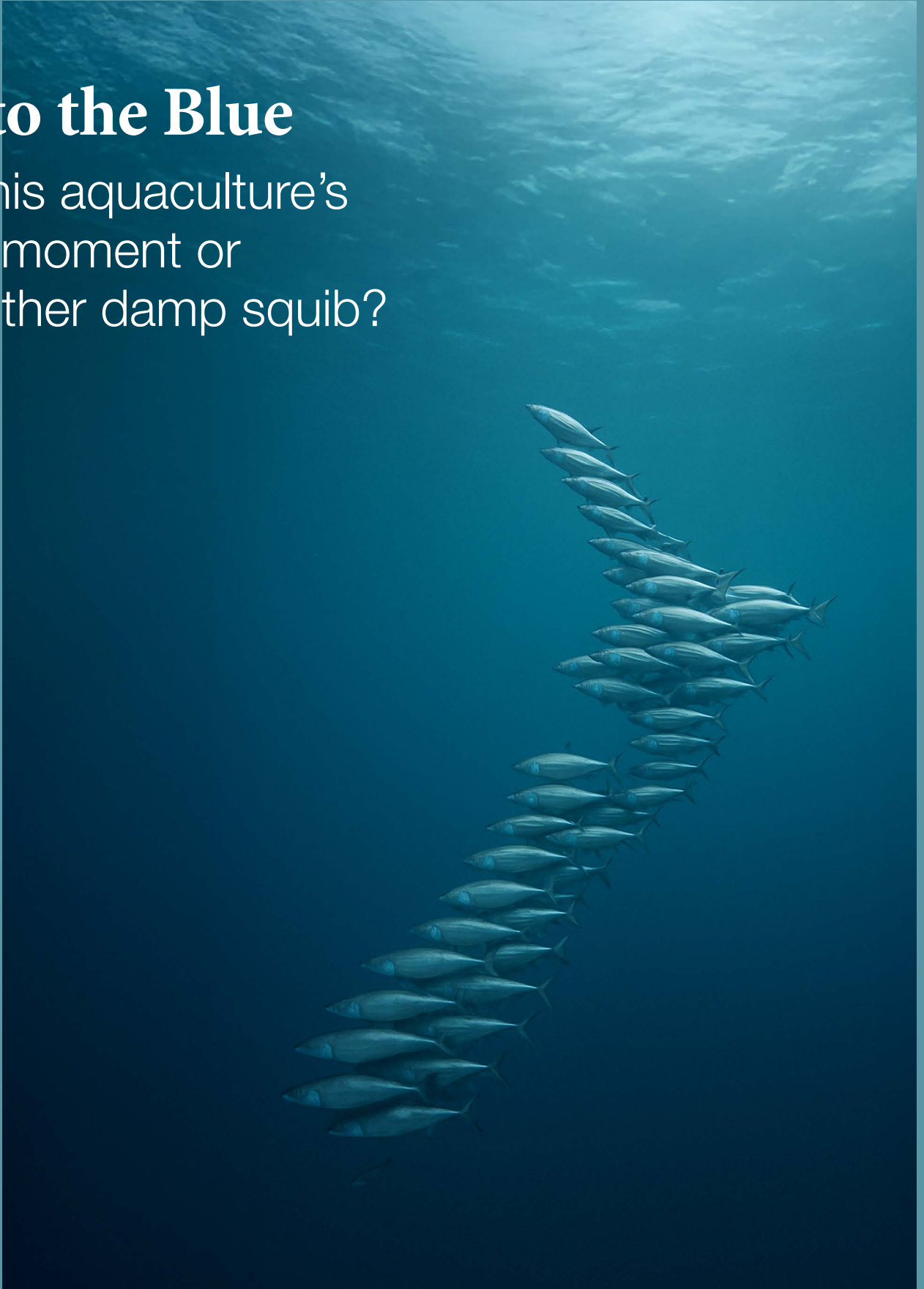


# Future of Food

## Into the Blue

Is this aquaculture's big moment or another damp squib?

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Future of Food series  
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Written by Vincent Heeringa and Dr Victoria Hatton based on interviews with:

AgriSea

- Clare and Tane Bradley, Owners

Cawthron Institute

- Volker Kuntzsch, Chief Executive
- Chris Cornelisen, Chief Science Capability Officer

Independent advisor

- Craig Ellison, industry veteran and a former Chief Executive of Ngai Tahu Holdings

Plant and Food Research

- Mark Piper, Chief Executive
- Dr Georgina Dowd, Senior Scientist

Moananui

- Jodie Kuntzsch, Chief Executive

NIWA

- Andrew Forsythe, Chief Scientist for Aquaculture and Biotechnology



**Dr Victoria Hatton** • CEO

+64 27 538 5338

victoria@foodhq.com

FoodHQ Innovation Limited

21 Dairy Farm Road  
PO Box 1210  
Palmerston North 4440  
New Zealand

[www.foodhq.com](http://www.foodhq.com)

# Into the Blue

Is this aquaculture's  
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With a vast, untapped resource lapping our shores, the ocean may provide the largest opportunity for the primary sector since the *Dunedin* first set off with frozen carcasses in 1882. But after 20 years of flat lining can the aquaculture sector perform a miracle and treble in value to reach \$3 billion in just 10 years, as the government wants?

