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IMPORTANT DATES

Board meeting
6 December 2024

Q1 Light audit due
31 January 2025

Havelock mussel festival
08 March 2025

The MFA team would like to wish everybody a safe and enjoyable holiday season.
Our office will be closed from 20 December until 6 January.
We look forward to seeing you all next year!

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GM's Comment – December 2024

When compiling the December Newsletter over the past five years, I've often felt like 'a broken record.' For four of those five years, spat falls on Te Oneroa-a-Tōhē/90 Mile Beach have been underwhelming, and ponderous regulatory settings have been a constant throughout. Well, not this year!

After a bumper spat season which saw regular landings of large, healthy spat, at the right time of year no less, the mood within the mussel industry is bordering on jubilant. Hearing comments like "the quality just kept getting better and better" and "we're fully seeded and then some" is truly encouraging. If we see good retention, it's going to be a busy couple of years on the water.

Furthermore, if we can't complain about the shortcomings of resource management law at industry events, what are we going to talk about? Since forming in November 2023, the coalition Government has made rapid progress towards more enabling regulatory settings for aquaculture. The Resource Management (Extended Duration of Coastal Permits for Marine Farms) Amendment Act has provided security of tenure through to 2050, while the Fast-track Approvals Bill looks set to provide a pathway for obtaining new waterspace and landbased assets. From there, changes to the New Zealand Coastal Policy Statement (NZCPS) and the National Environmental Standards for Marine Aquaculture (NESMA) are proposed, along with an overhaul of the Resource Management Act.

The Marlborough Environment Plan (MEP) process is now in the final throes, with only a handful of industry appeal matters outstanding. That said, it has been a busy 12 months, filled with mediation attendance and analysis of what the incoming national direction means for Marlborough. We understand there will be one final round of mediation in mid-2025 for those matters still unresolved. The first MEP matter to be heard by the Environment Court is the coastal occupation charges (COCs) topic, with the hearing commencing on the 10th of December. I would like to thank MFA members for their support on MEP matters, it truly has been a marathon, and I look forward to its conclusion.

As we head into summer, the El Niño–Southern Oscillation (ENSO) remains neutral, but we are on a La Niña watch. Forecasters are suggesting a 50% chance of La Niña conditions developing in late-2024 but expect a short-lived event when compared to previous years. Sea surface temperatures around the country for October were between 0.55˚C to 1.01˚C above average and are expected to remain elevated. If La Niña remains so prevalent, does that mean ENSO needs a rebrand? A bit more oscillation would be most welcome.

The Tasman Nelson Regional Pest Management Plan (RPMP) has recently been updated, in part to address the risk of Mediterranean fanworm (Sabella spallanzannii) establishing in both regions. The biggest updates relate to notification - if you discover Sabella anywhere in the Top of the South, you must now notify the relevant council within 24 hours, as well as Biosecurity New Zealand. With a number of recent detections in local ports and marinas, we all need to remain vigilant.

On the housekeeping front, please make sure that all farms, ramps and wharves are tidy and compliant heading into the break. The hordes of trailer boats, yachts and launches

will be with us in no time. I'd also like to encourage all members to get involved with the MFA Big Month Out and get some pre-Xmas beach cleans in. We have plenty of prizes up for grabs and there are far worse places to spend a day or two in December than at your local beach.

Finally, on behalf of the MFA Team, I'd like to wish you and your families a very Merry Christmas and a Happy New Year. Here's to a prosperous and productive 2025!

All the best,

Ned.

ADVERTISING RATES

1 / 4 Page Advert
Vertical - 87mm x 130mm
Ordinary Members $25 +GST
Associate / Non Members $50 +GST

1 / 2 Page Advert
Horizontal - 180mm x 130mm
Ordinary Members $50 +GST
Associate / Non Members $100 +GST

Full Page Advert
No border - 210mm x 297mm
With border - 180mm x 267mm
Ordinary Members $100 +GST
Associate / Non Members $200 +GST

Marine Farm Compliance Audit Programme

Declarations are Due

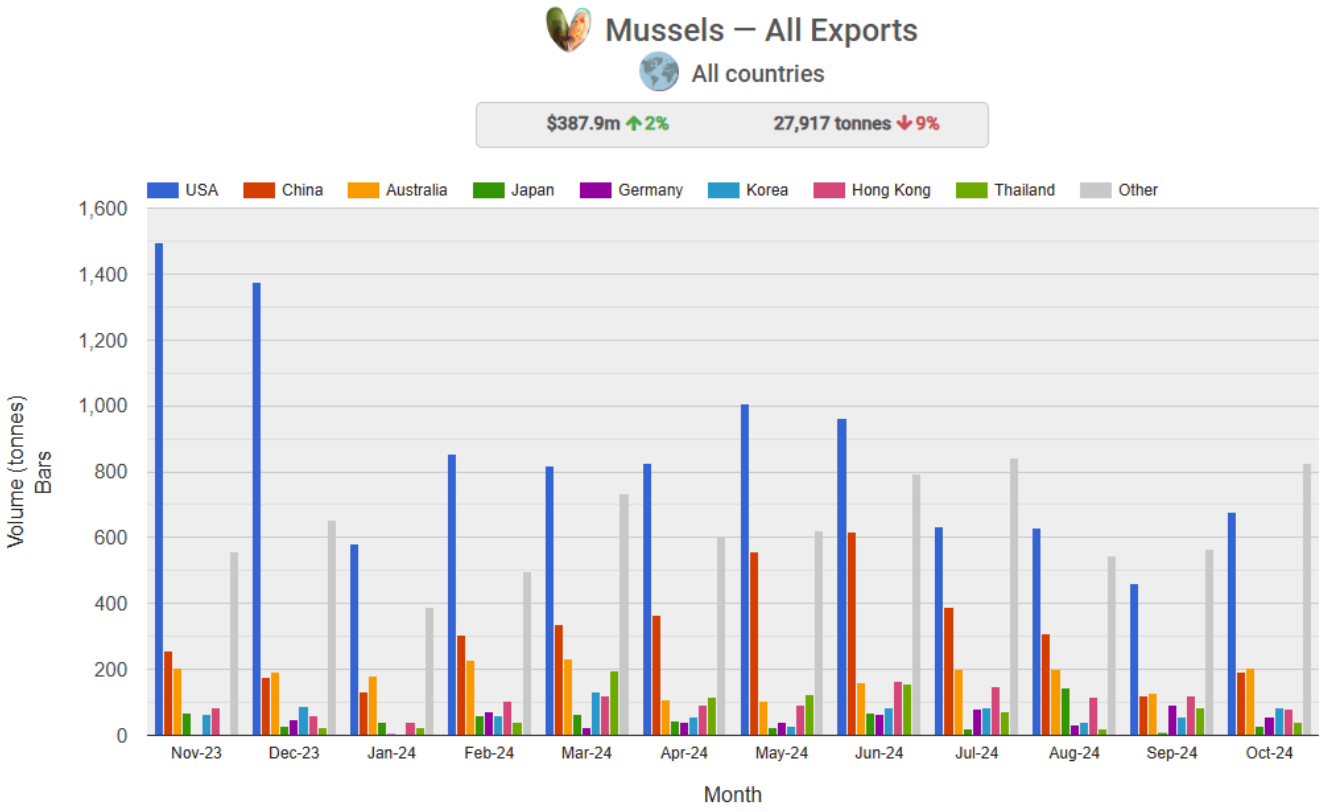
31st January 2025

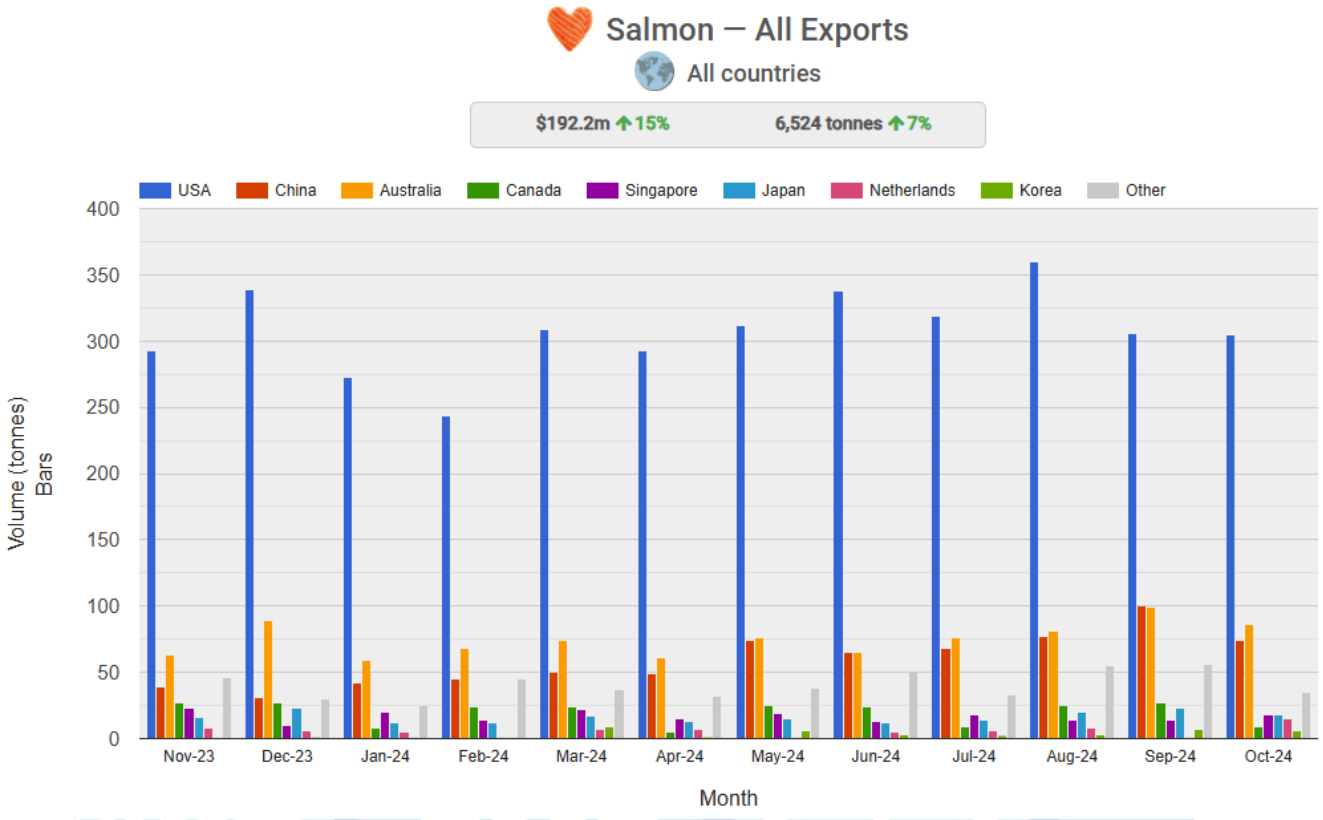
If you have not sent in your declaration for the 1st quarter, please do so as soon as possible

