed for Priority Marine Features – topics that are crucial for open-net pen farming applications. But by capturing a meaningful share of faeces and uneaten feed, closed containment systems can greatly reduce local seabed impact.

What happens to the captured sludge is a different story: there's a lot of untapped potential. A project funded by FHF – the Norwegian Seafood Research Fund – is currently mapping different solutions for the capture and usage of aquaculture sludge. The consortium will use lifecycle analysis, from feed right through to end use, to evaluate whether these solutions would solve the environmental challenge or simply move the issue from sea onto land.

5. A new wave of innovation and supply chain growth

Where regulation creates opportunities, supply chain innovation will follow (and vice versa). Norway's incentive scheme gives equipment manufacturers, engineers, and service companies an encouraging market signal. This should lead to a rapid evolution of pumps, filtration systems, sludge separators, measurement and monitoring equipment, and so on. As we know, Scotland itself has a wealth of innovative supply chain businesses in these areas that might well benefit from increased demand across the border.

...and the downsides

While some may view closed and semi-closed containment as the answer to everything, the commercial reality is much more complicated.

1. Cost and energy demand are still the elephants in the room

Fully closed systems can cost several times more per tonne of capacity and use more energy than traditional pen systems. Even

semi-closed units, though cheaper, require pumps, special materials, and complex maintenance. For Norwegian producers trying to recover lost biomass, this can be worth it, and economies of scale may play a part. For Scottish farms operating on slimmer margins, the number-crunching could perhaps be tougher, unless similar government incentives or planning advantages offset the cost.

2. Sludge management isn't solved yet

Where does all that collected sludge go? Even in Norway, with more processing infrastructure, it remains a logistical challenge. Pumping to shore is costly, barges are weather-dependent, and processing options vary by region. And until a more valuable end use product is developed, sludge remains a cost-benefit nut to be cracked.

3. The water-quality risk shifts, from natural to mechanical

In open pens, storms, warming seas and harmful blooms are the big hazards. In enclosed systems, the risks may look like pump failures, sensor errors, biofouling, clogging, CO₂ build-up, or oxygen crashes. It's a different risk profile: less dependent on the ocean, but more dependent on engineering reliability. Teams of technicians, data monitoring, and proactive maintenance will all be part of the transition to this new way of farming.

4. Verification and paperwork

Norway's regulations require independent experts to verify that a containment unit

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Biology
will
always
trump
technology

Above: SalMar Ocean Farm 1

Opposite: Nordlaks Jostein Albert

performs as it should, with organisations like DNV already on the scene to offer their services. However, the devil is in the detail: what do you measure, how often, and under what conditions?

The Directorate of Fisheries has already admitted that data systems don't perfectly track production in closed units. Refinements are likely to follow, no doubt alongside a great deal of administrative workload and – possibly – a bit of bickering.

5. Systems vary enormously

There is a risk of trying to compare apples with pears: system designs are completely different from each other, and standard categories have not yet been agreed. Regulators can't treat them as equivalent, and farmers shouldn't either. This is why Norway's technology-neutral but performance-based framework is sensible, and why good research and verification matter.

Research is the key

Ultimately, the success of closed and semi-closed containment will rest on research and good husbandry. The systems must work for everyone involved – first and foremost for the fish. So what research is being done in this space right now?

Jørund Larsen is the head of Production Biology and Technology at FHF. He tells Fish Farmer: "Studies have shown that facilities at sea can demonstrate promising biological and environmental results. But clearly, closed containment systems are fundamentally different from traditional open-pen farming in terms of production environment, hydrodynamics, and construction.

"Despite the good results we have seen so far, the development of closed containment technology is still in an early phase. If we want to make full use of the technology's potential, a lot of work remains to be done. Among other things, there is a considerable need for research on how the technology may best be used to ensure good fish health.

"Currently, the FHF has one ongoing project on floating closed or semi-closed farming technology. Led by SINTEF Ocean, the project is called 'Environmental requirements for good fish health and welfare in closed cages at sea (BIOCLOSED)' and is set to complete in September next year.

"We are also preparing to fund a new set of projects in this area. Working in close dialogue with supply chain members and producer companies, we have mapped out some of the most pressing challenges and opportunities involved. This helped shape the 20 million NoK (ca. £1,482,000) funding call we announced last summer."

The topics encompassed by the FHF call – identified by industry as being of the highest priority – include, among others:

- Arriving at a common categorisation of different system concepts, with clear definitions for each based on physical

design, water treatment, and what these mean for waste discharge and biological specifications;

- Mapping solutions for water intake and treatment, and documenting the effect of these on the risk of introducing and spreading infection leading to disease outbreaks;
- Carrying out data capture and analysis of completed commercial production cycles, so that documentation of biological performance throughout the cycle can be made freely available;
- Developing interoperable tools for assessing the technical integrity of different closed or semi-closed systems – taking into account salinity differences, mass density, and the effects of biomass – and making these available to the sector.

Larsen concludes: "The overarching theme of the call is to gain knowledge that can help ensure cost-effective solutions, good fish health and welfare, and sound husbandry practices. We look forward to announcing the funded projects in the near future."

As we know, biology will always trump technology. The new systems may be cutting-edge, but the only thing that really matters is whether the livestock thrives and survives. Future research may shine a light on optimal stocking densities, hydrodynamics, microbiome management, gill health under different filtration regimes, or a range of other topics. And as new funding emerges, so will the opportunities for Scottish consortia.

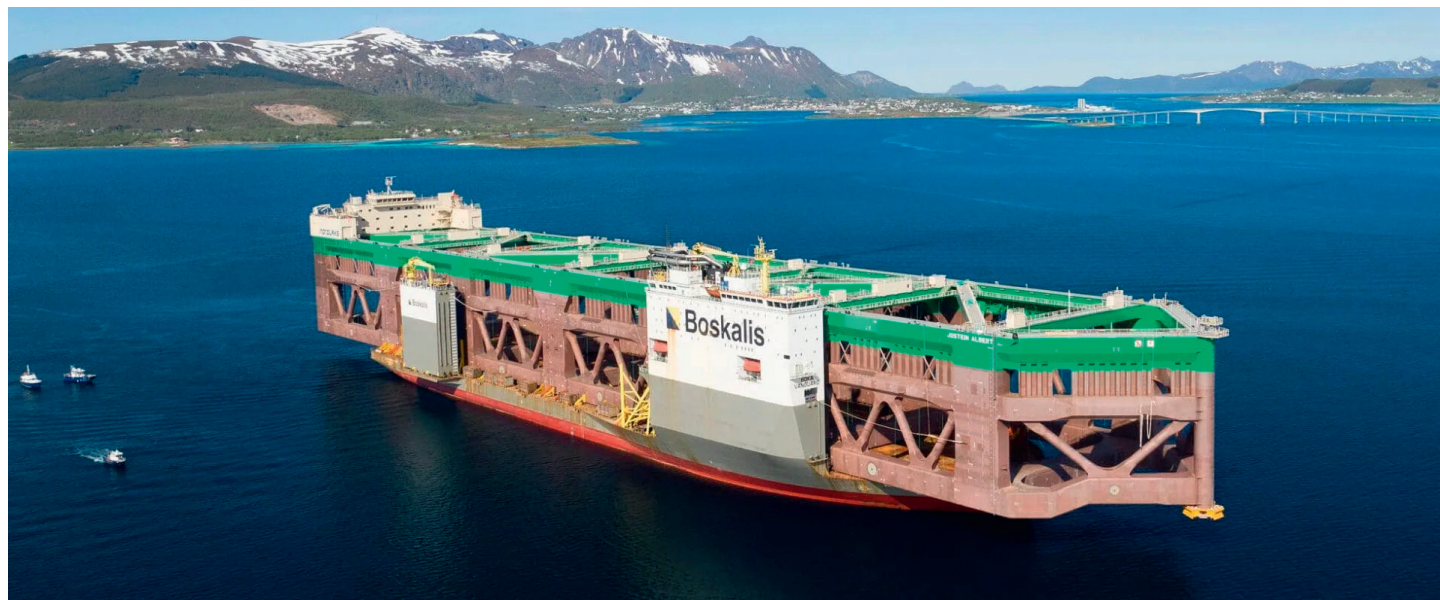
What does this mean for Scotland?

When changes are afoot (or should that be afloat?) in Norwegian aquaculture, the rest of the salmon world tends to sit up and listen. Be they political, technical or biological, developments in Norway often foreshadow where things are heading in other producer nations.

Scotland now has its own semi-closed developments emerging, with SeaQure Farming's trout farm project at Ardnish – supported by £1.8 million from the Scottish Government – and the long-awaited Loch Long Salmon's farm near Arrochar.

And for Scotland, where politics, public perception and environmental pressure are all playing a part in shaping the sector's future, the Norwegian experiment is going to be invaluable. We will be able to see real data on performance, economics, health and welfare, failures and successes, and long-term sustainability.

