

# AQUACULTURE FRONTIERS

## PART 2: WHO WILL DISRUPT THE SALMON INDUSTRY?



Salmon demand is escalating in most parts of the world, and the farming industry in its current form can't keep up. We ask where new supply where will come from and who will bring disruption.



ucn

# REPORT SCOPE

Salmon farmers have never been more lucrative. They have also probably never been more fearful of disruption. Producers are spending part of their record profit haul on R&D in a bid to keep up with massive demand growth. The industry is fighting sea lice as a top challenge. Scottish regulators are pushing for more stringent controls on the publishing of sea lice data. The municipality of Tromsø, a major Norwegian production area, said it would only award more licenses for closed containment systems, shocking major producers. As Atlantic Sapphire moves forward with the world's first land-based, large-scale

salmon farm, and SalMar accelerates offshore output, we assess where the industry is headed. Matt Craze traveled to China and South Korea to learn more about new salmon farming ventures in Asia. Tarah Mayes, who holds a masters' degree in aquaculture from Stirling University, analyzes the global effort to discover a breakthrough in controlling sea lice and other disease issues through work in genetics, nutrition and vaccines. Maaïke Tiersma will assess the future of salmon farmers in British Columbia and other areas where their contribution to local communities is being questioned.

# INTERVIEW LIST

- Salmones Camanchaca
- Blumar
- Agrosuper
- Marine Harvest
- Nova Austral
- Invermar
- Leroy Seafoods
- Cermaq
- Sernapesca
- AquaBounty Technologies
- Veramaris
- Cargill
- Nuseed
- AquaGen
- Salmones Magallanes
- Benchmark Holdings
- Tassal
- GSI
- Nordic Aquafarms
- Superior Fresh
- Whole Oceans
- Atlantic Sapphire
- Donghae STP
- Bakkafrost
- Matorka
- SalMar
- DNB Bank
- Kepler Chevreux
- Hudson Valley Fish Farms
- Gfresh
- Australis Seafoods
- Billund Aquaculture
- Inmersat
- Multiexport Foods
- Corbion
- Ventisqueros

# CHARTS + ILLUSTRATIONS

- Table of industry R&D expenditure
- Ranking of post smolt projects
- List + maps of offshore projects in Norway, Asia
- List + maps of RAS grow out projects
- Infographic showing Korean production process
- Map of alternative omega-3 producers
- Infographic of Norwegian sea lice levels
- Chile's antibiotic usage
- Infographic on big corporations targeting salmon industry

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## Executive Summary

### 1. THE CURRENT BOUNDARY LINE

We explore the current frontiers of the salmon industry and assess to what extent supply will fall short of demand.

### 2. NEW FRONTIERS

We assess all areas where salmon output can expand. We look at well-known expansion areas such as Chile's Magallanes region and Iceland. And we also explore some less explored options, such as Russia and South Korea.

### 3. COMBATING PATHOGENS

Improvements in feed, vaccines and genetics are being explored to solve the growing problem of sea lice and other ills such as salmonid rickettsial syndrome (SRS), which force Chilean producers to use antibiotics. We visited Cargill and Nuseed's R&D centers to grow omega-3 rich canola oil, and ask the industry if omega-3 levels have dropped to such a level where they have compromised fish health.

### 4. SMOLT REVOLUTION

The salmon farming industry is spending hundreds of millions of dollars on growing larger smolt. This could shorten sea-pen cycles and ultimately raise production. We assess the potential of these investments on overall supply. We evaluate how much output can come from shortening sea-pen cycles.

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## 5. RAS GROW-OUT AND CCS

This is where we evaluate next generation technologies to boost output. We assess what kind of impact RAS grow-out farms such as Atlantic Sapphire can have on supply. We interviewed Cermaq in Oslo to find out about their vision for closed containment systems (CCS).

## 6. OFFSHORE

SalMar, the third-largest Norwegian salmon farmer, is betting big on offshore farms. We look at the impact of both offshore in Norway, and in areas of the world where it could open up new production areas. In this regard, we focus on China's efforts to build an offshore salmon farming industry.