ONE **DECLARATION FORM PER SITE**
DUE BY THE END OF EACH PERIOD

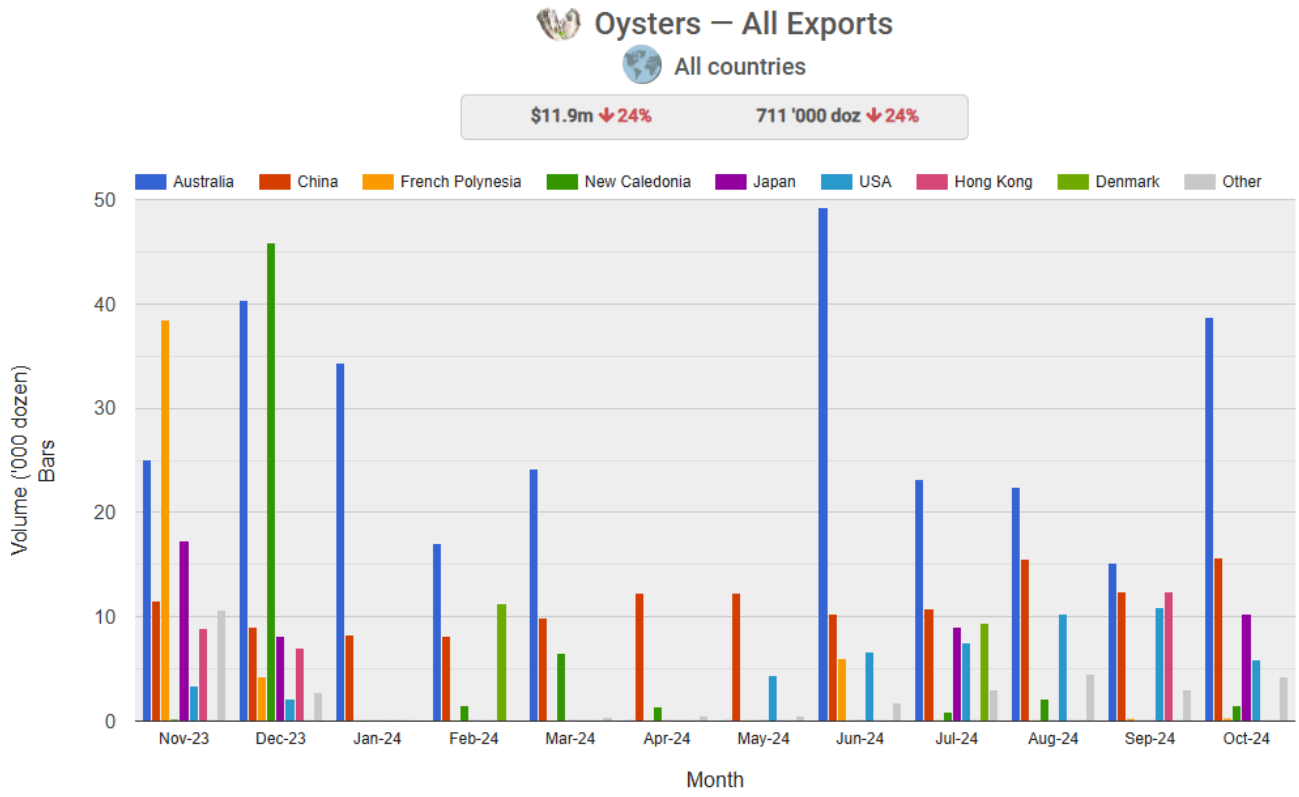
November, December, January	**(1)**
February, March, April	(2)
May, June, July	(3)
August, September, October	(4)

AQNZ Export Stats





AQNZ Export Stats



New marine biosecurity rules for the Tasman-Nelson Region

New changes to the Tasman-Nelson Regional Pest Management Plan (RPMP) are now in effect and will impact boat owners and operators entering the region. These amendments aim to reduce the risk of invasion by Mediterranean fanworm (*Sabella spallanzanii*) and other marine pests to protect our marine environment. The new rules also bring Tasman-Nelson in line with the Marlborough District Council RPMP, so there is consistency in managing marine pests throughout the Top of the South.

Tighter restrictions on vessel fouling

Under the new rules, all marine craft entering the Tasman-Nelson region must comply with stricter biofouling standards. The level of fouling on a vessel's hull and niche areas cannot exceed Level 2 on the Cawthron Level of Fouling (LoF) scale, unless specific exemptions apply. Level 2 macrofouling is defined as: *macrofouling is present in small patches, or a few isolated individuals or small colonies, and covers between 1 - 5% of the visible surface.*

Other key changes include:

1. The person in charge of a place (e.g. craft or structure) must destroy any *Sabella spallanzanii* found on that place. The infested place must be slipped or contained within an encapsulation system or treated with biocide where practicable.
2. Exemptions include any craft entering Tasman-Nelson for hauling out within 24 hours of arriving (boat owners may be required to provide proof of haul-out to authorised personnel), craft entering for health and safety or emergency reasons, or craft usually moored in Tasman-Nelson that leave the region for no more than three days before returning.

Ongoing surveillance and eradication

Any person who suspects they have observed Mediterranean fanworm in the Tasman-Nelson region must notify the relevant council within 24 hours of making the observation, detailing the location and situation of the suspected pest.

Tasman District Council and Nelson District Council, along with Marlborough District Council and Ministry for Primary Industries, will continue to conduct regular surveillance for Mediterranean fanworm. If detected, the pest will be managed through a coordinated approach involving boat owners, marine operators, and council staff.

For more information, please visit https://www.tasman.govt.nz/my-council/key-documents/more/environment-reserves-and-open-space/tasman-nelson-regional-pest-management-plan/

Many lines of spat research

Mussel farming began when seawater temperatures were much lower which is part of the reason why the industry needs to adapt its approach to managing spat.

Aquaculture NZ's Technical Director, Dr Dave Taylor, introduced his session on industry-led spat research and the SFFF Triploid project at MFA conference in August. He noted that warmer than average water temperatures started appearing in our coastal waters in the early 2000s, and from then on, things got worse. "Year on year from 2012/13 that temperature anomaly has increased," he said.

The NZ Greenshell Mussel Spat Strategy was developed in 2020 with a focus on retaining the spat we have, making best use of it, seeking more and diversifying supply, as well as increasing hatchery production to build industry resilience.

Aquaculture New Zealand helped to establish the Ahumoana o Aotearoa Spat Research Collective in 2023. It meets annually to align research efforts to industry needs. Its focus is understanding how to improve spat growth, retention, and performance.

Dave also outlined the Seafood Innovations Limited's 'Spatmeter' project, co-funded by AQNZ. Lead researcher Techion had worked on technology to count parasites in sheep faeces before further developing this technology to count spat. Working with Aquaculture Solutions (Andrea Strang), the project aimed at rapid, consistent measurement of spat count and sizes, and in future, spat condition. Field trials are underway with spat collectors and spat researchers.

He also outlined the Fisheries NZ funded project aimed at understanding environmental drivers of spat performance. The project tracks temperature, water quality and spat survival rates. With three years of funding, ten sites from Port Underwood to Golden Bay were established in the first spat deployment across 2023-24, which used hatchery spat from SPATNZ and Te Huata seeded using a standardised method (same rope, mussock, and 8m dropper length).

He said that based on the mussel industry's earlier growth trajectory, it should now be producing significantly more than 90,000 tonnes a year. The levers for greater production centred around spat sourcing, size, use and management, developing hatcheries, breeding programmes, nursery sites, and investment in technology on-farm and in processing.

Dave said the SFFF Triploid Mussels project which started in 2023, would quantify the potential benefits to the industry of farming non-reproductive triploid mussel stocks.

The three-year project supported by AQNZ investment was also being helped by in-kind support from SPATNZ, MacLab and NIML, with Cawthron conducting the research. This project will assess whether triploids reduce seasonality in production by extending the harvest window, show increased growth and survival rates, and have greater retention.

Other ongoing and future shellfish-farming related research includes:

- The positive effects of shellfish farms – habitat, remediation, regeneration
- Summer mortality
- Fish predation
- Nursery sites / systems/ feeds
- Hatchery spat
- Breeding programmes
- Biosecurity ONSIDE App Trial

Dave welcomed any additional research ideas and encouraged people to get involved in the industry-led Ahumoana o Aotearoa Spat Research Collective.