Right now, Norway is effectively creating a real-time testbed showing how closed and semi-closed systems behave at commercial scale, how regulators verify them, and how the economics play out when incentives are tied to environmental performance. And no doubt the outcomes will have an impact far beyond the Norwegian coast. ●



Stocked, but unsustainable



Ruscena Wiederholt considers the high price of fish hatcheries in conserving wild fish populations in the US

// ONE of the biggest problems, I think, that plagues current fisheries management is the same thing that plagues a lot of society's problems: inertia," said Douglas Tave, Manager at AveAquaculture, and former hatchery manager at the Los Lunas Silvery Minnow Refugium, a conservation hatchery breeding endangered Rio Grande silvery minnows.

Tave goes on: "Augmentation can be used as one component of fisheries management. But continuing to stock and stock and stock doesn't improve fisheries management. My personal thoughts are stocking fewer, but better fish, might be a better approach."

Augmentation is the business of aquaculture hatcheries, which strive to boost populations of fish and other aquatic animals. While they successfully supply fish farms with everything from trout and shrimp to octopi, they often fail on the natural end of things. For instance, hatchery fish can change ecosystems, interbreed with wild populations and compete with them.

Nonetheless, given nearly 13% of marine fish and a quarter of freshwater fish are

threatened with extinction, we need all the tools we can get to boost fish populations. Yet, the question remains: are hatcheries still up to the task?

High costs, low returns

First of all, in spite of their main objective, hatchery releases can actually decrease the abundance of wild fish populations.

"If you think about it, first we have to take some of the fish from the water to use as brood stock," said Kathy Hessler, Assistant Dean for Animal Legal Education at George Washington University Law School. "And so that's already exacerbating the problem. And then we return to the water fish that have to compete with the fish who lived there their whole lives."

For instance, hatchery fish can compete with wild fish populations for prey, leading to reduced growth, reproduction and population declines. But that's just the tip of the iceberg – since hatchery and wild fish differ at the genetic level.

"People don't realise it, but domestication starts the moment you bring the fish to the hatchery," said Tave. "Those that can survive begin the domestication process, and then everything else you do

is driving domestication, so that's changing the genetics of the population ... when you stock these fish in the wild, they're genetically a mismatch to the wild, and they also have behavioural problems. They don't know what predators are, for one thing."

As a result, hatchery fish often have poorer survival rates in natural environments compared to wild fish. Further, hatchery fish tend to have fewer offspring, along with difficulties mating, navigating, and avoiding predators, explained Hessler.

However, some hatchery fish can interbreed with wild fish – diluting the wild gene pool and lowering their productivity



and resistance to infections. Because of these issues, hatcheries often fail to create self-sustaining wild populations.

"It's a zero-sum game, because you have to keep putting more and more hatchery fish in to keep getting the returns that you have," said Brian Bennett, Community and Social Media Manager at Wild Steelhead Coalition.

Finally, hatchery returns obscure the true status of wild fish, explained Bennett, making it difficult to assess population health.

Complicating things further, the scale of hatcheries is enormous. In 2024, the U.S. Fish and Wildlife Service's National Fish Hatchery System produced 223 million fish and aquatic animals. While some facilities support threatened or endangered species, the majority boost recreational fishing and economic development.

Additionally, many of these efforts are funded by taxpayers at significant costs. Hessler has found estimates of \$400 per hatchery fish (£298) up to an astounding \$500,000 (more than £370,000). These exorbitant rates link back to the biology of the fish themselves. For example, Pacific salmon females can lay thousands of eggs, but fewer than 1% survive to become the next generation.

"That's a pretty low survival rate, which helps you understand why the cost is so high, because you have to have all of this infrastructure and you have to have millions and millions of eggs right before you get a decent return," said Hessler.

Further, the fees for running and maintaining hatcheries' often aging infrastructure are quite high, explained Hessler.

Reimagining hatcheries

Nonetheless, despite a problematic performance in many areas, hatcheries do have some positives. For instance, hatcheries can increase populations of threatened and endangered species, provide research opportunities and support the recreational and commercial fishing industries.

"People don't realise how important to the economy fishing is," said Tave. "And it's a great source of recreation for many people."

Case in point, global capture fisheries generated US \$141 billion (£105bn) in 2020, while also supporting millions of jobs.

Some conservation hatcheries are taking a different approach to fish breeding – and maintaining better genetic diversity as a result.

The Los Lunas Silvery Minnow Refugium is one example. In this naturalised facility, staff vary the speeds and patterns of water flow and simulate floods to induce spawning. In addition, they don't feed the fish, but



instead let them forage for river plants and invertebrates on their own. For a species that schools, this is critical.

"Any fish that have been fed when they get into the school exhibits more aggressive behaviour, causing the school to become more dispersed..." said Tave.

However, the behaviour of these groups is vital, since they transmit information about predators.

"If the school is dispersed, it takes longer for that information to pass through the school, which will increase their risk of predation."

As a result of their efforts, the staff have observed natural behaviours in the minnows – including avoiding predators, schooling and seeking shelter in plants.

Repairing rivers

Besides revamping hatcheries, another solution to fish decline is tackling the root causes themselves.

"I think if we look at the problems that are actually causing the reduction in fish populations, then it may be different answers in different places," said Hessler. "So maybe it's the dams coming down in some places, paying attention to clean water and water temperature, water quality issues, and certainly reducing fishing, if we really want to increase the populations."

In addition to habitat restoration, imposing fishing bans, promoting more plant-based diets, or even eating invasive fish, could help species recover. However, Hessler points out that fishing may need to be stopped for several years before fish populations become self-sustaining again. Limiting hatchery releases to certain areas is also an option.

"One of the things we would like to see is what we would call wild gene banks," said Bennett. "So you would designate certain watersheds as wild gene banks. There's no hatchery input in those rivers. And if we're not saying all rivers, you could designate eight watersheds. The problem is, it's going to take a generation. It doesn't happen overnight."

Such actions would help safeguard the genetic diversity of wild fish populations.

Ensuring sustainable fish populations is critical for both the environment, food security and the economy. Reforming hatcheries or closing at least some of them, along with habitat restoration, could be a step in the right direction for many wild fish populations.

"I mean the best hatchery is a wild river..." said Bennett. "So, our thing would be to give wild fish a chance. And they'll come back." ●



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The best
hatchery
is a wild
river

Opposite from top: Trout; Young trout being poured into a grow-out tank at a fish hatchery
This page from top: Los Lunas Silvery Minnow Refugium; Outdoor ponds at Los Lunas; Gravid female Los Lunas hatchery

A plea for understanding

Why don't policymakers take more account of rural needs?
A new survey poses the question



NEARLY three quarters of rural residents believe that politicians do not understand the needs of Scotland's countryside, according to a survey commissioned by a consortium of organisations, including Salmon Scotland.

More than 3,000 Scots were surveyed for the new poll by Diffley Partnership for Salmon Scotland, NFU Scotland, and Homes for Scotland.

The three top issues of concern for people in rural areas are health service access (45%), public transport (35%), and housing availability (30%), according to the Scotland's Rural Voice survey.

Robert Neill, Vice-President of NFU Scotland, said: "This report reinforces what we hear every day from our members: rural communities are proud, resilient and full of potential, but too often face barriers that limit their ability to thrive.

"Whether it's housing, transport, digital connectivity or access

to essential services, these issues are central to the wellbeing and sustainability of rural Scotland ... we urge policymakers to treat these findings as a clear call to action."

Researchers found that Scotland's rural residents are more satisfied with their lives than their urban counterparts, including with their home, the area they live in, their quality of life, and their general health.

More than half (57%) report that they are satisfied with the sense of community and belonging, compared to around a third (36%) of urban respondents.

However, most people living in the countryside (73%) feel decision-makers do not understand the needs of their communities, rising to 79% among remote rural respondents.

Nearly two thirds (63%) said rural residents do not have a meaningful voice in shaping decisions affecting them, rising to 70% in remote rural areas.





People in the Highlands and Islands, and the north-east, are more likely than rural residents in many other regions to agree with both statements.

Nearly nine in ten (89%) rural residents support greater power being devolved to Scotland's countryside, including decisions about local services and development.

Mark Diffley, Diffley Partnership founder and director, said: "This groundbreaking research throws the spotlight on the range of significant challenges facing Scots who live in rural communities across the country.

"We know that some parts of rural Scotland have declining populations, which presents problems for those communities, and we now know the main reasons for depopulation, its impact on rural communities, and how those in rural communities would like to see the issue addressed.

"The messages from rural Scotland are clear, and decision-makers will be keen to reflect these messages as the Holyrood election approaches."

The poll also uncovered widespread concerns about funding and public services in rural areas.

Four in five (80%) rural residents said there has been a lack of investment in infrastructure, such as housing, roads, and

public transport in Scotland's countryside. Only one in seven (15%) agreed that public services are meeting the needs of rural communities.

A lack of local employment opportunities in rural areas is the most cited reason for people moving to urban areas, at 62%, followed by a lack of housing at 45%, and poor public transport at 44%.

One in five (20%) of rural residents said they are likely to move to an urban area, rising to 36% for those aged 16-34. A quarter of rural respondents with children said they are likely to make the move.

Rural Scots want the Scottish Government to commit to a range of policies in their communities, including investing in better broadband (90%), increasing funding for public transport (88%), and expanding housing options (78%).