**Opportunity:** Opening the vast ocean resource surrounding New Zealand could usher in a revolution in farming and protein production akin to the first frozen shipments of sheep meat in 1882. With fit-for-purpose regulation and infrastructure, aquaculture could rival land-based farming as the lead industry and provide food, medicine and cosmetics to millions of people worldwide.

**Threat:** Aquaculture may experience merely incremental rather than transformative change – unless matched investment and quality strategy. Poor legal and environmental management could result in benthic pollution, contamination of wild stocks and a loss of social license for operators. Climate change may add prohibitive costs in the form of storms, increased pests and infections and stock die-off due to warming water.

### Key points:



The sector is starting from a low base, but with investment in science and technology, matched with more fit-for-purpose regulations, it could take a fair share of the growing global market.



Climate change creates extraordinary stress on aquaculture. Land based biosecurity expertise could provide a unique opportunity.



New Zealand could become a scale player in aquaculture if it can conquer the high energy South Pacific Ocean.



Scepticism surrounds the government's \$3 billion revenue goal by 2030. To achieve it New Zealand needs to triple the freight and quadruple the supply chain.



Easing the consenting process for existing aquaculture companies is a great first step by the government, but foreign capital and the provision of new consents opening prime ocean space will be crucial.



Māori entities have an important role as kaitiaki and holders of significant quota.

## What's required to make that happen? Do we have the right science? The right laws and regulations? The right markets? And talent? And if we do succeed, how do we protect this precious resource? Aquaculture has been the Next Big Thing since the 1960s. So, is it – or not?

**You'll never meet a bigger enthusiast for aquaculture than Volker Kuntzsch.** An industry veteran and the former head of Sanford, now Chief Executive of ocean research Cawthron Institute, is surprisingly upbeat. "I absolutely love talking about this. What do you want to know?"

Well, we want to know why Kuntzsch believes the aquaculture industry could reach \$10 billion in revenues by 2035 when it's currently just \$760m and has languished in incremental, piecemeal change since its inception in the 1960s. Even the government's stretch goal target is only \$3 billion by 2035.<sup>1</sup>

What makes him so optimistic?

"My optimism around the opportunity for New Zealand and the blue economy is very much derived from having been in the seafood industry for three decades and just looking at what's happening elsewhere, what's at our fingertips here in terms of science and innovation and of course our natural resources.

"With the ocean covering about 96% of our territory but contributing less than 3% to our GDP – and most of that is commodity products – the opportunity is really at our fingertips."

Some numbers lend support:

- Just 0.01% of New Zealand's 430-million-hectare marine economic estate is currently being farmed.
- 96% of New Zealand's territory is water and the country has the ninth largest area of claimed ocean space of any country in the world.

- New Zealand has the tenth-largest coastline of any country.
- In 2024 the government gave a blanket 25-year extension of all aquaculture permits.
- The Waikato District Council plans to double regional aquaculture exports in 20 years.
- The recently approved NZ King Salmon farm in the Cook Strait will be less than 12 hectares in size but may generate over \$350 million a year in revenue.
- Salmon generates a return 16,000 times greater than sheep and beef per surface hectare.
- One hectare of a salmon farm can generate \$14m of revenue.

And then there's the market. Consumer demand for seafood seems limitless. Globally, seafood has been growing at twice the rate of the population since 1961.<sup>2</sup> Most of the world's wild capture fisheries are at or near capacity so aquaculture is the only way to increase sustainable seafood production within planetary limits. Currently, half of seafood comes from aquaculture, and that share is expected to rise to two-thirds by 2030.

Without aquaculture, the world will face a seafood shortage of 50 to 80 million tons by 2030.<sup>3</sup>

"It all stacks up," says Mark Piper, Chief Executive of Plant and Food Research. Piper presented alongside Kuntzsch at a recent conference to boost the prospects of the 'blue economy', a catch-all term for ocean-related commerce. "The joys of being an island nation, with



our closest neighbour being a long way away, means we have relatively few ships transiting through. As a nation, we have a strong cultural connection to the sea and, while fishing has got some pressure on it, I think there's a strong future for wild harvest. Add to that the investment in research and innovations I agree that there is a path to \$10 billion. I can't see why not."

Not everyone agrees.

Craig Ellison, industry veteran and a former Chief Executive of Ngai Tahu Holdings and Sanford, shares Piper's enthusiasm for the sector and its potential to be a major contributor to New Zealand. He doesn't agree we'll get there any time soon. "I see a good future for the sector, we could be a scale player but not to \$3 billion in five years. It might take double that, but it would be a hell of an investment."

At best, the sector will achieve incremental growth. "At the risk of relying on alliteration it comes down to capital, consents, confidence, competence, and commitment. And all of those are under stress at the moment. We've got two primary species in terms of mussels and salmon, and I can see us maybe in five years getting to \$1 billion or \$1.5 billion. I can't see us getting to \$3 billion by 2030. Even to get to \$1 billion is a big ask."

The constraints (going with the C theme) are evident at the most basic level, such as a small supply chain with narrow margins. "Just take Sanford for example. Last year we did 25,000-30,000 tonnes of mussels and maybe we could do 50,000 tonnes on the existing water space. But does that mean double the profits? Probably not, it would mean marginal gains. And like other operators, we are constrained by access to spat – there's limited spat farms, and uncertain natural harvest and no easy process to allow consent for more

harvesting of spat. No one wants to farm spats – no-one wants them in their backyard. So, at every step – every one of those C's – we hit limits."