- *Brendon Burns*

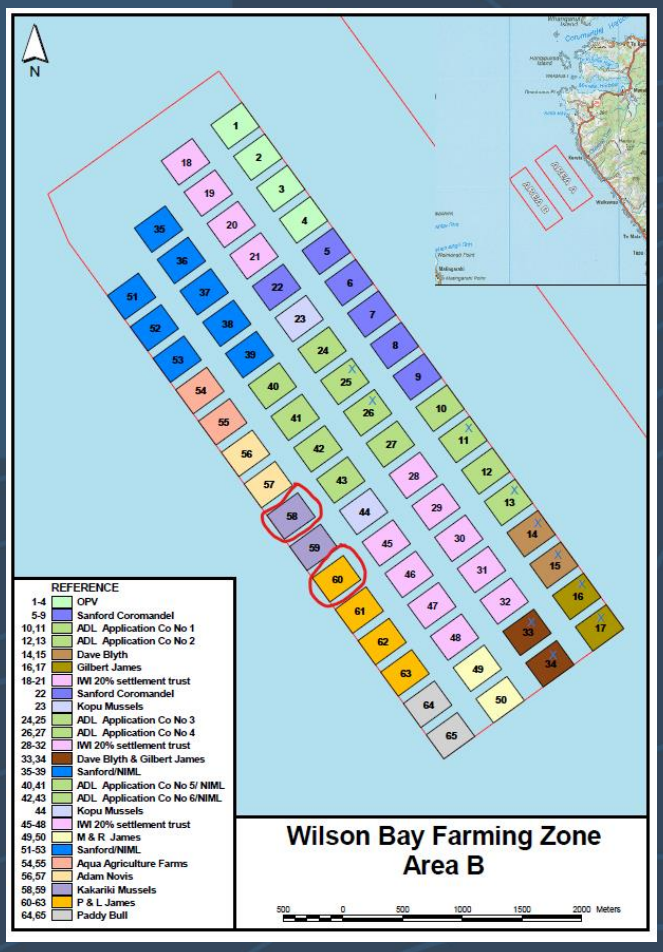
AQUACULTURE
DIRECT

Our future in the sea - Toitu a tangaroa

Marine Farms for Sale

Wilson Bay Area B
Tikapa Moana/Hauraki Gulf
Waikato Region

Farm	Hectares
Block 58	8
Block 60	8



Aquaculture Direct Limited | aquaculturedirect.co.nz | bruce@aquaculturedirect.co.nz

Sea Famers by Nature

Take the best methods of mussel farming from around the world, then improve on them for local conditions.

That's just part of the recipe for success of the Holmyard family, as Lynette and I learned when we met the Offshore Shellfish Ltd Head of Operations, George Holmyard. We met in the Devon fishing town of Brixham, in south-west England, where the family-run company is based.

George is well qualified for the role having worked on both family and other mussel farms since he was a boy. He then gained a Masters degree in oceanography and worked for oceanographic survey companies before returning to the family business. The Offshore Shellfish business was developed by John and Nicki Holmyard who have visited New Zealand and other mussel growing regions around the world in their quest to identify best practices.

Figure 1. Offshore Shellfish Limited Head of Operations George Holmyard in front of the Nelson-built Holly Mai.

After selling their farms in Scotland John and Nicki sought to take the bold move to pioneer Europe's largest offshore mussel farming venture off the coast of Devon and find suitable investors to back this long term project. The site was selected after a careful search for locations around the British coast where mussels (Mytilus edulis) naturally settle, grow, and thrive.

It took the Holmyards five years to permit the three blocks totalling 1540 ha, located 5-10 km offshore in Lyme Bay, Devon (Figure 2 shows two of the developed sites).

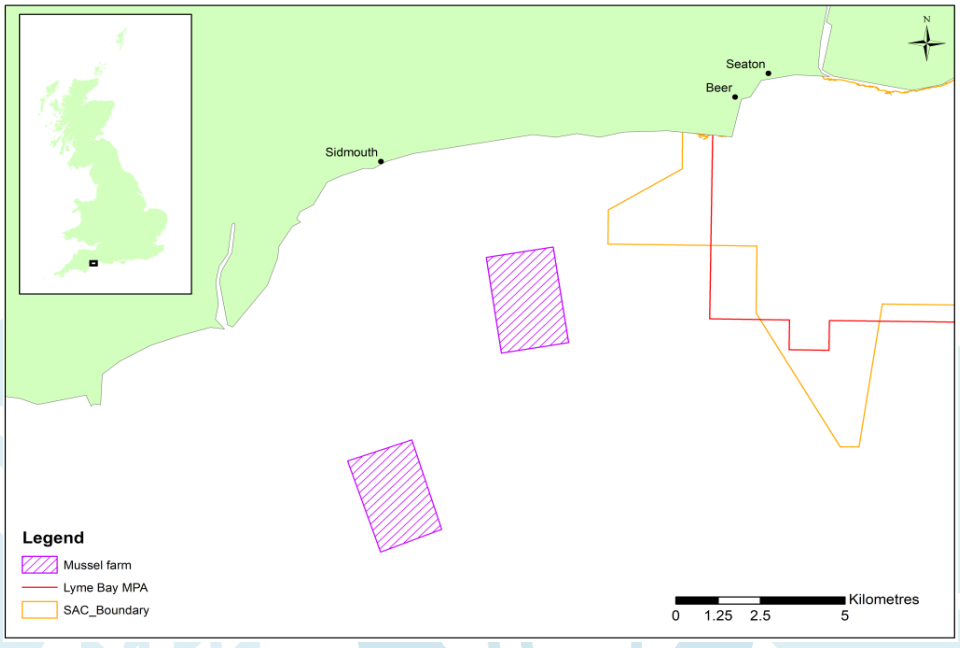


Figure 2 - Location of marine farm blocks and Marine Protected Area (MPA) and Lyme Bay and Torbay Special Area of Conservation (SAC) designated under the EU Habitats Directive in 2010. (https://sheehanresearchgroup.com/rope/).

Brixham has a long history of fishing but little aquaculture with other parties growing shellfish inshore at a much smaller scale. However gaining access to suitable wharf and shore facilities proved to be a challenge for this new type of business for the town.

One of the innovations pioneered by the Holmyards has been the manufacture and use of spar buoys on their single backbone lines. At the site, located in Lyme Bay at the wide western end of the English Channel and exposed to North Atlantic seas, the spar buoys provide a softer ride for the crop, almost eliminating losses due to shaking.

The spar buoys are made of 12mm wall thickness 400mm diameter HDPE gas pressure pipe, fitted with welded end caps of a Holmyard proprietary design (Figure 3). The spar buoys are secured at one end to the 3-4m submerged mainline and sit vertically in the water column. The spar buoys are pressurised to prevent implosion if submerged.

Figure 3. A crate of spar buoys fitted with proprietary end caps on the deck of the Holly Mai. Marine growth shows the typical depth of submergence.

The Holmyards take a data driven approach to mussel growing, continually experimenting to find the optimum arrangement for their location and growing conditions. After some initial losses, they found that active management of the spar buoys was required to maintain around 75% submergence, which was optimal (refer photo). With only 160 days of workable days due to poor weather in the English Channel, servicing can be a challenge at times.

The conventional backbone longline structures are in 25-35 metres water depth with 150m long single backbones. Warps have 50m horizontal length to Fielder Marine NZ screw anchors - providing warp ratios ranging from 1.7 to 2.2 depending on water depth. Line spacing is 50 metres to maintain good growth and prevent overcrowding throughout the extensive farm blocks.

Spat is caught on the farm and grown through to harvest size of 60pcs/kg in 13-15 months. Current practice is 10-13m droppers at 1000-1500mm centres. The seeding ratio is a very healthy 18:1. Final harvest densities of 13kg/metre reflect excellent site selection and crop management.

When fully developed it is expected that the currently permitted farm will produce around 10,000 tonnes of mussels per year.

A single type of Auckland Quality Equipment Megaloop rope is used throughout the operation, for both spat catching and grow out. This simplifies rope management. A nine rock core weighted rope is used due to the sea conditions. ANSCO equipment was well in evidence on the Nelson-built Holly Mai, which was purpose built for the farm.

Another area of innovation is that the Holmyards embrace the biodiversity that their farms attract and create, including organisms that might traditionally be considered detrimental to mussel growth.

A French map from 1871 shows extensive mussel beds in the area, long since lost. The BBC reports that the French map describes a large area of the seabed stretching from Torquay to beyond Lyme Regis as being home to "rich shell beds". (https://www.bbc.co.uk/news/articles/c36nw75z3pxo)

Scientists believe these were likely to have been oyster or mussel reefs that had been destroyed through the use of bottom-towed fishing gear during the 20th century. Bottom trawling is banned within the designated Lyme Bay Marine Protected Area. Research led by Dr Emma Sheehan at the University of Plymouth confirms that benthic changes are occurring allowing the region to become home to shellfish reefs again.

This experience has strong parallels with Auckland's Hauraki Gulf, where historical maps show the dense mussel beds that were destroyed by bottom trawling for wild mussels in the 20th century. It has been reported that, when catches in the Hauraki Gulf declined, the mussel boats moved down to the Pelorus Sound and took a few short years to destroy those mussel beds as well.

One of the farming blocks is located around 5 km from a Marine Protected Area, which is centred on historic reef areas. This provides an opportunity for the scientific research commissioned by the Holmyards to consider the contribution of the mussel farms to the wider restoration of marine ecology in the bay.

This restorative aspect of mussel farming is embraced by the Holmyards and can be seen in their branding and outreach activities - exemplified in the 3 minute video: *Offshore Shellfish - Eat Mussels, Save the Planet. Our sustainable seafood story* (https://www.youtube.com/watch?v=blWoA1CWs-Q).