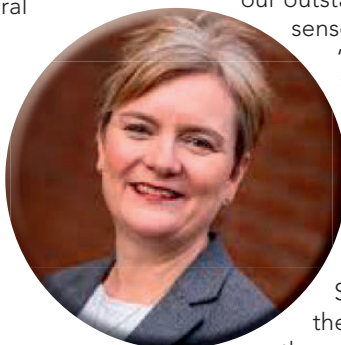
Tavish Scott, Chief Executive of Salmon Scotland, said: "Scotland's rural towns, villages and coastal communities should be thriving places where people want to raise their families supported by well-paid, highly skilled jobs.

"As a Shetlander, I recognise the enjoyment people take from our outstanding natural and marine environment, and the sense of local community and belonging.

"But this survey shows the reality of public services in many places, with poor access to healthcare, housing and transport contributing to rural depopulation."

Fionna Kell, Director of Policy at Homes for Scotland, commented: "Building more new, high-quality, energy-efficient homes for rural communities has never been more urgent if Scotland is to reverse depopulation, and improve the social and economic wellbeing of every part of the country.

"Urgent action is now needed to support the small and medium home builders, whose numbers have fallen 70% since 2007, and are so critical to employing and training people across rural communities and delivering much-needed rural homes." ●



Opposite from top:
Tobermory, Mull;
Tavish Scott

This page from top: Country
couple, Scotland;
Fionna Kell; Rural
housing, Scotland



We urge policymakers to treat these findings as a clear call to action



Stimulating stuff

A sugar kelp extract has been shown to increase wheat yield – and farmers' profits



A PROJECT which researches the optimum low energy extraction method needed to process cultivated kelp, resulting in soil biostimulants and animal feed supplements, has made a breakthrough following its most recent study results.

Algapelago Marine Limited (lead partner), a farming-led seaweed biotech business operating an offshore seaweed farm, has collaborated with Rothamsted Research and the UK Agri-Tech Centre to demonstrate the efficacy of these products under abiotic stress conditions.

The project, called 'Optimising low energy extraction of kelp for soil and livestock nutrition' (or Low Energy Kelp), is funded by Innovate UK, the UK's innovation agency.

Interest is growing in the use of seaweed-derived biostimulants in agriculture due to their potential to enhance crop growth, promote stress tolerance and increase nutrient use efficiency, and because they are derived from a sustainable source with positive environment impacts.

Current agri-seaweed products are dominated by seaweed

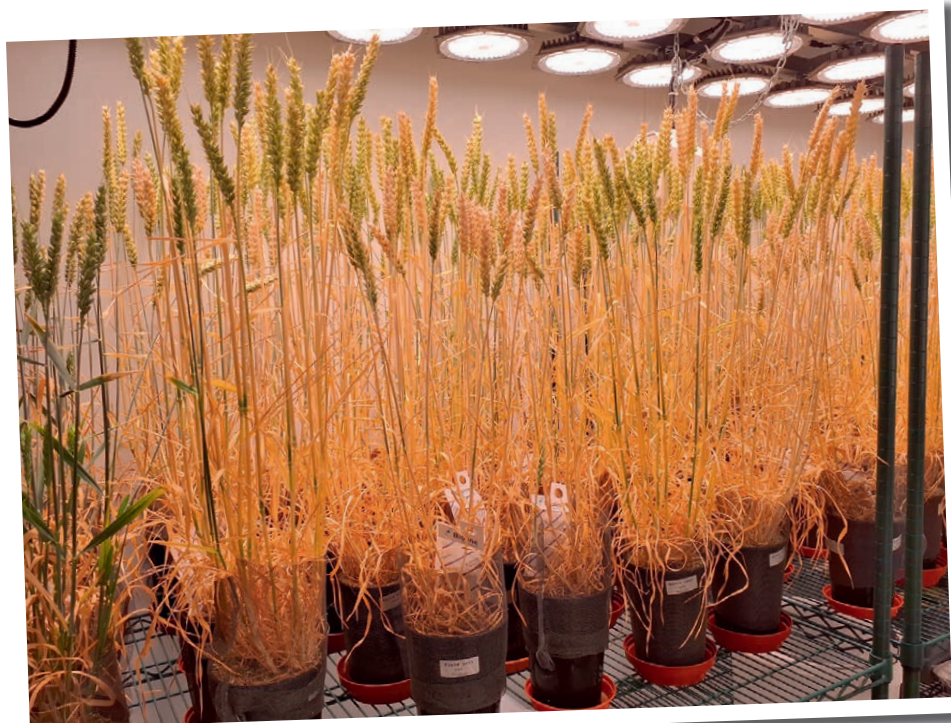
sourced from wild harvest, and the demand for seaweed-derived soil and animal supplements is expected to grow exponentially as policy drives a reduction in chemical inputs. However, the biochemical mechanisms involved in their beneficial impacts on crops remain poorly understood.

Algapelago Marine Ltd has developed a low-energy method for extracting biostimulants from farmed seaweed that provides a biostimulant product of consistent quality with potentially significant commercial value.

What are the results?

In order to establish optimal application methods and rates for Algapelago's TD65 biostimulant, two experiments were conducted in controlled environment facilities.

The first investigated the impact of four different rates of foliar applications on wheat and field bean yields under both well-watered and drought-stressed conditions, and the second investigated whether foliar application or soil application had the greatest impact on yields of wheat.



The aims of the first experiment were to determine the optimal application rate of TD65 under ambient conditions, and also to see if there were any yield benefits when plants were drought stressed.

The second experiment was conducted to try and identify if the benefits of the biostimulant were due to direct plant physiological impacts, or if any benefits were due to stimulation of soil microbial activity, and consequent increases in nutrient availability and uptake efficiency.

For the application rate experiment, wheat and field beans were grown in 10cm diameter x 90cm deep intact clay-loam soil cores, deemed appropriate for both ambient and drought-stress experiments.

For the application method experiment, plants were grown in 2L pots in a substrate of either sieved soil or glass beads (simulating a hydroponic system), providing a comparison between a crop grown in either the presence or absence of soil microbes.

Three application methods were applied: foliar only, soil only and foliar plus soil microbes, and in all experiments, results were compared against controls grown in identical ways, but minus biostimulant applications.

In the application rate experiment, an optimal application rate was identified, resulting in enhanced plant growth and a 24% increase in wheat grain yield, as well as a 45% increase in grain number, compared to the control values.

No benefit of the biostimulant application was observed in the drought-stressed plants.

In the application method experiment, the application method didn't affect the yields of wheat in either growing medium, although the plants grown in the hydroponic system significantly outperformed those grown in soil.

Further experiments investigating the timings of applications relative to growth stage, and applications under different drought stress scenarios (only one was tested here), are recommended to further understand and optimise the use of Algapelago's TD65 biostimulant product.

In addition, experiments using different rates of fertiliser application are recommended, as the biostimulant potentially could perform better under more nutrient-limited conditions than those that were used in the study.

Overall, there is evidence that seaweed-derived biostimulants can, under certain conditions, provide crop yield benefits.

“We are thrilled to see a 24% yield increase in wheat grain

Luke Ansell, Head of Operations at Algapelago Marine, said: “The completion of the Rothamsted crop trials is a significant milestone for the project and wider product development.

“Thanks to the Rothamsted team for all their hard work and we are thrilled to see a 24% yield increase in wheat grain due to this prototype sugar kelp extract.

“This result has validated our belief in the quality of our cultivated sugar kelp and extraction method.

“While we await the full analysis results from this study, a wider trial program is underway across soft fruits, field and root vegetables which will further build the evidence base for product efficacy.”

What are the impacts of the project?

This project, the Agri-Tech Centre says, has established the feasibility of rope-grown kelp species to improve UK food resilience, build soil health, and lower carbon emissions and nitrate usage.

Cultivated kelp is a rich and sustainable source of potash, micronutrients and bioactive compounds, and cultivation provides shelter and food for a range of organisms, including commercially important fish species.

Professor Adie Collins, Science Director at Rothamsted Research, said: “At a time when yields and corresponding profits are under pressure from a range of abiotic and biotic stresses, biostimulant research offers a glimmer of hope to farmers in an ever more challenging world.”

This project builds on previous feasibility studies to optimise the liquid extraction and ensiling of kelp, developing a novel two-stage extraction process that produces consistent agricultural products. Dr Saro Rengaraj, Innovation Associate for Soil Health at the UK Agri-Tech Centre, said: “From sea to soil, kelp builds resilience and grows results.

“Algapelago's kelp biostimulants could boost soil resilience, nutrient cycling and microbial health – sustainably enhancing crop productivity.” ●



Opposite: Application of biostimulants

Above: Wheat at the Agri-Tech Centre

Right: Sugar kelp

From small ponds to big ambitions: could UK King Prawn farming make a splash?

Researchers from The University of Exeter believe growing these shellfish in tanks on UK farmland is the key to a sustainable seafood revolution, writes **Vince McDonagh**

BRITONS love their prawns, chomping their way through 50,000 tons a year, thus making it far and away the country's favourite shellfish.

The problem is that most of them are imported cold water prawns from Norway or Iceland, and the King Prawn warm-water variety from Ecuador, India or Vietnam.

Could we not produce more of our own? The University of Exeter certainly thinks so.

In a recent study of the sector, it says that by developing what remains of a relatively modest contribution, and expanding the number of UK prawn farms, this could help create a sustainable and thriving seafood revolution.

Farming king prawns indoors in tanks on UK farmland is the way forward, they believe.