Perhaps more explosive growth could come from new species like seaweed. It's certainly touted as an exciting new frontier for aquaculture. The global market has more than tripled in the last two decades, from \$5 billion in 2000 to \$17 billion in 2021. And the volume of cultivated seaweed has grown a thousand-fold since 1950.<sup>4</sup> In New Zealand, the prospects look strong, with applications in almost every area of life, from food, feedstock and fertiliser to medicines, nutraceuticals and cosmetics.<sup>5</sup> Kelp forests provide nature-based services such as restoring sea floors and carbon sequestration. It's fast growing, ubiquitous and frequently described with excited adjectives: a miracle-product, a super-food and the answer to our environmental woes.

But seasoned operators suggest caution. Clare Bradley is co-owner of AgriSea, one of the most established algae brands in New Zealand. "I'm careful not to overhype seaweed. It's true that there's a great opportunity, but the timeframe to realise that opportunity to beyond \$3 billion is not just a few years, it's decades. It's such an immature industry. You can't just grow a massive crop out of nowhere or pluck out an existing resource and expect everything to recover overnight."

Likewise, Andrew Forsythe, Chief Scientist for NIWA's aquaculture and biotechnology division, is sceptical. "When I first came here from Canada in 2007, I think the dream was a billion in exports by 2025. Then it became a billion overall, and then it was a goal that was kicked down the road. We've actually achieved a lot of gains, but it's all been because the value of the product has gone up, not because our capacity to produce has increased."

# *“...we took that innovative, number eight wire approach seen on land and waded into the water”*

Is that about to change? Maybe, but it's a hard road. A study by market research firm Coriolis shows that new food sectors take decades to establish.<sup>6</sup> Whether it's wine, kiwifruit, avocados, cherries or berries, the data shows that a new food sector will be 'underwater' for decades as a handful of brave souls pioneer a new crop, usually at their own cost. Sometimes the industry fails (goats, alpacas, anyone?). It's not until the pioneers have been joined by government, industry, technologists and researchers in a decades-long effort, that hurdles are overcome, and a commercially sustainable sector emerges.

Is aquaculture at such a turning point? Have the decades of struggle by pioneers now been met by a perfect storm of industry, government and research? If so, what kind of aquaculture will succeed? Can we create a truly sustainable, regenerative aquaculture industry in Aotearoa New Zealand?

## **Slow undercurrent**

It's starting from a low base. Aquaculture is small, especially compared to other countries in Asia and Scandinavia. Norway alone accounts for half of the world's salmon production and 45% of its exports are from aquaculture.<sup>7</sup>

What dairy is to New Zealand, aquaculture is to Norway.

Māori historically practiced forms of aquaculture, farming tuna (eels) using weirs and traps. Kaitiaki or stewardship of shellfish such as mussels and pāua reflect sustainable harvest methods in vogue now. Today Māori-based entities hold about 40% of New Zealand's fishing quota, and Māori are entitled to 20% of all

new aquaculture development areas, as part of Māori Commercial Aquaculture Claims Settlement Act 2004.<sup>8</sup> This forms an important pillar in the government's plan to reach \$3 billion.

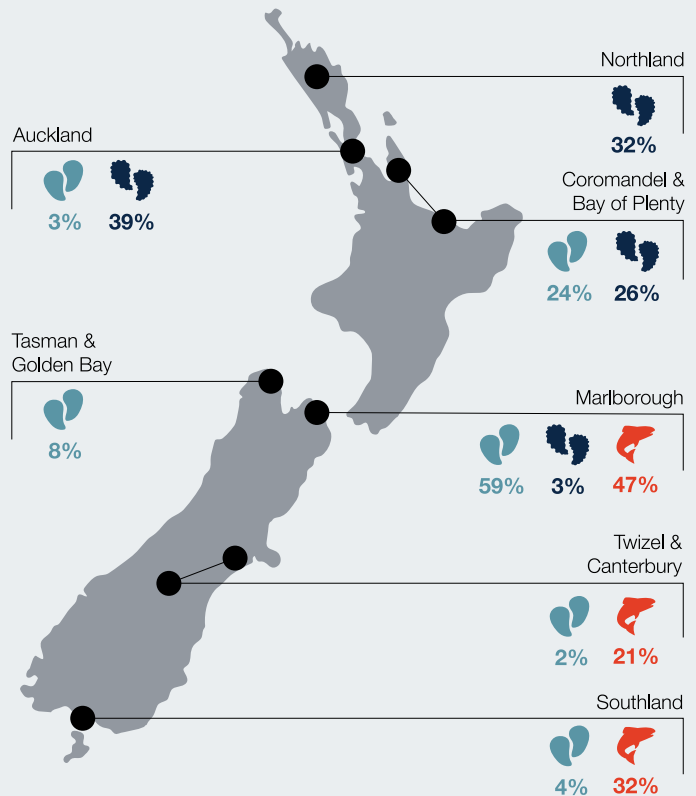
Modern aquaculture began here in the 1960s, as enthusiasts edged into the water with oysters and mussels. Their early success encouraged others.

“Basically, we took that innovative, number eight wire approach seen on land and waded into the water and started farming in the ocean, without any kind of regulatory framework or terribly much science,” says Cawthron Chief Science Capability Officer Chris Cornelisen. “Many of the 500 farms in Marlborough Sounds, for instance, were never even permitted. They've been grandfathered in retrospectively. They went out and created that entire industry, which I think is one of the most innovative in the world – certainly for long line mussels, because they use our technology overseas.”