The main market is Europe, with 95% of the crop being sold live to Krijn Verwijs Yerseke B.V. , a Dutch processor / distributor who depurates, then sells the mussels fresh under their Premier seafood brand, alongside fresh Danish mussels.

In a precisely timed operation, fresh mussels are loaded straight from the wharf and onto trucks for the cross-channel haul to Holland.

Water temperatures range from 10-19 degrees celcius. Predation isn't currently a major issue in Lyme Bay,but has seriously affected mussel production in Spain and Southern

France. French mussel farmers on the other side of the English Channel, just 150 km to the south, have in recent years have reported problems with gilthead sea bream predation.

The Holmyards continue to innovate. Spat is currently mainly caught on the grow-out farm, but another site is also used as spatfall typically occurs several weeks earlier. This results in a longer seeding and harvest season. Hatchery spat could enable a longer harvest season again and is being considered but costs are likely to prohibit this.

Many thanks to John, Nicki and George for their hospitality and to George for patiently sharing his knowledge in response to our many questions. It was fascinating to meet and discuss mussel farming with someone who was well-informed on the latest developments across the globe. It was also great to meet people who have the courage to make bold strategic decisions and the ability to see them through.

The Holmyard's success story provides plenty of learnings and opportunities for reflection. After a pie and chips in Brixham, Lynette and I left the coast of Devon for Cornwall's neolithic standing stones and ancient tin mines.

- *Kevin Oldham*

Identifying environmental drivers of spat performance project: Ahumoana o Aotearoa Spat Research Collective

The Ahumoana o Aotearoa Spat Research Collective (AASRC) is an industry-led initiative that aims to bring stakeholders and researchers together to address productivity challenges faced by the mussel aquaculture industry in New Zealand. The first AASRC project, funded by MPI Fisheries NZ (for three years), and supported by Aquaculture New Zealand and the Shellfish Aquaculture Research Platform (MBIE) at Cawthron, tackles the issue of inconsistent spat performance across different sites.

With extreme variability in the supply of 90-Mile Beach spat in recent years, our focus has been on understanding the environmental characteristics of good nursery sites, with a long-view of maximising the efficient use of this precious natural resource. To date, why some sites are better for holding spat and whether this is consistent over time is not well known. This may be due, in part, to the high variability among batches of spat and differences in the industry practices surrounding their deployment.

To address this uncertainty, the project aims to develop a tool (statistical model) that can predict areas that are likely to provide better spat performance (retention and growth) in the months ahead. The model will incorporate new data on spat retention and growth, historic industry data, and a wide variety of environmental data obtained from satellites and sampling in the field.

The first phase of the AASRC project, has focussed on obtaining new data on spat performance across a range of mussel farms and farming regions. Importantly, we have tried to reduce some of the variability in the seeding step by using a single batch of spat and deploying it in a consistent and industry-relevant manner across different sites. The sites were pre-selected by stakeholders and included mussel farms that were considered either good, average, or poor spat nurseries, allowing us to evaluate the industry rating and providing insight into the consistency of spat performance over time.

We have made good progress in the first year of this programme. In May 2024, the first of our spat deployments that went out in December 2023 (Deployment 1) was retrieved from eight mussel farms in Golden Bay and the Marlborough Sounds. We are also excited to report that our second deployment took place at the beginning of October 2024, but this time, we split a single consignment of spat among 19 mussel farms across five mussel growing regions from Banks Peninsula to Houhora in the Far North. These deployments have been highly collaborative events with representatives of thirteen mussel-farming and spat producing companies, Aquaculture NZ, the Marine Farming Association, Cawthron Institute and NIWA, all chipping in and contributing their expertise (Fig. 1).

Figure 1. *Deploying the spat – a coordinated and collaborative team event.*

For Deployment 1, two batches of hatchery-reared spat, kindly provided by SPATnz and Te Huata Ltd, were deployed at ten mussel farms (200 m/batch, Table 1). Temperature loggers were installed, and water was regularly sampled and sent to NIWA for analysis to provide environmental data for each deployment site. Further environmental satellite data will be obtained for each deployment. To assess spat performance, we assessed the number of spat per metre (i.e., spat retention), the size of the spat, and their condition.

To determine the condition of the spat, we quantified the ratio of the dried meat to shell – with lower values indicating less meat or lower condition, and we assessed the nutritional composition of the tissues in terms of their protein, carbohydrate and lipids. Together, these measures of performance provide a good overview of how farm sites can affect spat performance.

During the six-months of Deployment 1, the mussels from two farms, one in Wainui and one in Anakoha were lost, therefore, we can only report data for eight mussel-farm sites. The remaining mussels were sampled at two different depths (1 and 5 metres), at each site, in May 2024.

Table 1. *Sites used for Deployment 1 of the project and their anecdotal spat* performance rating.

Site #	Location	Anecdotal Rating
1	AMA 1 (a)	Good
2	AMA 1 (d)	Average
3	AMA 2 (q)	Average
4	Wainui	Good
5	Croisilles	Good
6	Anakoha	Good
7	Clova Bay	Average
8	Schnapper Point	Poor
9	Saratoga	Poor
10	Port Underwood	Good

The density (retention – numbers per metre) and size (mm) of mussels collected from both hatcheries after six months of deployment were graphed (Figure 2). Retention was greatest at Port Underwood (site 10) for both batches; however, this site also had the smallest mussels. The largest mussels were found at Schnapper Point (site 8) for both batches. There were no clear patterns in spat retention or size among 'good' (green), 'average' (yellow) and 'poor' (pink) sites and spat were generally smaller at 5 metres deep.

The condition index and nutritional composition of the spat varied among sites with values ranging from 15% at Croisilles, to 28% at Clova Bay for spat from Hatchery 1, and 16% at AMA 1(a), to 25% at Port Underwood for spat from Hatchery 2, suggesting that site can strongly affect the condition of the spat over six-months. In terms of nutrition, mussels from Saratoga and Clova Bay showed the greatest amount of fat (lipids) for Hatcheries 1 and 2, respectively, likely reflecting the different food and environmental characteristics of the sites, which is being assessed separately.

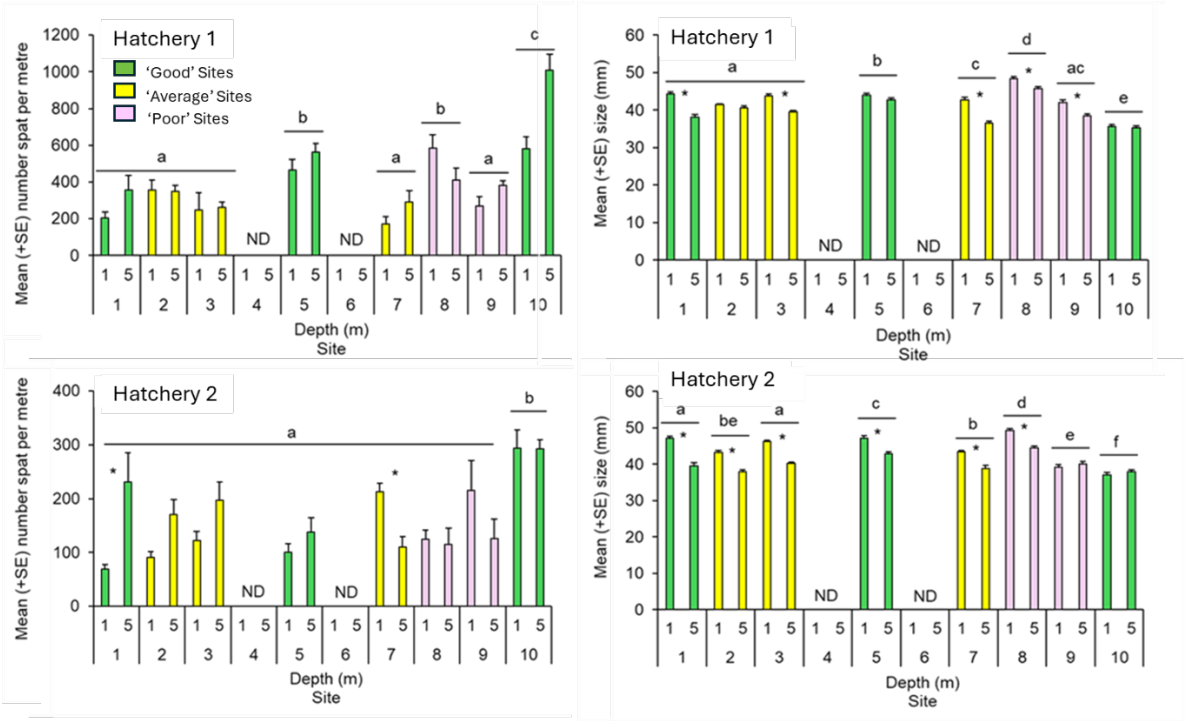


Figure 2. *Mean number of spat per metre for spat from two hatcheries at different sites in the Top of the South after a six-month deployment. Asterisks indicate differences between depths within a site. Different letters above bars indicate statistical differences among sites (pooling across depths) for each supply source. ND: no data.*

The results of this study indicate that the performance of single batches of spat can vary depending on the mussel farm they are deployed onto. Interestingly, mussels deployed at Schnapper Point also had good retention, and had the highest protein content, despite it being considered a poor nursery farm for spat prior to this experiment.

Indeed, there was no evidence to support that the two sites considered to be poor spat sites were any worse (in terms of spat abundance per metre) than the five or six (depending on spat source) sites that had been given better rankings by the mussel-farming industry. However, these are the results of only one study, hence we are keen to reevaluate the

performance of these eight mussel farms alongside a further eleven with the current deployment of spat (Deployment 2) and beyond.