The king prawn variety is one of the big five seafoods eaten in the UK, but they are produced in warm countries, meaning they are all imported, with some of this production taking place in environmentally sensitive parts of the world.

Researchers from the UK Sustainable King Prawn Project (UKSKPP) believe there is a "better way", through cost-effective and environmentally-sound king prawn aquaculture

production at home, creating employment opportunities along the way.

UKSKPP is a research and business impact project that is exploring the potential to create a new,

environment-friendly food production sector in this country.

It focuses on indoor Recirculating Aquaculture Systems (RAS), powered by renewable energy technologies, with circular economic principles built in at every stage.

It also aims to position the UK as a global frontrunner in sustainable, land-based seafood production, providing innovative diversification opportunities for both UK agriculture and aquaculture. Professor Rod Wilson (Project Lead), Biosciences, University of Exeter, says: "In the UK, we already love eating king prawns as a healthy, high quality and tasty seafood.

"This project aims to transform practices on UK terrestrial farms through the production of home-grown king prawns, using indoor closed-system methods, harnessing renewable energy technologies and integrating circular-economy opportunities."

The university says cultivating a ton of king prawns this way takes 50 times less land than raising the same quantity of pork or beef, and it boosts both the UK economy and food security at the same time.

"This impressive efficiency of land use for high-quality food production also opens opportunities for subsidies to support nature-positive solutions on



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We’ve
proved that
king prawns
can be
raised and
sold right
here in the
UK



Above: Professor Rod Wilson, Exeter University

Left: Eden Valley Prawns team

Opposite from top: Eden Valley Prawns; Professor Ian Bateman, Exeter University



Photo: eden valley prawns

other agricultural land (e.g. planting more woodland for CO₂ removal, improving biodiversity and reducing flood risk)," it adds.

The university's Professor Ian Bateman said: "Nature restoration is vital, but if we simply take land out of farming this reduces food production, shifting agricultural impacts on the environment elsewhere.

"King prawn production yields huge quantities of highly nutritious food [taking place] on small areas by providing a great example of how we can spare land for environmental improvements without reducing food output."

Researchers, business leaders and policymakers attended a showcase for the project at the university a couple of months ago.

Among them was Dr Andrew Whiston, CTO of Rastech and co-founder of Scotland-based Eden Valley Prawns – the UK's only commercial land-based king prawn farm.

He said: "We've proved that king prawns can be raised and sold right here in the UK using only seawater, feed, and renewable energy.

"No antibiotics, no pesticides, no

mangrove destruction, and minimal food miles. The UK can lead the way in on-shoring sustainable aquaculture; improving our food security with fresh, healthy seafood that we can all enjoy with a clear conscience."

Professor Rod Wilson, who is leading the UK Sustainable King Prawn Project, said: "If we are going to feed our growing population over the coming decades – while simultaneously reducing our carbon emissions and reversing biodiversity loss – sustainable aquaculture has to be a major part of food production.



"Our project aims to support a new farming sector for home-grown king prawns, using indoor closed-system methods, harnessing renewable energy and integrating circular-economy thinking so nothing is wasted."

The current retail value of king prawns in the UK is more than £300 million per year, and even replacing a small proportion of this would boost the UK economy and reduce environmental damage.

Growing king prawns in this way offers so many benefits, including to the UK economy – job creation in rural locations,

and environmental (both in the UK and overseas) – but critically, prawns could just be the start.

Dr Robert Ellis said: "Demand for protein in the UK will increase as our population grows. Ensuring we get this extra protein from a sustainable source is imperative, to minimise negative environmental impacts.

"High-tech aquaculture operated in novel locations, such as terrestrial farms or urban settings, could offer the perfect solution, and place the UK at the forefront of a sustainable seafood revolution."

To establish sustainable aquaculture at the forefront of the UK seafood sector, key barriers to the expansion of land-based production will need to be overcome.

These barriers include enhancing the public perception of aquaculture, creating a suitably skilled workforce, technological and legislative innovation, and UK hatcheries for key production species.

The UKSKPP research team says it is continuing to work with industry and government, and is undertaking research to address these barriers and unlock a new seafood future for the UK.

There is certainly huge enthusiasm among the Exeter University group. The problem facing such projects, however, is getting interest from both government and commercial companies. ●

Regional perspectives from Egypt and Saudi Arabia

Yomna Elshamy presents two case studies showing cutting-edge tilapia farming in Egypt and the Middle East

THE aquaculture sector has grown rapidly in recent years, driven by rising demand for affordable, high-quality protein sources.

According to the OECD–FAO report, global fish production is projected to reach 206 million tonnes by 2033. More than 85% of the expected increase will come from aquaculture, raising its share to approximately 55% of total global fish production.

Aquaculture in Egypt dates back to one of the earliest periods of recorded human

history. Ancient Pharaonic tombs, from around 2500 BCE, contain drawings that clearly depict the harvesting of tilapia from managed fishponds, providing one of the oldest known evidences of early aquaculture practices.

Modern aquaculture in Egypt began in the 1930s and expanded significantly in the 1960s with the establishment of the first semi-intensive government fish farm, covering 120 hectares, to produce tilapia, mullet, and carp. Throughout the 1970s and 1980s, the rapid increase in farms and hatcheries boosted national production from 17,000 tons to 45,000 tonnes. In 1984, Egypt launched its first trials of cage culture in the Nile River, marking an important milestone that set the stage for remarkable growth that ultimately positioned Egypt as the largest producer of tilapia in Africa and the Arab world.

Tilapia (especially Nile Tilapia, *Oreochromis niloticus*) is one of the most widely farmed fish species globally due to its tolerance to variable water quality, low dissolved oxygen, and a wide range of salinity and temperature levels. These characteristics make it ideal for diverse farming systems in the region.

Often referred to as the “aquatic chicken”, Nile tilapia forms the backbone of fish farming in Africa thanks to its rapid growth rate, low production cost, and high adaptability. Today, tilapia accounts for more than 9% of global aquaculture

output. Egypt is the world’s third-largest producer of tilapia, after China and Indonesia, with national production exceeding 1.1 million tonnes in 2023. By 2024, Egypt had also strengthened its global position by becoming the world’s second-largest exporter of fresh and chilled tilapia.

Driven by increasing food security concerns and the high economic burden of seafood importation, Arab states of the Persian Gulf (Middle East) are investing heavily in aquaculture to reduce reliance on imported products. Tilapia has become an important species within these national strategies, alongside high-value marine species.

Meanwhile, Saudi Arabia’s aquaculture sector has experienced substantial advancement, supported by Saudi Vision 2030, which prioritises enhanced national food security. Aquaculture activities in the Kingdom began in the 1980s, with early initiatives including the establishment of the Jeddah Fish Farms Centre in collaboration with the FAO (the Food and Agricultural Organisation of the United Nations).

Although the Kingdom has traditionally focused on high-value marine species such as sea bream, sea bass, and shrimp, the past decade has witnessed a significant expansion in Nile tilapia farming in inland waters. This shift is driven by rising domestic demand and the relatively lower production costs compared to marine species.





According to the General Authority for Statistics of Saudi Arabia (2024), aquaculture contributed 161.6 thousand tonnes to Saudi Arabia's total fish production, with Nile tilapia alone representing 62.8 thousand tonnes, highlighting its growing role in meeting local consumption needs.

Expansion of tilapia farming continues across several regions, including Riyadh and Al Qassim. Notably, Al Qassim has emerged as one of the Kingdom's leading aquaculture hubs, contributing approximately 20% of national tilapia production, in addition to producing several other species.

Egypt and Saudi Arabia: African leadership and Gulf ambition

Two distinct models of aquaculture success can be observed in Egypt and Saudi Arabia, reflecting how two private-sector farms operate differently according to their respective environmental conditions.

Egypt, with its long history and well-established aquaculture sector, stands as a leading producer in both the Arab world and Africa. Its leadership is reinforced by a strong private sector, active research institutions, large-scale national projects, and the presence of specialised colleges dedicated to aquatic and

fisheries sciences. This ecosystem has produced a new generation of experts, including Shady Hamdy, CEO of the Ibn Al-Nafis Hatchery, who represents the emerging scientific and technical capacity driving the sector forward.

Saudi Arabia, on the other hand, is progressing at an accelerated pace, focusing on capacity building and the adoption of advanced technologies to strengthen its regional and global position in aquaculture. The Kingdom's clear strategic vision centred on expansion, innovation, and sustainability has enabled rapid development in both freshwater and marine farming systems.

Among the most notable private-sector models in tilapia farming is Gulf Union Fish Farm, led by Mohamed Elshenawy, which demonstrates how modern production technologies can be adapted effectively to desert environments.

Ibn Al-Nafis Company – Egypt

The Ibn Al-Nafis hatchery represents an advanced model driven by a new generation of fish farming specialists in Egypt. Shady Hamdy, a graduate of the Faculty of Aquatic and Fisheries Sciences at Kafrelsheikh University, obtained a master's degree on the effect of probiotics

Opposite: Shady Hamdy
This page from top: Gulf Union Fish Farm; Ibn Al-Nafis team; ponds at Ibn Al-Nafis



The hatchery has also become a regional training hub



and algae on fish performance and fry production. He is currently pursuing a PhD focused on the development and application of YY technology, aiming to strengthen the integration between scientific innovation and practical farm operations.