By 1999 the industry hit \$200 million in export earnings, mostly made up of green-lipped mussel and salmon. But the growth also created conflict between adjacent landowners, iwi, conservationists and regulators. In 2001 the government called a moratorium on all new farms until it passed the Aquaculture Reform Act 2004, addressing regulatory inefficiencies, conflicts over coastal space, and environmental concerns.

Since then, the industry has grown about 6% a year and tripled in size. That's comparable to the primary sector but far smaller than dairy, which grew tenfold from \$2 billion to \$20 billion in the same period. The wine was smaller than aquaculture in the 1960s – now it's four times the size.

## Farmed right here



Source: <https://www.aquaculture.org.nz/>

And where wine and dairy brands have proliferated, aquaculture is still dominated by the three founding species and has failed to develop a strong secondary processing industry. Indeed, it may even be shrinking. “The New Zealand seafood industry has been consolidating into fewer, larger producers and this is expected to continue,” reports Coriolis. “Tonnes per employee is falling, suggesting further consolidation is likely going forward.”<sup>9</sup>

The sector has simply stalled. Salmon is a good example. Since the 60s salmon has been the brightest opportunity for New Zealand. “We are a minute player with a species that hardly has any competition,” says Kuntzsch. “Our king salmon species, compared to the Atlantic salmon, makes up maybe 10-15,000 tonnes of a global supply of salmon that is beyond three million tonnes. We should focus on the opportunity to create this niche product from New Zealand with a brand that highlights the care that has been taken to grow it and to market it in a sustainable way.”

Despite that potential, salmon production has flattened. “The salmon sector’s production has moved diddly-squat in the last 10 years,” NZ King Salmon Chief Executive Carl Carrington told RNZ.<sup>10</sup>

If aquaculture is to fulfil its potential something needs to change.

## A sea change required

For Volker Kuntzsch that change is science and innovation. “We have this vast open space. The challenge will be to ‘conquer’ the dynamic South Pacific. It’s a rather energetic environment. Just putting more cages in for salmon or lines for mussels won’t work. It takes quite a bit of new thinking.”

Kuntzsch has in mind \$100m each year in aquaculture-related science and innovation, the equivalent of what Fonterra spends on research annually.

“It is not a big number if you consider that the return of investment in the blue economy globally is at least five times the investment... We feel that within 10 years we can develop through collaboration that spans science, industry, iwi, government and regional councils.”

The more modest government Aquaculture Development Plan shows a staged growth plan, also informed by innovation but with a big dose of regulatory relief. Stage one, to reach \$1 billion, is to expand existing farms and on-shore infrastructure and ‘build confidence’ in a sector that’s been knocked about from all sides – legal, financial, and environmental.



Reducing regulatory hurdles is a major kick-start. Seven aquaculture projects were included in the Fast Track legislation introduced by the new government to overcome regulatory hurdles to large projects, reversing objections from environmentalists. A salmon farm planned for Rakaia/Stewart Island, called Ngāi Tahu Seafood's Hananui Aquaculture Project, was turned down by an expert panel from the Department of Conservation and Ministry for the Environment in 2023, even though it was admitted into the then fast track consideration. It's now included in the Fast Track legislation, before Parliament at the time of writing.<sup>11</sup>

Also in its sights is the Resource Management Act (RMA). In one of its first actions, the coalition government provided a 25-year extension of aquaculture permits for more than 1200 existing shellfish and salmon farms. The action was heavily criticised by environmentalists, but Fisheries Minister Shane Jones says the economic benefits outweigh environmental costs. "I'm more concerned about the resilience of our rural communities and needing to keep jobs going and international revenue than about snails and mangroves which are relatively irrelevant, relatively minor issues," he told Newsroom.<sup>12</sup>

Coastal areas are often subject to multiple, sometimes conflicting, uses, and aquaculture must compete with industries like tourism, fishing, and transport. Those conflicts are supposed to be handled by the RMA, but it's perceived as a major brake on the industry. "Under the RMA, everything took a long time, it was very expensive so it put people off investing, you could go through 10 years of consenting processes and spend \$10 million and end up with nothing," Aquaculture NZ chief executive Gary Hooper told the NZ Herald.<sup>13</sup> "The RMA would pitch the economy against the environment and I'd like to think New Zealand is a lot smarter than that, we can have world-class environmental guardianship and stimulate the economy at the same time."

It's not just regulations that are changing. Mark Piper, Chief Executive of Plant and Food believes investment in existing technologies or simple innovations provide some important impetus. He lists biosecurity, improving the cleaning of nets and dealing with pests and pathogens as key enablers. New Zealand salmon are less susceptible to sea lice that beset northern hemisphere salmon, but there are plenty of pests and diseases to worry about, such as *Bonamia ostreae*, a parasite that kills oysters.

In 2017 the Ministry for Primary Industries made the decision to remove all the farmed oysters from Big Glory Bay in Rakaia/Stewart Island, after the parasite was detected on oyster farms in the area.

Big Glory Bay oyster farmers were compensated \$2.5 million after being forced to close their businesses,<sup>14</sup> but the incident highlights just how complex the ocean environment can be, with infections travelling by currents, vessels and introduced species.

Cawthron's Chris Cornelisen says a simple tool missing from the industry is the kind of environmental and animal sensor tech already in widespread use by land-based farmers. "This is simple stuff and the technology, using monitors on buoys and sending data via satellite, has been around for a while but it just hasn't been affordable or fit for purpose for aquaculture."