Finally, we would like to acknowledge the participants and delegates of the Ahumoana o Aotearoa Spat Research Collective that made this project possible.
The team at Aquaculture New Zealand for project management.
Kim Thomson of Te Huata Ltd and Ned Wells of the Marine Farming Association for coordinating sampling and the industry-led deployment of spat.
Rodney Roberts of SPATnz and Kim Thompson of Te Huata Ltd for contributing the excellent hatchery-reared spat used in the first deployment.
Denison Enterprises Ltd, KADH Fishing Company, Reichardt Marine and Westpac Mussels supplied spat and supported with transportation and logistics.
Marine Farm Management Ltd, James Marine, Te Aupōuri, NIML, Whakatōhea Mussels, Sanford Ltd, Maclab (NZ) Ltd, Aroma, Clearwater Mussels Ltd, Waimana Marine Limited and Cedenco Foods New Zealand Ltd supplied mussel farm space, vessels, personnel and advice across this project.

We are grateful for everyone involved in the planning, deployment, collection of samples, and sample analyses for this project. The scale of this project is unprecedented and the collaboration and support of all the people mentioned above is truly invaluable.

The committed and collaborative approach to deploying the spat in a highly standardised manner, sharing data, knowhow and resources like farm space, vessel time, and personnel has established a groundbreaking model for collaborative research. The Ahumoana o Aotearoa Spat Research Collective will continue to engage with its members and the wider aquaculture community as it develops workstreams for years two and three of this project, and in developing new industry-focused projects for the future.

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Ned Wells (ned@marinefarming.co.nz)
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Shell material continues to show positive results for enhancing biodiversity in the Marlborough Sounds

In December 2023, with support from Sanford, 4 tonnes of steam-cleaned mussel shells were deployed onto the seafloor in Pelorus Sound/Te Hoiere at varying heights off the seabed. The shells have been sampled after 1 and 6 months on the seabed and will be sampled approximately every six months until June 2025. The results are encouraging so far, with a large range of biodiversity in the shell plots, compared to the control seafloor areas, including a range of organisms, such as scallops and triplefin fish eggs!

Work is a continuation of our previous work where we are expanding our understanding of how we can use shell material from aquaculture to enhance biodiversity on the degraded, muddy, seafloor. This experiment aims to understand how shell material at different elevations from the seabed enhances biodiversity, including recruiting organisms such as algae.

As we approach the one-year mark, we're excited to see how the ecosystem continues to evolve and grow, and we are looking forward to more analyses. During our six-month sampling, we noted the first signs of algae growth on the shells, an important indicator of the effectiveness of providing hard substrate on the seabed for recruiting organisms. We are hopeful that the upcoming sampling will reveal a continued increase in algae and other recruiting organisms and further development of these restored habitats.

The beginning of some algal growth on the shell plots with a baby scallop recruiting onto the shell!

By using shell to restore the seabed, we aim to enhance biodiversity and improve ecosystem services in areas where mussels were overharvested historically. The next year of monitoring will be very important in understanding how these restored habitats continue to develop and contribute to enhancing these degraded ecosystems. Stay tuned for more updates!

A Triplefin fish posing for the camera on top of their eggs nestled into one of the shell plots.

Please feel free to get in touch with any questions or if you'd like to get involved:
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Emilee Benjamin: emilee.benjamin@auckland.ac.nz.

Hot families: The potential for breeding to unlock mussel resilience in a warming world

My Poppa wasn't the most cultured bloke. The story goes that on a family holiday, my Nana suggested a museum visit. "Not interested" said Pop. "Once you've seen one museum, you've seen them all".

What has my Poppa's lack of culture got to do with aquaculture you may ask? To many people, his philosophy also applies to our Greenshell mussels. They're all the same. They have a green shell. Once you've seen one you've seen them all. As "shellfish people" we all know this is not true – shell colours vary markedly, as do meat weight, growth and many other factors.

As scientists we have the ability to delve even deeper into these fascinating differences, and we've observed that Greenshell mussels have different 'personalities'. When a 'stressor' (e.g. a simulated marine heatwave) is applied to a selection of mussels in the lab we observe huge differences in the mussels' response to stress. One mussel might 'retreat into survival mode' (e.g. decrease its heart rate and metabolism) while another might 'panic' (e.g. gape widely while it's heart races).

It turns out that many of the differences we observe can be attributed to genetics. At the Cawthron Aquculture Park we are fortunate enough to have access to selectively bred mussel 'families' through our collaboration with industry (Te Huata Ltd and SPATnz). These 'families' are exactly what you might think – mussels that are genetically related to each other through breeding (just like my family has different genetics to yours). The breeding process is a whole other story that we won't go into here, but it essentially involves spawning the mussels and mixing eggs and sperm to make mussel babies. In a hatchery setting we can control who breeds with who by mixing together eggs and sperm from specific individuals.

Fig 1. Two different Greenshell mussel families, showing the diversity in shell colour

Our science has shown (and Coromandel mussel farmers will no doubt tell you) that adult Greenshell mussels (> 50 mm in length) don't like sustained seawater temperatures above 24°C (for embryos and larvae this temperature is even lower). Their health is comprised and they will start to die if other conditions are suboptimal (e.g. there isn't enough food around). Temperatures of 26°C are a 'tipping point' where adult mortality significantly ramps up, and we are now seeing these seawater temperatures in the north island during summer (see figure below). A mussel's genetics, however, can determine what percentage of the family die when exposed to these hot temperatures. We have now tested almost 100 unique families in numerous lab experiments where we expose the mussels to 26°C for a prolonged period.

In a recent study we found that one family had 42% of individuals still surviving after 2 weeks at 26°C, while in another family only 5% of individuals remained. Fascinatingly, the best surviving family (lets call them family A), were different to the less resilient families in many ways. We applied some fancy lab techniques to a subset of family members (real white lab coat stuff) and found that family A had a different gill microbial community (microbiome), and responded to the heat stress by expressing different genes and having different immune responses compared to the other families. The least resilient family (lowly family B) had very few genes that responded to the heat stress at all, indicating they were unable to activate mechanisms to protect themselves from the heat (or maybe they're a lazy bunch and just couldn't be bothered?).

Another quirk with Greenshell mussels is that 'size does matter' and 'age isn't just a number'. Thermal tolerance can change through life, with different ages and sizes of mussels having different levels of resilience. To look into this, we compared the heat tolerance of individuals from six different families across their early life at ages 6, 8, 10 and 52 weeks old. We found that within each age bracket, larger mussels from each family (even the most heat tolerant families) appeared to be more vulnerable to high temperature. This relationship within families seems to weaken as the mussels get older (e.g. beyond 1 year old). This may be because fast-growing active youngsters require a lot of energy in the earlier stages of life, and individuals with a higher metabolism (and faster growth) may run out of energy when also dealing with environmental stress. These size-age interactions have implications when breeding for heat tolerant families and need to be further investigated.

During the age study, we also sampled gill tissue from the 52-week old mussels to look at correlations between heat tolerance (survival) and expression of a specific gene called heat shock protein 70 or "hsp70". This gene is activated in animals when exposed to any stress (not only heat), and acts as a protection from stress-related cell damage. We found that the best surviving families were able to express higher levels of the hsp70 gene, suggesting that this gene can indeed be used as a 'biomarker' or 'indicator' of heat tolerance in Greenshell mussels. It would be great if we could accurately predict heat tolerance in mussel families without having to carry out survival trials.

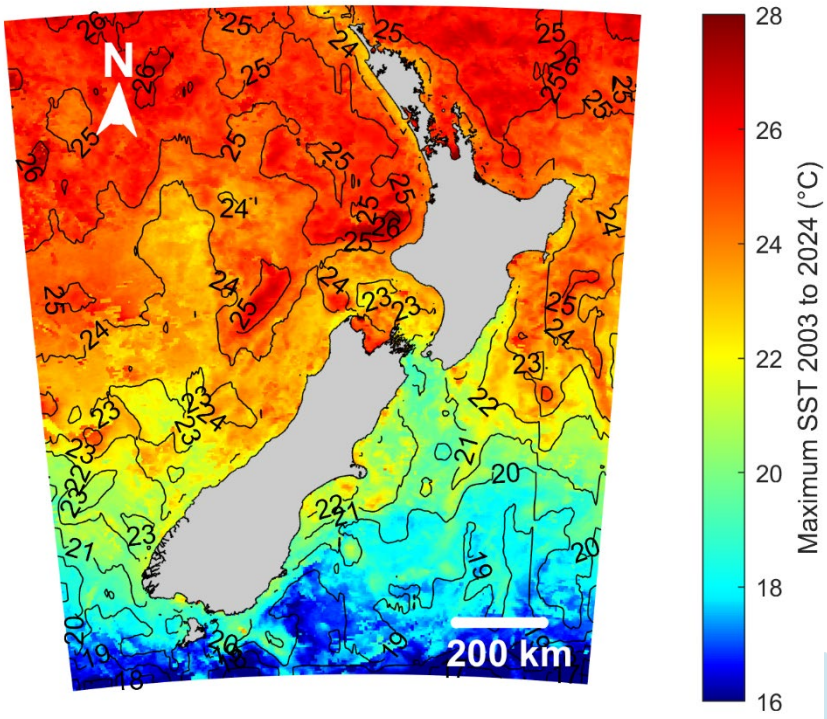

Fig 2. Maximum seawater temperature around New Zealand over a period of 21 years (Jan 2003 – Jan 2024). Image taken from: Delorme, N.J., King, N., Cervantes-Loreto, A. et al. Genetics and ontogeny are key factors influencing thermal resilience in a culturally and economically important bivalve. Sci Rep 14, 19130 (2024).