YY technology is a genetic technique in tilapia farming that produces all-male fish by developing a male broodstock with YY chromosomes through a specific breeding and sex-reversal process. These YY males are then naturally mated with normal XX females to produce 100% all-male offspring.

The hatchery operates across five acres, including 63 concrete tanks and greenhouses, with a production capacity of five million Nile tilapia fry (*Oreochromis niloticus*) per cycle, totalling five production cycles per year. The team also manages a 15-acre farm with an annual grow-out production of approximately 60 tonnes, and provides technical supervision for other farms and hatcheries in the Delta

region. Ibn Al-Nafis' approach is based on improving the quality of seed to increase the productivity of fish farms and enhance competitiveness.

Shady and his team rely on selecting broodstock and eliminating the use of antibiotics, not only within their own facilities, but also across the farms and hatcheries under their supervision. Instead, they adopt vaccination programmes against *Streptococcus*, combined with robust improvements in water quality and feed management. This approach has contributed to reducing mortality and producing healthier stock with outstanding growth performance.

Under the leadership of Shady and Dr Tamer Al-Bastawisi, the hatchery is conducting advanced trials on YY Technology, in cooperation with aquaculture business Agromar, the pioneer of this technology in Egypt, to raise growth rates and improve genetic characteristics, marking the first practical deployment of this technology in Egyptian aquaculture.

In parallel, the team is testing a system that simulates the In-Pond Raceway System (IPRS) to suit local conditions, and developing specialised feed formulations to improve feed conversion efficiency and reduce operational costs.

The hatchery has also become a regional training hub, receiving trainees from 15 African countries through programmes offered by JICA (Japan International Cooperation Agency) and the Egyptian Ministry of Agriculture and Land Reclamation. The team also provides advisory support to fisheries development projects affiliated with the United Nations Development Programme.

Moreover, Ibn Al-Nafis is contributing to the development of the Smart Feed Estimation Device (SFED), a digital tool designed to optimise feed usage, maintain water quality, and reduce the accumulation of ammonia. Also, the hatchery is further working toward adopting renewable energy solutions, including solar systems, to enhance sustainability and reduce operational costs.

Gulf Union Limited Company – Saudi Arabia

Gulf Union Fish Farm represents an advanced model for fish farming in desert environments in the Kingdom of Saudi Arabia, driven by qualified young professionals. The farm is managed by Mohamed Elshenawy, who holds a BSc in Aquaculture from Al-Azhar University.

The farm spans an area of 100,000 m², including a 2,100 m² hatchery, a RAS (recirculating aquaculture system) nursery unit with 50 ponds, and a rearing unit with 80 tanks. The hatchery also includes 82 tanks for breeding, hatching, and larval rearing. The second phase of the project is currently underway, adding 50 new ponds with a capacity of 260 m³.

The farm achieved an annual production of 300 tonnes. The management aims to scale up to 1,000 tonnes in the near term and 3,000 tonnes by 2030, supported by ongoing expansion plans.

Operating in a desert region with limited water resources, the farm adopts a Zero Water Waste approach. A portion of the water is treated and recycled through the RAS system, while the remaining water is used to irrigate crops such as wheat and alfalfa, significantly improving water-use efficiency, and reducing the farm's water footprint.

The hatchery has also achieved a milestone by producing six million tilapia fry annually, meeting the internal demand (about 1.2 million fry) while supplying surplus fingerlings to other farms. The project has obtained the SAMAQ certification, issued by the Saudi national

aquaculture product certification body, ensuring compliance with best aquaculture practices, product quality and food safety standards.

Elshenawy emphasises the role of probiotics in boosting fish health and performance, not only for water quality management but also for improved immunity and enhanced feed conversion ratio, contributing to reduced costs and more efficient production. The farm also adopts a continuous harvest model to ensure a consistent supply of fresh fish that meets market needs all year round, under a comprehensive operational risk management strategy.

The Ibn Al-Nafis hatchery stands as a compelling example of youth empowerment and innovation in the fish farming sector in Egypt, as scientific research is effectively translated into measurable economic impact, which contributes to elevating the quality, improving production efficiency, and boosting the competitiveness of Egyptian fish in both local and regional markets. Similarly, the Gulf Union farm represents a successful model of modern aquaculture in Saudi Arabia, where advanced technologies and efficient water management are applied to achieve stable production and high product quality, supporting national food-security goals and enhancing the regional competitiveness of Saudi aquaculture.

And despite the remarkable growth achieved by Egypt and Saudi Arabia in the aquaculture sector, the industry still faces a

set of challenges that require innovative solutions and expanded collaboration between farms and research institutions.

According to Shady Hamdy, the fluctuation in feed quality from year to year remains one of the key challenges that hinders production stability and limits growth, making feed development and supply-chain consistency a top priority for Egyptian fish farms.

Meanwhile, Mohamed Elshenawy emphasises that the wide thermal range in Saudi Arabia's desert environment necessitates investment in the infrastructure of the facility inside production units. It is also essential to conduct comprehensive groundwater analysis before initiating any construction, to ensure stable water characteristics and suitability for aquaculture.

Looking ahead

Aquaculture serves as a cornerstone for enhancing food security in Egypt and Saudi Arabia, with a promising future for growth and increased export capacity. With the continuous development of production systems, improved biosecurity, expanded infrastructure, and the promotion of scientific research and modern technologies, this sector is expected to continue playing a vital role in supporting regional food security and opening broad opportunities for investment in the coming years.

Yomna Elshamy is a master's researcher in aquaculture, at Kafrelsheikh University, Egypt, specialising in fish nutrition. Her current research focuses on alternative protein sources for aquafeed in Egypt, with a particular emphasis on cost-effective and environmentally sustainable solutions.

Further reading

Tilapia Culture by Abdel-Fattah El-Sayed and Novel Approaches Toward Sustainable Tilapia Aquaculture by Seyed Hossein Hoseinifar and Hien Van Doan are considered essential references for anyone seeking to understand the scientific and technical foundations of sustainable tilapia farming.

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The past decade has witnessed a significant expansion in Nile tilapia farming

Opposite: Mohamed Elshenawy

Above: Gulf Union Fish Farm

Left: Ibn Al-Nafis Hatchery fry



Why Spanish consumers are eating less seafood – but more salmon

With Norwegian salmon exports to Spain growing significantly in the past 10 years, are Spaniards giving up their favoured dish in favour of the pink fish, asks **Vince McDonagh**

SPAIN and seafood were once thought to be inseparable, but perhaps the love affair might be starting to wear a bit thin.

That is unless your preference is salmon, says a Norwegian Seafood Council report.

Cod, mackerel and salt fish may be sliding off the menu, but it seems the Spanish cannot get enough of the pink fish.

The report says that in the past ten years, Norwegian salmon exports to Spain have grown significantly in volume, and the value increased by almost 200%. Yet over the same period, total Spanish fish consumption has dropped by at least 30%. That is a big reduction.

In 2015, Spaniards ate an average of 26 kilos of fish per person per year. In 2024, consumption was down to 18 kilos. That's a sizeable decrease by any measure.

Yet, over the same period, consumption of Norwegian salmon has increased significantly – by 17,000 tons.

This is yet another confirmation that salmon is highly popular in Spain, says the council's seafood Spanish envoy, Tore Holvik.

In 2015, Norway exported approximately 65,000 tons of salmon to Spain at a value of NOK 2.8 billion (£207m).

By 2024, that figure had reached around 82,000 tons, worth more than NOK 8 billion (£590m).

In addition, the number of seafood served at various restaurants has increased in the past year, according to a report to the council from the market research analysis company, Circana.

The report compares 2023 with 2024, describing, among other things, what Spaniards have eaten, drank or ordered at various restaurants, how much and how often they have eaten, and how much they have paid.

Briefly summarised, the research suggests that over the past ten years Norwegian salmon exports to Spain have increased significantly, while fish consumption has decreased by almost a third.

It sort of begs the question – are





Spaniards giving up their once favourite fish and switching to salmon instead?

The report suggests that salmon now accounts for almost one in ten fish servings in Spanish restaurants, which was not the case just a decade ago.

The impact of (mainly British and European) tourists on what diners eat cannot be ignored either, although they are not specifically mentioned in the report. Most four-star hotels offer smoked salmon as part of their buffet tables.

It would also seem that the Spanish custom of long meal preparation may be on the way out.

The report finds that Spaniards are becoming more price-sensitive, often choosing quick and easy seafood dishes when eating at home.

Like most other European countries, inflation and the backwash from Covid are having an effect on spending.

The number of visits to Spanish restaurants has not returned to pre-pandemic levels. Inflation is playing a part in this, with people having to dig deeper to eat out.

At the same time, seven out of ten people are becoming worried about their own finances and job security, while six out of ten believe that prices at restaurants have increased far too much, a feeling shared in many other European countries.

People are more careful with their spending, and are more likely to look around for offers and promotions. In short, this means increased price sensitivity, including for seafood.

While the number of visits to so-called "full-service restaurants" and individual restaurants where people sit down and eat is decreasing, visits to fast-food chains are on the up.