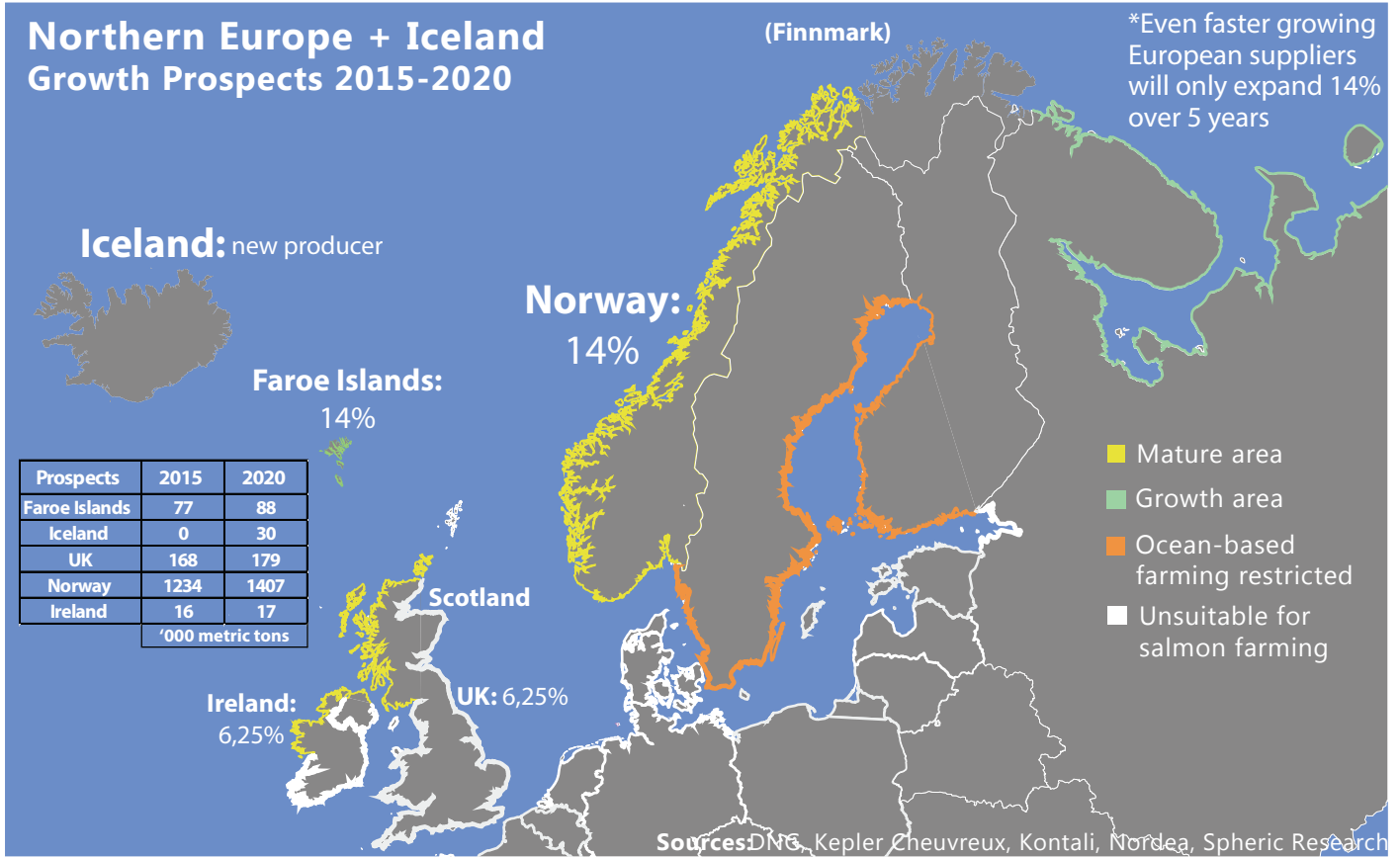
## 7. SUSTAINABILITY

Will farmers ever win over communities? We assess where the battle is being won and lost and what impact this will have. We cast the spotlight on British Columbia, where the salmon industry faces the prospect of losing licenses.

## 8. TECH SOLUTIONS

Finally, we look at the companies creating business solutions for the salmon industry. At the time of publication, Stingray Marine Solutions has officially close to zapping 1 billion sea lice with a laser pulse since starting operations in 2014. We journey through some of the most important innovations in salmon farming and ask which ones could disrupt the industry .

# Northern Europe + Iceland Growth Prospects 2015-2020



## PREVIEW

Global demand for salmon is exploding, and existing producers can't keep up. Asian demand, in particular, is going off the charts for all types of salmon, especially Atlantic salmon flown in from Norway.

Suppliers face multiple challenges to keep boosting world supply, despite earning high profits. Tense relations with local communities, a continuing chronology of farming mishaps and pathological challenges such as sea lice holds the industry back from effectively responding to a supply shortage.

Consumers around the world can't get enough Atlantic farmed salmon and now China has developed a taste for the product. The salmon fillet is currently the most popular seafood product in China, according to online delivery platform Gfresh. The \$880 million purchase of Chile's

Australis Seafoods by Chinese conglomerate Legend Group is testament to the level of interest in Atlantic salmon from Chinese consumers. Australis has one of the best growth pipelines in the Chilean industry, with new licenses to develop in the new Magallanes production region.

Areas like Magallanes, however, are few and far between. Right now, without big technological breakthroughs such as land-based farms, offshore or a silver bullet solution for sea lice, salmon will become too expensive for many consumers.

The industry's major players aim to become the master of their own destinies. Not only are they funnelling greater profits into R&D, but they are also spending proportionally more to find breakthroughs. The biggest source of expenditure so far has been to grow bigger smolt on land, before transferring them to sea.