Our research has shown and continues to highlight that Greenshell mussels are not all created equally. Selective breeding using shellfish hatcheries will be a crucial tool in the toolkit when it comes to climate change adaptation. Furthermore, we need to learn more about what resilient wild populations can tell us.

No matter what direction we take with climate adaptation in the future, collaboration is the key to progress in a changing ocean. Like museums and mussels, we are all different. But it's the combination of indigeneous knowledge, marine farming expertise and western science (different ways of knowing) that will make the biggest difference for our mussel industry and communities in a changing climate.

To find out more about our research and to collaborate with us, please contact Jess Ericson (jess.ericson@cawthron.org.nz) and Natali Delorme (natali.delorme@cawthron.org.nz).

- *Jess Ericson - Shellfish Aquaculture Scientist (Climate Change Adaptation), Cawthron Institute*

If you want to get deep into the science mentioned in this article you can find the scientific papers here: Delorme et al. 2024, Ericson et al. 2024, or check out this 'behind the scenes' piece for another plain language summary of Delorme et al. 2024.

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Born to the land, lived for the sea

Jim Jessep was born into a family working hill country 50km inland, but his heart was always set on life at sea. He became a marine farmer just as markets (and income) disappeared in the early 1980s, but he would not have traded a day to be back on the land. "I just loved every minute of it."

He became a forceful advocate for the industry and is the only person to date to have twice served as Marine Farming Association President.

Jim grew up as the eldest of three sons on the family farm near Lake Waikaremoana. They had a launch on the lake, and he most loved his time on the water. At 16, he sat and passed the entrance exams for the NZ Navy officer training at Dartmouth in Britain, only to have his flaky feet fail the medical. He stayed in the UK for a while, working as a shearer, where he met his wife-to-be, Fran, who was also doing her OE.

After they married, the newlyweds moved into a cottage on the family property. Jim worked for his father, Trevor, and Fran taught at the school in the nearby village of Tuai. There was also a local school which their three sons Jim, Dave, and Ben, began to attend.

When Trevor passed, Jim took over the farm, but it was not what he wanted to do. "I used to wake up every morning and shudder at what I had to do."

That wasn't because he was afraid of hard work, as was soon to be truly proven. In 1982, the family arrived in Blenheim. They bought a house on Scott St on the boundary of Marlborough Boys' College, reversing the minimum hour-long commute each way to high school in Wairoa the boys would have faced on the farm – if not boarding school.

Earlier, in 1981, Jim and Fran, with a 25% partner – cousin Kevin Hearle and his wife Eleanor - had bought a mussel farm with four longlines at Fairy Bay in Pelorus Sound. This had been established by Roy Gunn, who gained the 9th marine farm licence issued.

Fran fishing in Fairy Bay near the couple's mussel lines

All the mussels produced were being sold to McFarlanes at $12 a sack for the market it was developing, particularly in the United States, for its Seatone mussel powder product.

"Ten days after we bought the farm, McFarlanes, which had been advertising the product as curing arthritis, was shut down from sales by the US Government," recalls Jim. "We didn't sell a mussel for two years."

He got a job selling real estate which, along with Fran's more secure income from relief teaching, kept the family afloat. Worse was to come. The man who'd put a deposit on the farm near Tuai couldn't find the money to pay the balance.

Jim had to return to the farm, evict the failed purchaser, and start running the property again. He also was forced to take commercial loans at 23% interest to pay for the marine farm and their Blenheim home. "I used to lie awake at night and wonder how I'd ever get out of it."

The property took 18 months to sell and while a neighbour helped run it, Jim had to return regularly.

With virtually no market for mussels, his marine farm mercifully didn't take a lot of tending at that time. Jim was grateful Talley's later took the product off one of his four lines. The marine farm purchase had included shares in a vessel, Havelock processing factory, and a mussel harvester. "We thought we'd covered everything but the venture was always short of money and it went belly up."

Only when Sanford's bought the cooperative's factory in Havelock in 1986 did Jim think things really started to come right for them.

In the meantime, he'd leased the Fairy Bay farm to Mike Hitchins, whose Pernaful Holdings had expanded its fresh mussel sales by developing the first tanks to display mussels in retail outlets.

Jim was also working for Mike, first by marketing fresh mussels across the North Island. That included standing for a week by the first tank in an Auckland supermarket. Later, he became product coordinator for Pernaful as well as expanding his own Fairy Bay farm to eight lines

Jim's first boat Othello was a kauri double-ender built in 1908 with leaks in the small cabin to prove its age.

She was replaced by the Rora, originally a crayfishing boat. He'd also bought, with his two brothers Mike and Tim, a couple of hectares at Fairy Bay where they built a 'mussel storage facility.' It doubled as a basic bach replacing an earlier tent.

"Fran and I and the boys would all go there for Christmas."

Towards the end of the 1980s, Mike Hitchins was also President of the Marine Farming Association and Jim was on the executive. In 1989, after just three years, his easy-going demeanour and quick brain saw him succeed Mike as President.

Jim was determined to help mussel farmers get past some tough times, to the point of promising them they'd all have Mercedes by the end of the next year. "I bought three Matchbox Mercedes and gave them to Executive members. I said: I don't believe in broken promises."

Because there were no staff at MFA at that time, the President's role involved acting as a virtual CEO, meaning his own farm could be neglected. His fellow Executive members helped out. "They would say: Anything you need doing on your farm Jim?"

The President's desk at the MFA office

His role included attending all the hearings with MFA lawyer Ron Crosby of the first Marlborough Sounds Resource Management Plan. This included a requirement for marine farms sited in front of forestry to be moved when it came time to harvest the trees. Alternative space for the farms was scheduled. Jim and Ron managed to convince the council to put these areas into the MFA's name. No farms were ever shifted but the MFA gained spat catching and growing areas in several parts of the Sounds. "Suddenly we became financial."

Working with Bruce Hearn, the pair also managed to get growers and processors to agree on a levy per tonne of mussels so they could recruit and pay a manager.

Bruce Hearn in the skipper's seat with from left Don Mitchell, his late wife Liz, Eleanor Hearle and Jim – all enroute to an MFA meeting at Portage.

Paul Lupi was appointed in 1991 as MFA's first Executive Officer and he was succeeded in 1998 by Graeme Coates. "We were very fortunate to have two very able people." The funding also allowed some other staff to be employed.

Not that it was all hands-off for the President. In the early 1990s, Jim learnt that Wellington bureaucrats had decided it was appropriate to allow Kaitaia spat to be sold offshore. Quickly realising it could end the industry; he immediately went to find local MP and Fisheries Minister Doug Kidd. "In two hours, he fixed the whole thing up – they were never to be exported."

His first term as President also included helping the industry through its first biotoxin crisis in early 1993 which saw hundreds of people laid off. Jim recalls shellfish toxin testing for export at that time was done by Government scientists feeding mussels to three mice.

"If one died, your mussels were ok but not if there were two dead."

The MFA and industry worked to develop a programme where processors stored samples from each harvest so they could be tested if needed. This became the forerunner of the Marlborough Shellfish Quality Programme

In July 1993 Jim was succeeded as President by Colin McNab before resuming the role from 1994 for another six years. He has been the only President to serve two non-consecutive terms.

Through his tenure, there was industry expansion and consolidation, but also the second moratorium on new consents. It also included Marlborough District Council sending out rate demands for marine farms. The MFA urgently contacted its members.

Jim, with his successor as President, Rob Pooley and Graeme Clark

"We said: Don't pay these demands. They are not legal." Jim led a delegation to see Mayor Leo McKendry and MDC CEO Bob Penington. "We said you are never going to be able to enforce these." The rates demands were quietly dropped.

At the July 2000 MFA AGM, Jim stood down as President. He leased his Fairy Bay farm to Sanford and later to Aroma and developed a vineyard in the Awatere.

In 2008's Queen's Birthday list, the couple received double honours. Fran got a QSM for services to the Marlborough community, and Jim was made a Member of the New Zealand Order of Merit for services to marine farming and the community.

Fran and Jim got their respective honours from then Governor-General Sir Anand Satyanand accompanied by Lady Susan.

Now at 83, he's a man with no regrets about following his dream of a life based around the sea, even if his vessel wasn't painted grey and armed with guns.

"I have loved every minute of it. The people in the marine farming industry are just great." Jim was made a life member of the Marine Farming Association at the 2005 annual conference and awards ceremony.

Since retiring, both he and Fran have been playing more bridge with Jim putting his brain to use to represent New Zealand's Seniors teams in international competitions.

They have also been more able to indulge their love of travel, unsurprisingly including a number of cruises.

Meanwhile, son Dave is completing a full renovation of the bach at Fairy Bay and has bought a share in the mussel farm business. This ensures another generation of Jesseps – there are four grandchildren - to maintain the family's link to the sea for another generation (or more).

- *Brendon Burns*

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King Shag breeding finally improves!

The devastating weather in July 2021 wreaked havoc on the Marlborough Sounds Road network, some of which remains unrepaired. Less known, however, is that this weather event almost wiped out the entire breeding output of King Shags for that year. Most colonies didn't fledge a single chick, with only the Trios colony spared, as its breeding season started later.

Unfortunately, the following two winters brought similarly poor weather. Since King Shags breed in winter, this led to three consecutive years of poor breeding in most colonies. With such a highly restricted species, this is alarming. Fewer young birds mean fewer replacements for older birds, leading to a population decline.

Consequently, we've seen a 20% decline in the King Shag population, dropping from around 800 birds in 2015-2018 to approximately 620 birds now. This decline is almost certainly due to poor breeding and low recruitment.