Of these, familiar names such as McDonald's, Burger King and KFC (Kentucky Fried Chicken) are leading the way. These chains are also taking an increasingly large share of the Spanish out-of-home consumption market, particularly among the young.

As with most other countries, Spain has not avoided rising costs or worries about making ends meet.

At the same time, the scanner data shows that Spaniards are increasingly choosing seafood dishes that are more or less ready-made, or quick and easy to make – and salmon fits that bill perfectly.

This category includes, for example, sushi, spicy fillets and fish burgers.

In the first half of 2025, the sales volume of processed fish increased by 4.3%, while sales of natural fish decreased by 5.2%.

Tore Holvik says: "Overall, and despite fluctuations, Norwegian salmon is among the species that is doing very well, whether in a restaurant or at home. It is about the fact that Norwegian salmon has developed a very strong preference among Spanish consumers."

The report says the sushi wave has only just begun on the Iberian peninsular, with out-of-town dining increasing, especially at Asian and traditional restaurants. Holvik believes Norwegian salmon is well positioned for further growth in Spain due to the increase in popularity for sushi and poke.

In addition, demand for salmon as a ready-to-eat food in the form of sushi, sashimi and poke bowls is also increasing in hypermarkets and supermarkets. And he believes the sushi segment could also prove an exciting market for farmed cod.

Holvik also thinks there is potential to get even more salmon on menus at traditional restaurants.

More fish is served during the summer months when temperatures are very high, the survey also finds. This is where the potential for growth lies, says Holvik. ●

Left: Tore Holvik, Norwegian Seafood Council

Above: Spanish supermarket



Norwegian salmon is... doing very well, whether in a restaurant or at home



Northern **star** on the rise?

Within the next decade Iceland could be one of the top five Atlantic salmon producers. But **Vince McDonagh** asks, how is Iceland's politics affecting its prospects for fish farming?



FOR a country with such a strong seafood tradition, Iceland was rather slow in getting into aquaculture.

A decade or so ago, the sector barely existed, with an output of less than 3,000 tons a year. But by 2024 the country was producing 55,000 tons, mostly Atlantic salmon, with Arctic char in second place.

The 2025 figures have yet to be published, but lice infestation problems in the Westfjords may have led to a temporary reduction, with volcanic eruptions leading to a decline in Arctic char output.

Nevertheless, with several new, mostly land-based, projects in various stages of progress, the overall strategic path has to be upwards.



Iceland is strategically well placed for the lucrative US market, despite tariffs. It is also making steady inroads into Europe and the Far East.

Within the next decade the country may well be one of the top five Atlantic salmon producers, taking over from the Faroe Islands, although speculation that it could push Scotland out of third place are probably wide of the mark for some years yet.

The Icelandic government, having produced a major report on the future of fish farming last year, has already signalled the direction it wants the industry to take.

Just before Christmas, the Reykjavik government announced broad details of a new comprehensive law on aquaculture, in which many of the changes stem from a National Audit Office report from two years ago, which was critical of the industry, saying its administration was too weak and too fragmented. Many of the proposed changes stem from this report.

The Minister of Industry and Trade, Hanna Katrín Friðriksson, wants to strengthen the legal framework for aquaculture and combat its negative environmental impacts with new comprehensive legislation.

The aim, she says, is to create a more solid foundation for sustainable value creation in aquaculture.

Among the main changes regarding sea pen farming are increased incentives for the use of closed equipment and infertile salmon, more effective responses to discharges, and stricter rules for monitoring the sexual maturity of farmed salmon.

There is also provision for increased control and response to lice infestations, and risk-managed planning with the

introduction of infection control zones. Minister Friðriksson also proposes that the Fisheries Fund be abolished as part of administrative simplification, and that fees be based on the industry's performance to ensure competitiveness.

The bill specifically addresses land-based aquaculture in a separate chapter, in which regulations would be adapted to specific situations, including in terms of licensing, supervision, infection control, and animal health.

The report points out that current laws have largely been formulated with the needs of sea aquaculture in mind and do not adequately address the challenges associated with land-based aquaculture.

Sea-based aquaculture is discussed in a separate section of the bill, but this branch of the industry is still at the concept stage in Iceland, so immediate action can wait.

Finally, the bill discusses fjord farming, which is a new and undeveloped branch of aquaculture.

This system involves keeping fish in a closed cage at depth and feeding exclusively on natural zooplankton that is attracted to the cage using optical technology.

The intention is to provide legal support for such experiments and later assess whether there will be grounds for the establishment of more detailed rules.

The Ministry is now inviting comments, observations and suggestion on its plan.

While there are soothing noises from ministers, experience in other countries, notably Norway and Canada, show that when governments become involved, the industry is none too pleased.

Relations between the government and the deep sea fishing industry over a cut in mackerel catches have deteriorated in recent months.

The Norwegian experience is a classic example of how the salmon industry and government can end up with daggers drawn, especially when it comes to tax.

Aquaculture reviving many coastal economies, says report

THE social impact of fish farming in Iceland can be diverse, according to the official body Statistics Iceland.

It says aquaculture has increased the number of sources of foreign exchange for the national economy, and has accounted for over 5% of the value of all merchandise exports.

This development is extremely positive, as strong and diverse exports are a fundamental pre-requisite for improved living standards in this country.

The figures from Statistics Iceland show that aquaculture has a major economic impact on the people of the various regions and that has not been lost on those who live there.

Some of these areas went into decline after the loss of deep sea fishing some years ago, but now thanks to aquaculture, the economy has become more dynamic and diverse, while the population has increased and this has revived the housing market.

The increased activity of aquaculture companies is clearly visible in labour market figures, where employment income has never been higher.

The Statistics Iceland figures show that the number of people employed in aquaculture has almost quadrupled in the period 2010-2022, while employment income, at 2022 prices, has increased more than six-fold, to ISK 3.4 billion.

KPMG Analysis says these figures do not include indirect jobs, adding that the economic impact of aquaculture is extensive. The conclusion of KPMG's analysis for Iceland is that for every job in aquaculture, almost the same number of indirect jobs are created.

Experience shows that aquaculture has strengthened other industries directly and indirectly, for example, through increased utilisation of accommodation space, increased activities of contractors and transport companies, and more diverse jobs.



And there is opposition to the plans from conservation groups. The Wild Salmon Conservation Fund, which wants to ban sea cage farming altogether, has said the draft bill on aquaculture "does not meet the demands of voters".

The organisation claims that sea cage farming causes environmental damage in every country where it takes place and wants it banned in Iceland.

There is strong support for the fund's cause away from fish farming areas, especially in the capital Reykjavik. So the government may face strong political pressure.

The two main Icelandic salmon producing regions are the Westfjords and the Eastfjords, where aquaculture expansion has been reviving the economic fortunes of these areas.

The fishing and aquaculture employer organisation SFS says that aquaculture has increased the number of sources of foreign exchange for the national economy and has accounted for more than 5% of the value of all merchandise exports.

It adds: "This development is extremely positive, as strong and diverse exports are a fundamental prerequisite for improved living standards in this country.

Aquaculture already has a major economic impact on the people of the various regions, and its impact is not lost on those who live there.

"The economy has become more dynamic and diverse, the population has increased, and more life has entered the real estate market, to name a few.

"This can be attributed directly to the increased activity of the aquaculture companies themselves, and indirectly to the spill-over effects that the activities have on other industries."

The Menon report, produced for SFS, the Icelandic seafood employer organisation, says: "The economic value of aquaculture is likely to grow even further beyond the next decade as the sectors included in the analysis reach maturity.

"Achieving maturity typically grows a sector's tax footprint, as operations

”
The aim is
to create a
more solid
foundation
for
sustainable
value
creation in
aquaculture

Opposite from top: Image of a new Icelandic land-based salmon farming project, located in Þorlákshöfn, by the company First Water; Hanna Katrín Friðriksson

Above: Image of planned new Samherji land-based salmon farm



become profitable and corporate tax income grows.

"However, if not managed carefully, industry growth can also have less desired impacts, primarily on the environment. All in all, a growth of this scale will have wide ranging impact on Icelandic society."

SFS adds: "Iceland's aquaculture strategy and resulting policy

Reykjavik urged to help revive mussel farming

THERE are great opportunities for the revival of Iceland's mussel farming, according to a consultation group working on the restoration of this modest, but important, sector.

That is if the government can show enough support, they stress.

Mussel farming was once a small but relatively important part of the aquaculture scene. However, its slow decline began a decade ago, with companies dropping out of the business year on year.

Some blame that decline on the Althingi, Iceland's parliament, passing a law on shellfish farming a few years ago.

The law was seen as controversial, and the heavy regulation had a devastating effect. A decade later, no mussels were farmed in Iceland and mussels disappeared from the market.

The group believes mussel farming could create many jobs in fishing communities around the country, but the state would have to assist and take care of the analysis of algae toxins in the product while the industry is being developed.

should seek to amplify positive impacts while limiting negative impacts. This involves prioritising and making trade-offs that may also impact other industries.