"So, the technology that Cawthron has developed can tell a farmer about the weather, waves, water quality, information about their structures, even if their lights are working on their buoys. We can also tell them what's been happening over time with forecasts and swell maps."

It amazes Cornelisen that such data has not already been collected. "These are big farms, more than 1000 hectares. There's a lot at stake."

But the lack of sophistication reflects the immaturity of the sector. Apart from some larger players such as NZ King Salmon Talleys and Sanford, the sector is dominated by small, under-capitalised, often family-owned businesses, operating on entrepreneurial nous and passion.

It's one of the C's in Ellison's list. "This is an expensive industry to develop because you have to do everything at scale," he says. "There are part-time, family businesses – they might run a few mussels' lines, a few oyster lines and a contracting service that transports salmon feed for example. But if you want to be vertically integrated for new salmon farms, you're not talking tens of millions, you're talking hundreds of millions of dollars. Access to capital is constrained. And my view is it's probably not available in New Zealand. It will be foreign capital that's required. And that won't flow until the consenting and other constraints are addressed."

The first \$1 billion in revenue may be achieved through changes in existing regulation and expansion of existing assets, especially salmon. But to kick-on to \$3 billion or even \$10 billion will require a transformational effort.

*“...the oceans are in peril from overfishing, climate change and pollution.”*

## A second wave

The second stage of growth, taking the industry to \$1 billion and beyond, involves more profound change, including much larger farms tethered many kilometres from shore. Adding distance from the coast opens possibilities: much larger nets, cooler waters, reduced pollution and fewer competing claims from marine users. It also adds complexity. As Kuntzsch says, our oceans are “highly energetic” (not many Norwegian-style fjords for protection) so the farms can encounter waves up to six metres high. A warming ocean because of climate change will make it even more energetic.

But enthusiasm for such mega-farms is growing. A good example is Blue Endeavour,<sup>15</sup> New Zealand’s first open-ocean aquaculture farm. Following a five-year consenting process, NZ King Salmon was granted permission in 2024 to build a farm seven kilometres offshore and about 12 hectares in area. It’s expected to generate over 10,000 tonnes of salmon worth an estimated \$350m in export earnings – more than double the company’s current production. Blue Endeavour’s pilot farm, made up of two 55-metre diameter pens, will harvest its first salmon in 2030.

It’s a big deal for NZ King Salmon, with the struggling company sinking almost \$10 million into the pilot and putting its dividend on hold. “Blue Endeavour is the next step in our evolution ... It will pave the way for our industry,” says King Salmon manager Mark Preece, speaking on the company website.

The project also represents another aspect of this fast-growing sector: an emerging professional network of collaborators, including the Cawthron Institute, MPI, government ministers, Crown Research Institutes,

iwi, industry and local government – all pushing for investment and growth. It’s reflected in the 2019 government strategy document and most profoundly in Aquaculture NZ becoming a professional body.

Most notable is the formation of Moananui, a Nelson-based ginger group consisting of aquaculture companies, Nelson Regional Development Agency, Plant and Food, Cawthron, Beca and a handful of entrepreneurial firms. Led by Jodie Kutzsch (yes, she’s married to Volker) the group’s mission is to accelerate the blue economy through research, investment and collaboration. What’s required is a more ambitious and holistic agenda for ocean economics

“Traditionally we talked about maritime economies as everything that’s creating economic value for, with, on, and under the water. The difference is that a blue economy continues to provide for economic value and return, but actively pursues the social, cultural and ecological gains that are necessary, particularly on a changing planet,” says Jodie.

She sees an urgent need for a joined-up conversation between business, government, environmentalists, Māori and communities – not the least because the oceans are in peril from overfishing, climate change and pollution. Economic, environmental and social imperatives must work in parallel.

“We’re interested in finding financing models, business models, decision-making frameworks, regulation and community engagement that works. The only way to do that is if we can be collaborative. We can’t leave that to the government, and we can’t leave it down to business. We can’t wait for other problems to be solved. We have required a lot of silo breakdowns so we can all benefit.



Moananui received its first two years of funding from the Sustainable Seas National Science Challenge and MPI's SFFF in 2023 so it will be interesting to see if it can continue the momentum as a standalone membership-based organisation.

## The third wave

The third stage of aquaculture's evolution is diversification – the kind of sophistication witnessed in more mature sectors like dairy and red meat and this includes:

- New species such as grouper, geoduck and clams
- Algae (seaweed) for food, carbon, bioactives and fertilisers
- Land-based farming or recirculating aquaculture
- Secondary processing in the form of extracts, cosmetics, nutraceuticals and medicine
- Mobile, open-ocean farms
- Cellular or lab-based proteins.

Much hope is pinned on seaweed. Its thousand-fold harvest growth since the 1950s reflects its use in food, nutraceuticals, cosmetics, pharmaceuticals, aquatic animal, or livestock feed, biofertiliser, textiles, and biofuels. It can also be used for producing fully biodegradable and compostable biomass for non-plastic substitutes and plastic alternatives. Blue carbon advocates point to its restorative effects on ecosystems and carbon sequestration.