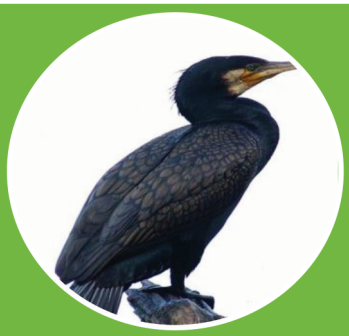
The good news is that this past winter recorded the best King Shag breeding season on record. A total of 194 chicks fledged, with productivity at 0.98 chicks per pair, surpassing the previous best of 0.64 chicks per pair. More settled weather meant that no colonies suffered washouts or washovers.

Long-term, protecting King Shags from weather-related impacts might be the best conservation action. I am currently investigating the use of decoys and a sound system to establish a new King Shag breeding colony on a higher island, providing better weather protection. I aim to fundraise $5,000 to get this project off the ground and am seeking industry support. The mussel industry shares the Sounds with this endemic species, and your support could help us make a significant difference for this unique bird.

- *Mike Bell – Toroa Consulting Ltd*

MARLBOROUGH SOUNDS ICONIC KING SHAG

HOW TO IDENTIFY THEM – HOW TO HELP PROTECT THEM

	Description	How to identify which species
	**KING SHAGS** King Shags are a rare seabird, which is endemic to Marlborough they are generally located in the Outer Sounds. Colonies nest on rocky outcrop and roost on other rocky points & on mussel floats. The King Shag does not nest or roost in trees, they are very wary & rarely seen in close proximity to boats.	• Black & white plumage which is browner in juvenile birds • White wing patch, especially noticeable when in flight • Black feathers on head reaching below bill giving the appearance of a darker head compared to a Pied Shag • Pink legs & feet • Tends to swim away from you flicking its head from side to side
	**PIED SHAG** Pied Shags are found throughout the sounds. Their nesting colonies are typically found in trees close to or overhanging the sea. The Pied Shag roosts in other trees or on rocky points & on mussel floats. They are relatively approachable. Birds readily follow boats especially when fishing or harvesting mussels.	• Black & white plumage, brown in juvenile birds • No white wing-patch • Back completely black or brown • Black feathers only on upper head making birds appear more pale-headed than King Shag • Black legs & feet
	**SPOTTED SHAG** Spotted Shags are found throughout the Sounds. Higher numbers are found in the Outer Sounds. The Spotted Shag nests in small colonies and in small pockets & caves in the steep cliffs. Quiet & approachable bird. Does not usually approach boats.	• Grey plumage • Yellow legs & feet
	**LITTLE SHAG** Small Shags are found throughout the Sounds in small numbers. Little Shags nest in trees, often in Colonies with Pied Shags. Relatively flighty, and does not usually approach boats. Commonly seen within mussel farms.	• Small Size • Variable amount of white on breast of birds, ranging from birds with full white breast to those with just a white chin • Short yellow bill • Black legs & feet
	**BLACK SHAG** The Black Shags are found throughout the Sounds in small numbers, they are common in the Inner Sounds & around the harbours of D'Urville Island. The Black Shag nests in small colonies in trees. Often in lagoons or lakes back from the sea.	• Large size (Similar size to King & Pied Shag) • Fully black plumage • Browner in Juvenile birds • Black legs & feet

IF YOU ARE APPROACHING A KING SHAG OR A KING SHAG COLONY – YOU SHOULD

REDUCE SPEED, REDUCE NOISE & KEEP YOUR DISTANCE **(at least 200 metres)**

Keeping an Eye Out for Bird Flu: A Guide for Marine Farmers and Boaties

New Zealand has been fortunate to remain free from the highly pathogenic avian influenza (HPAI) H5N1 strain, which has caused significant outbreaks in other parts of the world. However, the risk of bird flu arriving in New Zealand through migratory birds remains a concern. The Department of Conservation (DOC) and the Ministry for Primary Industries (MPI) are actively monitoring the situation and have robust systems in place to detect and respond to any potential outbreaks.

What is Bird Flu?
Bird flu, or avian influenza, is a contagious viral disease that affects both domestic and wild birds. It spreads through direct contact with infected birds or contaminated environments. The H5N1 strain is particularly concerning due to its high mortality rate in birds and its ability to spread rapidly among wild bird populations.

Signs of Bird Flu in Birds
Marine farmers and boaties should be vigilant for signs of bird flu in seabirds, which include:

- Sudden death in multiple birds
- Weakness, tremors, and lack of coordination
- Difficulty breathing and nasal discharge
- Diarrhoea and swelling around the head and neck

Risk to Other Mammals
Bird flu can also pose a risk to other mammals, including seals, dogs, and cats. These animals can become infected through contact with sick birds or contaminated environments. Symptoms in mammals can include respiratory distress, lethargy, and neurological signs. It is crucial to keep pets and other animals away from areas where sick or dead birds have been found.

Reporting Unwell Seabirds
If you encounter three or more sick or dead birds, it is crucial to report this immediately to MPI on **0800 80 99 66.** Provide detailed information, including the location, species, and number of affected birds. Do not handle sick or dead birds to avoid spreading the virus.

Preventive Measures
To help prevent the spread of bird flu, follow these guidelines:

- Avoid contact with wild birds and their habitats.
- Maintain good hygiene practices, such as washing hands and disinfecting equipment.
- Keep pets and other animals away from areas where sick or dead birds have been found.
- Report any unusual bird deaths or illnesses promptly.

By staying informed and vigilant, marine farmers and boaties can play a crucial role in protecting New Zealand's bird populations and other wildlife from the threat of bird flu.

For more information head to the Ministry for Primary Industries and Department of Conservation websites.

- https://www.mpi.govt.nz/dmsdocument/64557-How-to-report-suspected-bird-flu
- https://www.mpi.govt.nz/biosecurity/pest-and-disease-threats-to-new-zealand/animal-disease-threats-to-new-zealand/high-pathogenicity-avian-influenza/
- https://www.doc.govt.nz/avian-influenza

Tough times for global mussel aquaculture

Here in New Zealand, our geographic isolation can create the impression that the challenges faced by our mussel aquaculture industry are one-of-a-kind. However, during my recent travels to mussel farming countries across Europe, I discovered that this is far from true.

Denmark

The first stop on my travels was the European Aquaculture Society conference in Copenhagen, Denmark. In Denmark, blue mussels are predominantly cultured in bottom culture plots, with the industry producing approximately 40,000 tonnes of mussels each year. Production begins with seed mussels being dredged from wild beds and then transported to shallow coastal areas, where they are re-laid on the seafloor for ongrowing.

However, like New Zealand, Denmark's mussel aquaculture faces significant inefficiencies. In 2016, for instance, over 5,000 tonnes of seed mussels were harvested from wild beds, but high rates of mortality after relaying onto bottom culture plots led to nearly zero harvests. The industry increasingly finds itself in a cycle of harvesting more seed to produce fewer marketable mussels, a trend that appears to be worsening. This year alone, farmers are reporting adult mussel mortality rates as high as 85%, with the causes still unknown.

Photograph from a presentation at the European Aquaculture Society conference showing the incredible numbers of starfish predating upon mussels on farms in Denmark (Photo: Danish Shellfish Centre - DTU Aqua).

While Denmark grapples with substantial predation pressure from starfish—a challenge we don't encounter here—New Zealand certainly contends with its own similar issues with predation, particularly with predation from fish, especially in the Coromandel region.

Netherlands

My second stop was in the Netherlands, a major mussel farming country where I spent some time on farms with the industry. Like Denmark, the Netherlands also grows blue mussels, and also primarily grows them on the seafloor, although they are gradually shifting towards suspended culture practises.

The production process in the Netherlands follows the same general principles as Denmark – seed are harvested from wild beds, before being re-laid onto bottom culture plots. However, times are changing in the Netherlands. Due to pressure from NGOs and environmental groups, the industry is being forced to gradually phase out the dredging of

seed mussels from wild beds. Luckily, in many areas in the Netherlands, it is incredibly easy to catch seed on vertically hung nets. It's so easy in fact, that in the southern region of Zeeland they have a saying, "if you hang your grandma in the water, she'll come out covered in mussels". Perhaps this is something us scientists should test. Get in touch if you know any volunteers.

Spat catching nets deployed in the southern Netherlands. Clearly spat supply is not an issue there!

Things aren't all rosy in the Netherlands though. Like Denmark, they are currently experiencing catastrophic mortality of adult mussels grown on the seabed. They are also unsure as to what is causing this mortality, but they have found it to be less pronounced when mussels are grown in suspended culture.

The Netherlands is also grappling with declining consumption of mussels locally. They find that young people are far less likely to buy mussels, and are therefore, developing products to try and appeal to young consumers – microwaved mussels coming to a supermarket shelf near you!

Microwaved mussels – a new product designed in the Netherlands to appeal to younger consumers. https://zeelandsroem.nl/en/#mussels/mussels-a-la-minute

There are also rising concerns in the Netherlands about a proposal from the EU to include mussels in the list of animals where welfare concerns need to be considered. In simple terms, there is a movement that considers it cruel to boil mussels alive, and instead thinks they should be euthanised first. The details around what this might look like are vague, but it is something the New Zealand industry should keep an eye on, as it could end up affecting imports.

On a final note, the Netherlands thinks it is crazy that we throw away our blue mussels, and people in the industry are very interested in importing New Zealand blue mussels to supplement their local production. We are currently in the process of teeing up some trials. Fingers crossed – if it goes well, we might finally have a use for our blue mussels.

Slovenia

The final stop on my tour around Europe was Slovenia. Unlike Denmark or the Netherlands, Slovenia is not a major mussel farming country. Their limited 47 km coastline constrains the size of the industry, which remains artisanal. Nonetheless, Slovenia does have mussel farms! They also farm blue mussels, but they farm them in suspended culture using a system similar to New Zealand.