# PREVIEW

“This is a market that is ripe for disruption,” said Dag Stelmo, a senior vice president at DNB Bank in Norway. “The salmon farmers’ dilemma is that they need to bring back volume growth.”

Demand is unquestionably elastic. With high prices, European consumption has dropped off, especially among young adults, said Gorjan Nikolik, an analyst for Rabobank. Net demand is on its sharp ascent because of surprisingly high demand from new markets, especially in Asia.

As with each of the instalments of Aquaculture Frontiers, we ask the industry where output can expand (or shrink).

In the case of salmon, we start with sustainability performance, and assess the relationship that the industry holds with its community stakeholders. With social approval, it’s highly likely that governments will give the industry more licenses to operate. Without acceptance, licenses won’t get renewed.

Cooke Aquaculture’s collapsed sea-pen in the Puget Sound effectively killed the US farmed salmon industry in one swoop. The 2016 accident hogged headline space of the front page of the Seattle Times in the worst way possible, getting flatly rejected by Seattle millennials and First Nation indigenous groups. The decision of Washington governor Jay Inslee to end salmon farming in the state has given a new drive to the salmon industry’s chief opponents in British Columbia to the north. This is a key battleground for the salmon industry, and we zoom in on this situation.

Continuing from that debate, we take a look at the industry’s massive transition to grow bigger fish on land. We take a look at the investments being made in this area and ask industry executives and system providers how the commissioning of these facilities might improve health and production metrics.

We explore the scientific solutions being carried out in the areas of feed, genetics and pharmaceuticals to tackle key challenges such as sea lice in Norway, caligus and salmonid

rickettsial syndrome (SRS) in Chile. We’ll take a look at the huge advancements in novel omega-3 ingredients. We are probably the only group to have visited both R&D facilities of Cargill and Nuseed in Australia and we provide an important update on this topic.

We spend one chapter highlighting other technological advancements being employed by the salmon industry. This section guides you through the solutions being offered by big companies outside of aquaculture. We look at everything from copper alloy cages to GPS systems for sea pens developed by Inmersat to make sea farming more reliable.

The other chapters look at futuristic farming methods – closed containment systems (CCS) and offshore farms. Technology is evolving so rapidly in the salmon industry that current farming techniques might be obsolete in ten years, said Norwegian research group Sintef.

Our offshore section takes us from the well documented advancements of SalMar’s Ocean Farm 1 site in central Norway to less heard of projects such as Donghae STF’s submersible cage design in South Korea. Likewise with closed containment systems, we look at floating systems designed by leading producers such as Cermaq and Marine Harvest. And we also assess the development prospects of RAS salmon megafarms including the Atlantic Sapphire project being built near Miami.

We have taken a cross-disciplined approach in assessing the salmon industry’s with experts from different areas of study. Matt Craze traveled to Australia, Canada, Chile, China, Denmark, Norway, South Korea to bring a broad global perspective to this report. Tarah Mayes holds a Masters’ degree in aquaculture from Stirling University in the UK and wrote the sections on the salmon industry’s key scientific challenges. Maaïke Tiersma evaluates the challenge that salmon farmers have in convincing stakeholders in key areas such as British Columbia in prolonging their stay in these key production regions.

# REPORT AUTHORS

## Matt Craze



Matt started Spheric Research in 2017 to provide research and business solutions to the seafood and food industries. Matt is a regular contributor of articles on global seafood trends for Undercurrent News.

Previously, Matt was part of a team that founded Bloomberg LP's commodities news desks in Europe, the Middle East and Africa, and Latin America between 2004 and 2015. Matt also works with New York-based management consultancy firm 10EQS and holds an MBA with Cornell University.

## Tarah Mayes



Tarah Mayes graduated from the University of Stirling in the UK with an MSc in Sustainable Aquaculture, where she focused on fish nutrition and the health effects of omega-3s on Atlantic

salmon. As a California native, she is passionate about the development of sustainable aquaculture in the United States through science-based solutions and effective legislation. She currently works as an independent researcher and contractor for sustainable aquaculture ventures.

## Maaike Tiersma



Maaike Tiersma holds a degree from Brown University in Conservation Science and Policy. She moved to Chile with a Fulbright Research Grant to work with the Interdisciplinary Center for Aquaculture Research

(INCAR) on a vulnerability assessment of the aquaculture industry under climate change. Maaike studies community conservation and sustainable enterprise.



## SPHERIC RESEARCH

Provides key insights into the global seafood industry, and has now provided research to numerous major companies in seafood and several of the world's largest agricultural companies. Spheric Research provides research on major global seafood topics that are sold exclusively by Undercurrent News and also offers tailor-made research and business solutions to the seafood industry.



## UNDERCURRENT NEWS

Undercurrent News is the most read seafood industry news service globally. UCN was started by journalists Eva Tallaksen and Tom Seaman in 2012 and has become an authoritative voice in the industry, placing an emphasis on high quality journalism and sending reporters to key trade shows and industry seminars around the world.