The Sustainable Seas National Science Challenge<sup>16</sup> has a handy summary. “There are three types of seaweed

(often referred to as macroalgae): green, red, and brown, all of which are farmed or harvested in some manner. Red seaweeds (52%) and brown seaweeds (47%) make up most of the global supply. Most farmed seaweed is used for human consumption, either directly or as a food ingredient (85%); the balance (15%) is used for a range of markets including livestock feed supplements, extracts (e.g. agar) and other uses such as soil bio stimulants. Within seaweed food-products, China and Japan are the largest importers representing more than 71% of the global market.”

Cawthron has strong interest in the crop and not just the macro algae. “Seaweed, algae, and microscopic stuff like phytoplankton – they're commercially important because you can grow vast amounts and produce a wide range of proteins for food or fish feed. And there's also health benefits,” says Chris Cornelisen. “There's lots of value in the little parcels of goodness, but then there are ecosystem benefits, removing nutrients and cleaning up the water or pairing it with finfish aquaculture to minimise impacts from salmon while being able to harvest the seaweed.”

Cawthron's work includes an experimental farm in Tasman Bay, collaborations with pharmaceuticals in the US and trialling growing varieties in a tank in Germany. So how does this excitement turn into commercial action? There's no shortage of talk about it. The Sustainable Seas National Science Challenge has written the book on how to grow a seaweed sector. Its exhaustive reports into markets, risks, requirements and capability are freely available – with handy diagrams in case you get bored.<sup>17</sup>

It's conclusion: it will be difficult to turn what's effectively a cottage-industry into a major earner. “We have an

emerging seaweed sector with pockets of product innovation operating at a small scale but is constrained by an underdeveloped local seaweed supply-chain that itself is inhibited in many instances by low-profit return to growers, fishers and gatherers, and by regulation.”

“There are signs that a seaweed sector regulatory framework has been evolving in response to emerging drivers and information. However, the process for those who have tried commercially orientated seaweed research and farming trials has been lengthy, costly, and frustrating hindering progress and investment.”

The seaweed sector faces constraints in Craig Ellison’s five C’s: capital, consents, confidence, competence, and commitment.

Clare and Tane Bradley, owners of AgriSea, are sceptical that seaweed will be a major contributor to the \$3 billion in the immediate term. “We need a co-ordinated effort and strategic focus for seaweed as an export earner. A world bank report<sup>18</sup> pinpoints animal feed additives and bio stimulants as a near term and scalable market opportunities, but new entrants to the global seaweed market are also chasing this opportunity, so where does New Zealand’s, unique species and high-value offerings lie?”

After almost 30 years in the bio stimulant and animal feed markets AgriSea, are turning to a biorefinery approach so that maximum value is extracted through a multi-market, multi-use approach from their seaweed source.

The opportunities are vast – and it’s the plethora of opportunities that can lead to distraction rather than a coordinated, species & market specific development. A key missing element seems to be understanding market demand or even if there is a market. Only US\$1 billion of seaweed is exported globally and almost all of that is within Asia.

So, what’s New Zealand’s plan? The Government recently released the New Zealand Aquaculture Development Plan<sup>19</sup> which talks about actions and measures of success for the sector but is very light on how you go about growing the market, let alone how you add value, or sophistication to the commodity.

According to Chris Cornelisen, “the biggest issue is matching to a good market that’s going to bring you a sustainable return. If you don’t know the

market, product ends up as a fertiliser and becomes a commodity. This is akin to growing an interesting lettuce. The value is not in the commodity but in bio actives as ingredients for something else, maybe health food or cosmetics. But how do we find that market?”

## An innovative future

All that said, the pipeline of innovation in aquaculture looks exciting. Plant and Food Research and Cawthron are working on mobile fish farms – large, movable cages which can be dragged into fresh currents of cold, nutrient-rich waters. The cages emulate the natural conditions of fish and avoid damage to the sea floor seen in some places.

Another arm of the same programme involves shellfish towers, cassette-like structures stored below the water level (provoking fewer complaints from neighbours) and dragged up for harvest. Cawthron has had successful trials in Tasman Bay with scallops – creating excitement because the scallop fishery was closed in 2016 due to declining numbers.

Dr Georgina Dowd of Plant and Food Research is pursuing yet another innovation that could disrupt the entire aquaculture sector – lab-based or cultured fish protein. Deploying the same tech as the lab-based chicken that received so much media hype, Dowd is using original terakihi and snapper cells to grow tiny slabs of tissue in the lab. The end goal is to grow fish fillets at a commercial scale without the need to harvest a fish at all.