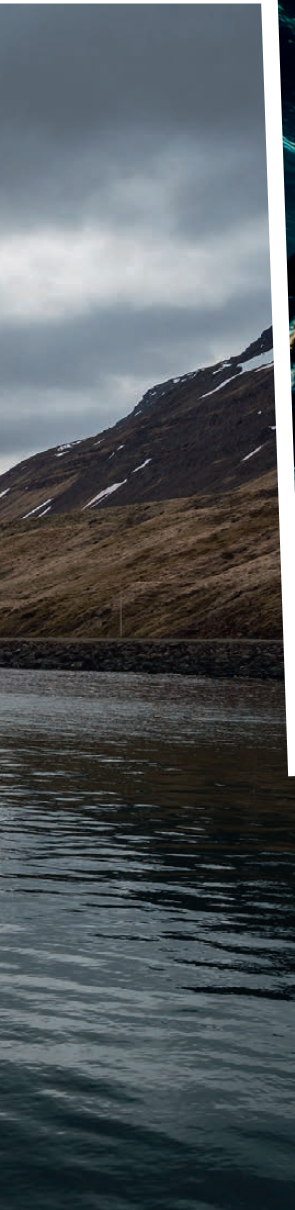
"Done right, this will result in a balance where economic value is captured through sustainable industry growth that occurs in harmony with the environment and society."

The report also says that overall, Iceland is an attractive location for traditional farming due to its naturally suitable conditions and availability of capacity in fjords.

"Further growth would be supported by increasing the overall maturity of the supply chain and strengthening the regulatory system. Iceland is still expected to double production from traditional farming within the limits of current regulations.



Iceland's aquaculture strategy and resulting policy should seek to amplify positive impacts...



"This in contrast to the other major salmon farming countries, where future growth from traditional farming is constrained by natural capacity and must be driven primarily by efficiency-enhancing technology.

"Iceland has experienced rapid growth in production, fuelled by private investment, since 2016, demonstrating its attractiveness as a site for traditional salmon farming."

However, the existing methods used for traditional farming in Iceland face key environmental challenges, and are unlikely to propel the salmon industry much beyond twice its current economic size.

As with Norway, salmon farming is divided into traditional (fjord based) and land based. Traditional operations have increased at a 35% compound annual growth rate over the past decade.

Iceland's fjords, like those of Norway and Scotland, are well suited for this type of aquaculture and have the potential to grow up to 100,000 tons, says the report. And, for the most part, disease is less prevalent.

There are challenges, however, from sea lice, and research is not as advanced as in other countries.

Ongoing projects in Iceland have plans to deliver up to 125,000 tons of output across four companies, but most of these projects are in their early stages.

There is talk of Iceland developing offshore salmon farming, but it is still just talk. In Norway, where developments are more advanced, this sector has yet to properly get off the ground.

Iceland may want to wait and see how the Norwegians progress before venturing themselves. I would suspect that offshore farming in Iceland is at least a

decade away. Overall, Iceland is in a good place when it comes to the development of its aquaculture industry, provided the government doesn't interfere too much.

Improvements to the country's transport infrastructure are badly needed and that is an area where government can, and should, interfere.

Economic growth can also be driven through the value chain, with increased domestic feed production and processing. ●



Above: Icelandic salmon farm

Above right: Mussel farming

Right: Icelandic workboat at farm

ICELAND FACTS

Population: 390,000 (approx.).

Iceland gained full independence from Denmark at the end of the Second World War.

More than 60% of Icelanders live in the capital Reykjavik.

Vikings discovered Iceland by accident 1,100 years ago, making it one of the last places on Earth to be settled by humans. The language is linked to the Vikings.

Area: 103,000 square kilometres or 39,769 square miles.

Fish and fishery products are the country's main source of export income followed by aluminium products.

Iceland experiences some 26,000 earthquakes a year, the majority are very small, but every now and then a large and, occasionally terrifying, eruption occurs.



Fishmeal on the up

Our feed roundup includes global fishmeal trends, new evidence on essential oils and a big deal for Skretting and Mowi

FFO, the marine ingredients organisation, has reported positive global trends in marine ingredients production in the first three quarters of 2025.

In Peru, the second fishing season in the North-Centre region is ongoing, with two thirds of the 1.63 million metric ton quota completed so far.

"This is a positive sign which leads us at IFFO to project a production of 5.4 million tons for fishmeal and 1.2 million tons for fish oil in 2025," Dr Enrico Bachis, IFFO's Market Research Director, comments.

Based on the market reports that IFFO shares with its members by October 2025, the total cumulative annual fishmeal production* rose by approximately 7% compared to the same period in 2024. This increase was driven by higher output in most regions, except for the Iceland and North Atlantic area, which reported a year-on-year decline.

Similarly, cumulative fish oil output through October 2025* showed a year-on-year increase of around 5%. Most countries recorded positive trends compared to January–October



2024, with the exception of Peru, where lower oil yields in 2025 played a significant role in the decline.

This data is based on statistics shared by IFFO members in Chile, Denmark, Faroe Islands, Iceland, Ivory Coast, Mauritius, Norway, the UK, the USA, Peru, South Africa and Spain, accounting for 40% of global fishmeal production and 50% of fish oil output.

Meanwhile, China's cumulative fishmeal consumption in aquaculture and pig farming is likely to surpass that of 2024.

Domestic production of marine ingredients has been limited during the last quarter of 2025. Production for the year is not expected to surpass the 2024 level, which was estimated at 570,000 metric tons.

According to the Ministry of Agriculture, domestic aquaculture production continued to grow through October across key farming regions. Currently, active aquafarming is mainly concentrated in warmer provinces, such as Guangdong, Guangxi, and Hainan. White-leg shrimp, cultivated in sheds and greenhouses, remains one of the primary farmed species, helping to support fishmeal consumption. In contrast, farmers in colder regions have largely suspended aquaculture activities, either stopping feed use entirely or significantly reducing it.

Cumulative fishmeal consumption in aquaculture is estimated to have exceeded last year's levels so far, even

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Above: Mowi feed bags
Opposite: Anchovies

though demand over the past two months has been lower on a year-on-year basis.

Skretting in tie-up with Mowi

Mowi has entered into a strategic and industrial partnership agreement with Skretting/Nutreco, where Mowi produces feed based on Skretting's feed formulation.

Key highlights are:

- * A strategic partnership to deliver more than NOK 650 million (EUR 55 million of £46m) in annualised net cost savings through improvements in feed formulation and recipes, procurement and logistics.
- * Mowi Feed with its two state-of-the-art factories to be retained as-is providing an expected EBITDA contribution in 2026E of NOK 825 million (EUR 70 million), and to capitalise on further tightening of the feed market in the coming years.
- * Total EBITDA contribution of feed partnership with Skretting and retained Mowi Feed business unit of more than NOK 1,475 million (EUR 125 million/ £108m).
- * Total earnings of NOK 1,475 million (EUR 125 million) equivalent to an EBIT per kg (GWT) of NOK 2.1 (EUR 0.18) for Mowi Group, and NOK 2.6/kg (EUR 0.22) for Mowi Norway. This corresponds to NOK 1.7 in earnings per share (EUR 0.14).
- * Skretting, the aquaculture feed business line of Nutreco, is a leading global aquafeed manufacturer and supplier with advanced nutritional expertise and R&D capabilities.

The partnership agreement will build upon Mowi and Skretting's existing long-term commercial relationship, and Skretting will make available its proprietary know-how, R&D capacity, data and procurement capabilities.

Mowi announced a strategic review of its feed division in March. That has now been concluded, and Mowi said it was pleased to have announce that it had entered into a strategic and industrial partnership agreement with Skretting/Nutreco.

Mowi CEO Ivan Vindheim said: "Mowi and Skretting are a great match for each other, and the partnership with Skretting is our preferred outcome from the strategic review process. I am confident that teaming up with them will make Mowi into an even better salmon farming company."

"With this agreement, Mowi Farming secures the best performing feed in the coming years at the lowest cost in the industry."

"The partnership will deliver improved feed formulation and recipes for our European salmon farming operations which will drive significant cost improvements whilst ensuring top quality feed performance in the years to come."





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exploring
the impact
on the
fish’s
immune
system



Essential oils prove effective in reinforcing sea lice resistance

Essential oils have long been recognised for their beneficial effects as far as humans are concerned – but now, it seems, they can also contribute to helping salmon resist sea lice.

Research published earlier this autumn suggests that Digestarom® PEP MGE, a mix of essential oils developed by DSM-Firmenich, can bring about a 68% reduction in lice load compared with a control group.

Digestarom is described by DSM-Firmenich as “a matrix-encapsulated blend of essential oils”. These active components are known to have many biological functions, including antimicrobial, anti-inflammatory and anti-oxidant, as well as improving feed efficiency and growth.

Perhaps unsurprisingly, the company is coy about the exact ingredients of its “secret sauce”, but they are all functional feed additives rather than pharmaceutical components.

Trials were carried out on Atlantic salmon earlier this year, at Machrihanish, with the University of Stirling. The study involved the most common northern species of salmon lice, *Lepeophtheirus salmonis*.

Louise Buttle, Sustell lead for Aqua and Global Account Manager with DSM-Firmenich, explained: “The aim is to reduce the number of treatments that are necessary within the cycle.”

Treatments for sea lice can themselves

harm fish, for example by damaging skin and reducing the protection the fish get from mucus, as well as requiring the loss of feeding days.

She said: “We don’t suggest that essential oils reduce sea lice numbers, but they can support the fish’s immune system.”