Of the three countries I visited, Slovenia had it the worst.
Like New Zealand, they are facing enormous problems with fish predation, but they also suffer high losses due to predation by flatworms (an invasive species originating from New Zealand nonetheless).
The waters in the Adriatic Sea are also getting very warm, and as a result, they are experiencing 100% mortality of adult mussels. Things are getting so bad that farmers in Slovenia and nearby Croatia are abandoning their farms, leaving the lines and floats in place.

Mussel lines from a farm in Slovenia. The picture may look nice, but all of these mussels are dead. I've never seen mortality like it.

Ireland

Although I didn't get the chance to travel to Ireland, I also recently had conversations with mussel aquaculture scientists there. Much like the countries I visited, Ireland's mussel aquaculture industry is facing some serious challenges. They have experienced years of enormous seed harvests, only for following years to have no seed harvested whatsoever. The season for harvesting seed, whether line caught, or bottom dredged also seems to be changing, and mortality of adults is a major issue.

Takeaways

So, what does this all mean?

Well, clearly there is something going on that is causing similar issues impacting mussel farmers throughout the world – declining seed catches, changes in seed catching seasons, inefficient conversion of seed into market ready adults, high mortality, and increasing predation pressure.

What is causing this? We don't know. But by getting countries to work together and share their experiences, we hope to build a network of scientists and industry throughout the world focused on trying to figure it out.

- *Dr Brad Skelton – University of Auckland*
  Brad.Skelton@auckland.ac.nz

How one student's struggles inspired skipper training innovation

Anyone who's gone through one of my Skipper Restricted Limits courses will likely have heard about the "dyslexic fisherman from Bluff" who inspired me to develop a practical maritime course for skippers.

When teaching the newly restructured course for Skipper Restricted Limits at a Polytech in 2015, I met Joel (from Riverton, not Bluff).

Joel's journey is an inspiring one. He had grew up on the water and started working full-time at sea commercially when he was 16.

Joel is dyslexic. Despite his wealth of hands-on experience and skills, he couldn't navigate the new Training Record Book and Polytech theory course. The academic setting left him feeling overwhelmed and alone.
Had he tried just a few months earlier, he could have gone for his Local Launch Operator (LLO), but that ticket disappeared when Sea Cert came into effect.

As his tutor, we did our best at the time, but the system was rigid. It didn't leave room for someone like Joel, who learned better through doing rather than trying to interpret the illogical wording of the record book and sitting in a classroom for 5 weeks.

Joel wasn't able to complete the program and had to go home without his ticket. He has been paying another skipper to drive his boat ever since. It was an utter failure of our education system, discriminating against neuro-diverse learners and creating barriers to progression. I have no doubt this is contributing to our critical skills shortage in the maritime industry.

It was a tough blow that had a profound impact not only on Joel but also on me. I had a number of students during my few years at the Polytech who struggled to get their TRBs signed off before coming on the course. In response, I asked the school if we could hire a boat and sign off the books as we saw students complete the tasks but was turned down.

That led me to invent a practical course where we deliver some theory in the classroom before going out on the boat each week to put the learning into practice.
Skipper Training NZ has grown, and I get to work with fantastic people who all share my passion for developing confidence in mariners with heaps of genuine support.

Coming back to get his ticket wasn't easy for Joel. The memories of struggling with the classroom and the fear of failure weighed heavily on him. "I've spent years on the sea—longer than most people in my position. It's what I'm good at, but the classroom always made me feel like I was no good", Joel admits. "This time, it felt different. I wasn't just sitting at a desk. I was out on the boat, learning by doing. That's where I shine." The teamwork and tutor support also stood out to Joel.

Joel's story shows how important it is to teach in ways that fit different types of learners. It's healthy to have different schools offering different methods.

It's also a story of resilience and empowerment. He is living proof that with determination and the right support, anyone can succeed. "Don't give up," Joel says. "Even if the system didn't work for you, there's another way—and it works."

- *Milo Coldren*

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- Jo, 2023 SRL Graduate

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Moana New Zealand honoured with Kaitiaki Award at Ngā Tohu Kaiārahi Pakihi Māori o Aotearoa

We're incredibly excited to share the news Moana New Zealand is the recipient of the 2024 Kaitiaki Business Leader Award from the University of Auckland Business School.

The award is for an organisation that upholds Māori values that promotes and achieves environmentally sustainable outcomes. The Kaitiaki Business Award is one of only six that are awarded by The Auckland University Business School.

Chair of the Board Rachel Taulelei says, "We're incredibly proud of this recognition from the University of Auckland Business School and to be recognised for outstanding Māori excellence in the seafood industry—it's truly special and I'm so proud of the Moana New Zealand team who actively contribute and improve the wellbeing of not just the moana, but the people and te ao."

"As we acknowledge Moana New Zealand's 20 years as a 100% Iwi-owned business in the fisheries sector, I also want to thank our Iwi owners for their steadfast guidance and support over the decades. The award is not only proof that Māori can lead in this sector through our values and mātauranga, but it also gives us an opportunity to shed some light on climate headwinds our industry faces and the important work our team has been doing to meet those challenges.

"Social sustainability is a key element to Moana's success. The focus is on integrating corporate social and environmental responsibility into all business objectives."

Not such a slick solution for feeding Greenshell™ spat

The raising of baby finfish in hatcheries for aquaculture often requires the delivery of high-quality oils that support their rapid development. These oils are very high in energy which is used to fuel the rapid growth of the developing larvae. The oils also contain omega-3 nutrients which are vitally important in marine food webs and are used by many marine organisms for the construction of tissues, especially some cell walls and nervous tissue.

Our research on Greenshell™ spat has found that spat also have a nutritional requirement for such oils, but at lower amounts compared to fish larvae. Given this, we decided to test one of the most widely used high quality oils for raising fin fish larvae by feeding it to mussel spat to see how they would respond.

The product *S.presso* is a highly refined, natural oil that forms tiny droplets when dispersed into seawater. It is formulated to meet the nutritional needs of most types of marine finfish's larvae; however, this nutritional profile is surprisingly similar to that required by Greenshell™ spat.

A bottle of liquid S.presso oil product that is used in rearing larval fin fish, but not so good for mussel spat.

To feed *S.presso* to fin fish larvae it is normally dispersed into seawater and then fed to microscopic filter feeders, such as brine shrimp or rotifers. These then filter out the tiny oil droplets, filling their tummies with the oil. The microscopic filter feeders are then fed to the fish larvae which swallow them whole, consuming the nutritious oil in the process.

Greenshell™ spat are also efficient filter feeders so, theoretically, they should also be able to consume and make good use of the *S.presso* suspended oil droplets. So, we trialled it with mussel spat, at a range of different concentrations of *S.presso*.

Unfortunately, the spat cannot handle the oil droplets. The oil quickly becomes stuck to their tiny filter feeding structures on their gills and gradually clogs the gills preventing all feeding.
It was a bit of a sticky end for them! The search continues for the ideal spat feed.

- *Aven Zhuang and Andrew Jeffs - University of Auckland*

Aquaculture training going well… more to be done

One year on from the launch of new aquaculture training programmes, Primary ITO's seafood sector manager Daniel Edmonds says the industry's getting involved in training but there's still plenty of room for growth.

Dan Edmonds – Primary ITO seafood manager

Two all-new New Zealand Certificates in Aquaculture (Levels 3 and 4) and an associated apprenticeship were launched in 2023, in the first major revamp of training since the late 1990s.

Daniel says to date, around 70 aquaculture company staff have enrolled in the updated training programmes, from finfish to mussel harvesting. The programmes help with developing staff skills, increasing safety and wellbeing, and staff retention.
"This is training done on the job, onsite and on-farm with companies often using their own expertise and training staff with our help," says Daniel.
"It means staff are learning the right skills, at the right time, and in the right place – at work, where they need to apply those skills.

"We know that the marine farms with people in training are finding it really useful and with the growth in the industry, there's also scope for many more people in training."

The programmes include components for teamwork and sustainable environmental practices, with elective strands in hatchery, fish and shellfish, customised to a workplace. As well as staff enrolled in training, 20 Aquaculture workplace assessors have registered with Primary ITO to deliver training and assessment.

"These workplace assessors are a key part of what makes on-the-job training work. At any sort of marine farm, it's critical that the people delivering and assessing training are experts in their field.
"There is no enrolment fee for aquaculture training with Primary ITO

and we provide support for the training and learning materials with funding from government."

An additional support for employers with apprentices is the Government's Apprenticeship Boost scheme. That provides $500/month to employers for every first-year apprentice in the sector. More information on this support is available from Primary ITO's website. Please contact Primary ITO if we can help with your training requirements.

Michael Stewart – Primary ITO Seafood Training Manager

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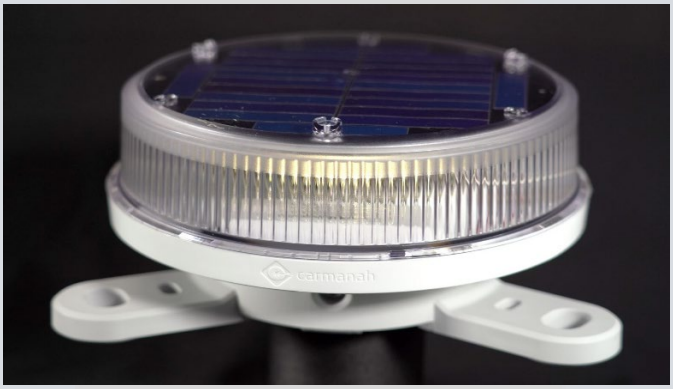

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