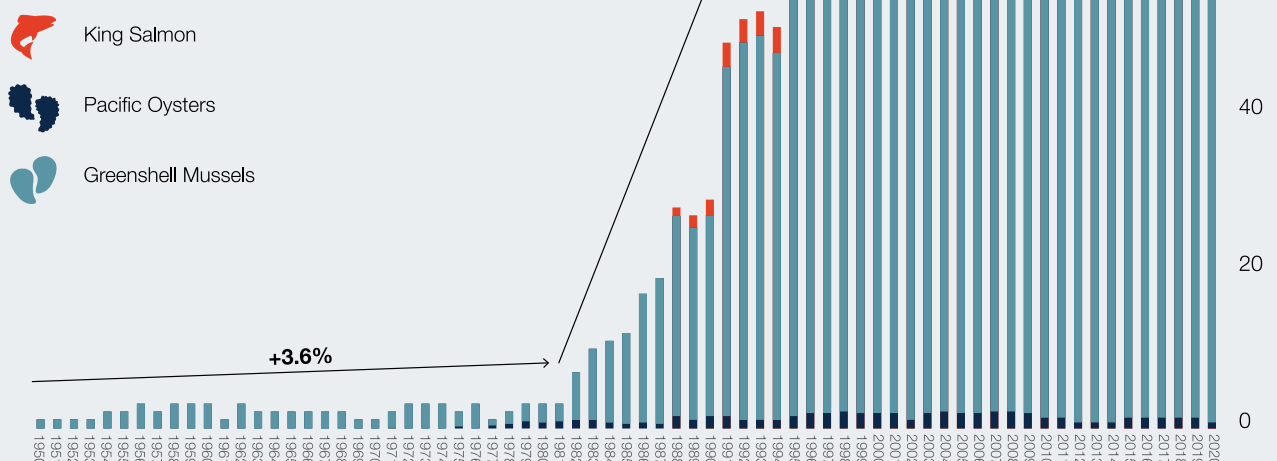
In Ruakaka, north of Auckland, NIWA is experimenting with land-based or recirculating aquaculture systems for finfish like salmon and king fish. Lead scientist Andrew Forsyth is a Canadian with experience in salmon farming. The advantage of land-based farming, he says, is control. “When you think of losses in sea cages, it’s typically because they’re exposed to pathogens and parasites, or environmental changes – too hot, too cold, or not enough oxygen and so on. We can control all those in a recirculating system.”

Production rates are higher too. “Salmon and kingfish want to herd in nature, to form a fairly tight school, so if you are feeding them and you can meet all their environmental requirements, having them in a tank – I

## New Zealand Biomass Harvest From Aquaculture

Kilotonnes (t; 000); 1950–2020 (latest available)

*New Zealand aquacultural production grew to around ~2004; growth has stalled since; all new species attempted in the past fifty years have failed*



**1983** Changes in Marine Farming Act allows use of sea cage for salmon\*

**1992** “Several other species such as abalone, dredge oysters, seaweeds, grey mullet, rock lobster and freshwater prawns are at various stages of development.”

**1995** “The aquaculture industry is expected to diversify into other species during the 1990s, as government investment in biological research during the 1980s starts to pay off. Though industry investment has been limited by general economic conditions, work by MAD on the most promising new species (scallops, pāua, rock lobster, dredge oysters and seaweeds) can now be capitalised on by industry. Pāua farms are now established, and seaweed pilot projects are under way.”

**2000** “The aquaculture industry is involved in research to extend the range of species and technologies involved. This includes consideration of turbot and brill, oysters, sponges for chemical production, kingfish and rock lobster as well as further enhancement prospects for several species such as pāua, scallops and snapper.”

- 2004**
- Māori Commercial Aquaculture Claims Settlement Act 2004
  - Aquaculture Reform Act 2004

## *“There is a market... We’ve just got to get our ducks in a row.”*

don’t want to anthropomorphise too much – but they’re very happy fish. So, we can run them at a relatively higher density and still have low mortality, high survival and high food-use efficiency. And because you could control the temperature you can accelerate the growth rate or decelerate the growth rate.”

And then there’s the unexplored potential of extracts, such as oils and collagen. An in-depth study into marine bio actives by Coriolis, funded by MPI, reveals an industry poised for growth. It has all the elements: strong market pulls, multiple brands, a broad and sustainable supply base and growing science and technology.<sup>20</sup>

Cawthron for example is pioneering an algae-based pain medication extracted from algae. The active ingredient, neosaxitoxin, has pain-reduction properties and a Cawthron-led drug trial reached stage two trials in the USA.<sup>21</sup>

Extracts could be a billion-dollar industry, says Kuntzsch. “I’m very passionate about our mussel industry for example. Our green shell mussel is unique to New Zealand. We predominantly sell it as a half-shell frozen product, as a commodity. But we do sell some very small quantities in high-value powders and oils. There is more opportunity here.”

### **A dose of salts**

It all comes down to confidence, collaboration and creativity – more C’s to add to Ellison’s list.

“Cawthron and Plant and Food Research see this opportunity to collaborate to make this happen. We believe that within 10 years, we could turn this industry into a \$10 billion industry. And at the same time reach our climate targets. It’s absolutely a win-win,” says Kuntzsch.

That might be true but to do it in just 10 years. After two decades of stagnation? With a supply-chain that needs to quadruple, freight that needs to triple<sup>22</sup> and a country obsessed with NIMBYism?

Canadian Andrew Forsythe of NIWA says he came to New Zealand 20 years ago partly to escape the ‘toxic’ culture that surrounded fish farming. “In many ways it’s still the same now in Canada, and in Tasmania where the growth has been spectacular.

We could do it differently, better.

“But I see bright sparks. I think the kingfish thing is going to take off. I think there’s significant growth in salmon and in other niche parts of the sector ... but maybe we must be a little bit more self-critical asking ‘okay, are we doing it right? Are we doing the marketing right? Are we growing what the customer wants? Can we do it better and cheaper than someone else? Are our regulations safeguarding the environment but allowing business to flourish? I agree that there’s tremendous wealth in the world middle class who want quality assured products, particularly seafood. So, there is a market. The job is more internal than external. We’ve just got to get our ducks in a row.”

Call it ducks, call it a dose of salts, call it Ellison’s C’s, the excitement about aquaculture needs to be matched by investment and action before it hits \$3 billion, let alone \$10 billion.