Buttle stresses that the mixture is important, and the active components can be used in different proportions in different circumstances.

Buttle says: “We are still exploring the impact on the fish’s immune system, but there is a hypothesis that we’re strengthening the skin and mucus barrier.”

Will this affect the cost of feed? It’s a micro ingredient, only around 1%-2% by volume, so the cost is “manageable”, Buttle says.

Importantly, is it palatable for the fish? Yes, she says: “Across all doses we have seen no negative effect on feed intake.”

Meanwhile, DSM is also celebrating European Union approval for its Hy-D product, which supplies vitamin D in feed, to be used with salmonids and all other animal species. Hy-D, which is derived from *Saccharomyces cerevisiae* (“brewers’ yeast”) has been authorised for use with pigs, poultry and ruminants since 2024. ●



This page from top: Salmon; Louise Buttle; Fish feed; Salmon scales

What's NEW

Monthly update on industry innovations and solutions from around the world



Above: Larsen Mettler

Oxzo in \$25m investment from S2G

Oxzo, a leading provider of oxygenation services for aquaculture has unveiled a US \$25 million strategic investment, led by S2G Investments.

The move aims to create a more sustainable aquaculture sector, with the company saying the partnership positions the company to expand globally. Oxzo, is based in southern Chile but has operations in Norway and Canada. It is currently working with three of Norway's leading salmon producers.

Larsen Mettler, managing director of S2G's Oceans Investment team said: "We are delighted to partner with Oxzo's management team, which combines deep technical knowledge with a clear vision for transforming aquaculture globally."

Rafael Ariztia, chairman of Fiordo Austral and Oxzo, added: "We are proud to welcome S2G as an investment partner. Their participation aligns perfectly with Oxzo's strategy to grow in international markets, granting access to highly qualified teams, top-level information, and global networks."

dsm-firmenich announces EU authorisation of Hy-D® in aquaculture

dsm-firmenich Animal Nutrition & Health has received EU authorisation for Hy-D® use in salmonids and other fish species.

Emrah Mazi, Head of Special Nutrients at dsm-firmenich Animal Nutrition & Health, said: "This new EU authorisation for Hy-D® is a significant milestone, underscoring its global relevance and reliability as a source of vitamin D for aquaculture and all animal species."

"We are thrilled about the opportunities this brings for our customers across Europe and beyond."

Dr Benedict Standen, Head of Marketing for Aquaculture at dsm-firmenich Animal Nutrition & Health, stated: "EU authorisation for Hy-D® represents a first-of-its-kind opportunity to bring real benefits to European aquaculture operations around the world. These include improvements in growth, immunity and enhanced product quality."



Icelandic supplier launches new company to bring three subsidiaries together

The Icelandic fisheries and aquaculture supplier Hampidjan Group has launched a new umbrella company for its subsidiaries Vónin, Mørenot and Fiizk Protection.

All three subsidiaries came under the ELDI brand on 1 January.

Thomas Myrvold (pictured), the CEO of Mørenot Aquaculture, has been appointed CEO. He said: "Our vision is to become the global provider of end-to-end aquaculture innovation. This means combining world-class technology, smart products, strong service capabilities, and a global footprint with the local presence our customers rely on. We want to help shape the future of aquaculture by acting as a global player and a solutions-focused innovation company, while remaining firmly rooted in the communities and regions we serve."



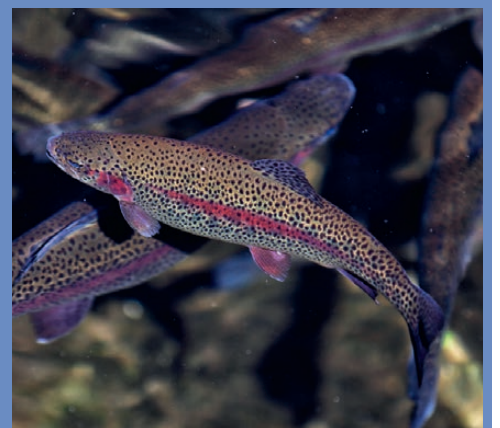
Zinpro introduces chromium additive for salmonid feed

Zinpro Corporation has received EU approval of Zinpro® Availa®Cr, a chromium methionine nutrition solution for use in salmonids. The regulation marks the first EU registration of a chromium-containing zootechnical additive for fish.

The decision makes the family-owned firm the first company to bring chromium to the EU animal nutrition market.

The company says the European Food Safety Authority (EFSA) has confirmed the safety and efficacy of chromium methionine, and said that robust scientific trials had demonstrated significant improvements in growth performance, feed utilisation and nutrient retention in Atlantic salmon and rainbow trout. The company added that the breakthrough allows nutritionists to create more flexible, cost-effective diets that support animal health, reduce waste and lower environmental impact.

Zinpro Global Aquaculture Technical Services Nutritionist Dr Claudia Silva led the scientific trials to obtain the approval.



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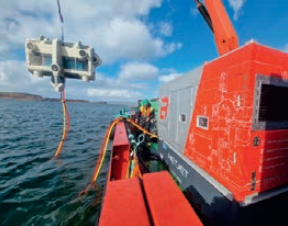
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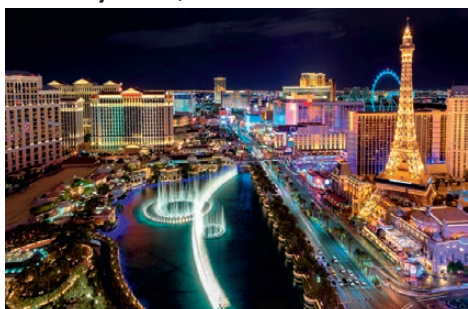
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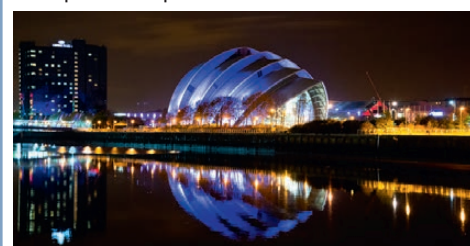
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Do we want – or need – any more government meddling?

By Nick Joy

HOPE you all had a very good Christmas. I have to ask, however, how much bonhomie can one person stand before having a good rant?

Whether it's reasonable or not, I am going to have one anyway. Actually, last month's Fish Farmer has cheered me up a lot, as various articles pushed for creating the environment for better investment and economic prospects for our fragile economic areas.

However, there was a quote that set me off: "We are glad to see that the Scottish Government is taking the welfare of salmon seriously!"

Well, I'm not. I am totally fed up with the unwarranted intrusion of government into food production. It nearly always sounds well-meaning but it rarely ever makes the slightest difference to the animal, just cost and problems to the farmer.

The advent of regulation in farming, supposedly for the good of the animal, the environment, or even sometimes the people involved, has burgeoned since I started with this industry. I know that legislation is an accretive process and therefore each generation sees a relatively small movement. Nonetheless, the damage being done to all farming industries by the blind hand of government is getting to a stage where farmers are making bad and short-term decisions because they can no longer envisage how the future will be, and production begins to suffer.

We know about the attitude to beef and sheep based on the idiotic presumption about CO₂ which assumes that monocrop vegetable crops damage the environment less. This is based on ignoring very obvious facts, such as impact on biodiversity of monocrops versus grazing fields, or that the land which is used for grazing is not suitable for vegetable crops. This is madness in a country which isn't even vaguely self-sustaining in food production (we import 48% of our food).

Aquaculture is not as simple as that, and takes place in a medium that science is only starting to grapple with; just take a look at the ridiculous sea lice dispersal models. So there is reason to be even more nervous for our future.

For me, where it becomes truly terrifying is when government no longer requires proof of science before it starts using theories as bases for legislation. The Norwegian "traffic light" system, or the Scottish Environment Protection Agency's latest policies, are perfect examples of statisticians getting involved in regulation. The fact that the dispersal models cannot predict accurately where sea lice can be caught has to be a reason why it cannot be used as a basis of regulation. Of course we all know the reason for the increase in regulation in salmon farming, and this is our dear colleagues in the wild salmon lobby. Yet, there is a wonderful quote in the last issue of Fish Farmer from someone I admire very much and once worked with, Bob Kindness. He was referring to the Conservation Stocking programme on the River Carron, and said: "The increase in numbers correlated exactly with the stocking effort."

Well, if that was the case, how could the problem be at sea for

”
We all know
the reason
for the
increase in
regulation
in salmon
farming

the rest of the rivers? I know Bob and have worked with him, and he is a man of both science and integrity. My problem with government science is that I do not even vaguely feel the same about them. For a long time we have faced people who, after their period in government, join the wild salmonid lobby. On top of that, what is clear is that when scientists stop being willing to openly debate their theories, we end up in a sphere where we don't know what a woman is.

So forgive me my pre-Christmas rant, as I have seen and am seeing the terrible implications of urban governments meddling in things they don't even vaguely understand, briefed by people who won't show their affiliations and won't discuss their theories openly with those most affected by them. Until we can trust the route by which government regulates our industry, I will remain implacably opposed to them doing any more to regulate any part of our industry.

So having got that off my chest, may I wish you compliments of the season and a happy and, hopefully, prosperous New Year. ●



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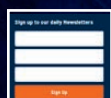
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