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  - <sup>9</sup> Coriolis, 2023, <https://www.coriolisresearch.com/reports/coriolis-bio-siii-marine-bioactives-100>
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  - <sup>12</sup> Newsroom, 2024, <https://newsroom.co.nz/2024/03/06/every-fish-farm-in-nz-to-have-consent-extended-for-25-years/>
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# 06

Future of Food series

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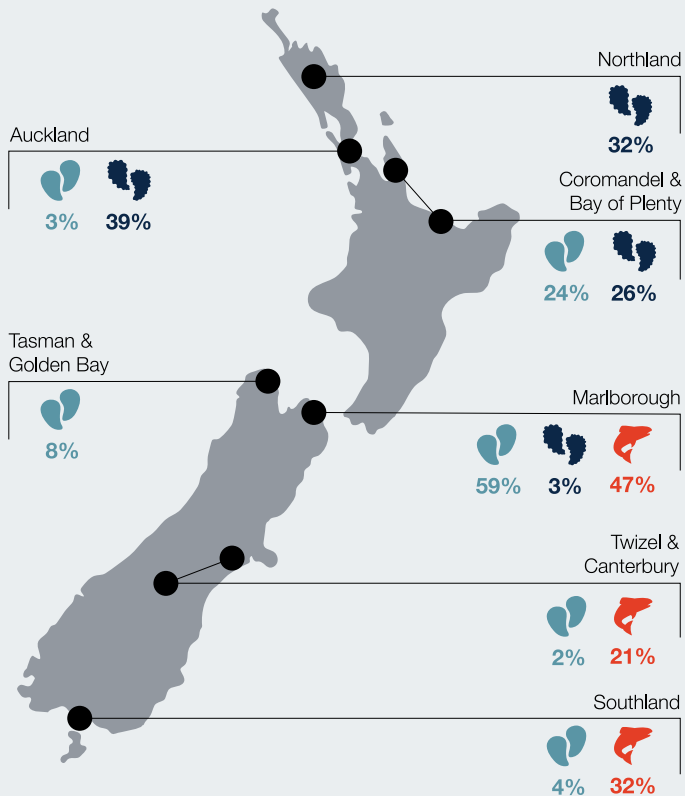
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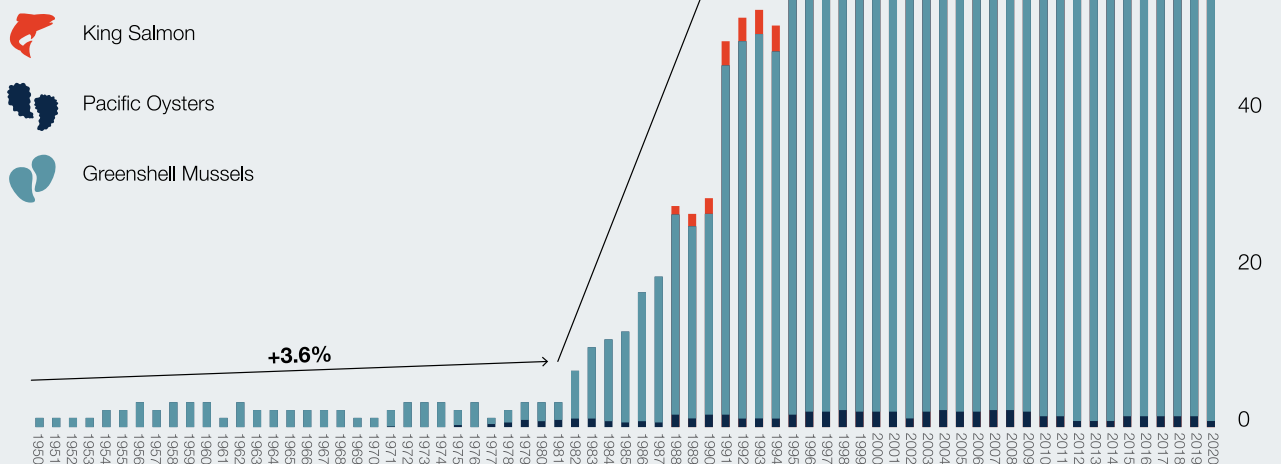


Source: <https://www.aquaculture.org.nz/>

# New Zealand Biomass Harvest From Aquaculture

Kilotonnes (t; 000); 1950–2020 (latest available)

*New Zealand aquacultural production grew to around ~2004; growth has stalled since; all new species attempted in the past fifty years have failed*



**1983** Changes in Marine Farming Act allows use of sea cage for salmon\*

**1992** “Several other species such as abalone, dredge oysters, seaweeds, grey mullet, rock lobster and freshwater prawns are at various stages of development.”

**1995** “The aquaculture industry is expected to diversify into other species during the 1990s, as government investment in biological research during the 1980s starts to pay off. Though industry investment has been limited by general economic conditions, work by MAD on the most promising new species (scallops, pāua, rock lobster, dredge oysters and seaweeds) can now be capitalised on by industry. Paua farms are now established, and seaweed pilot projects are under way.”

**2000** “The aquaculture industry is involved in research to extend the range of species and technologies involved. This includes consideration of turbot and brill, oysters, sponges for chemical production, kingfish and rock lobster as well as further enhancement prospects for several species such as pāua, scallops and snapper.”

**2004**

- Māori Commercial Aquaculture Claims Settlement Act 2004
- Aquaculture Reform Act 2004