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Sacks of clean greenshells aboard Sanford MV Lady Marie ready to deposit on one of the six trial sites in Pelorus Sound

IMPORTANT DATES

MDC Smart & Connected Aquaculture 9th September 2020 10am MFA Boardroom

Wainui Farmers Group Meeting (Members Only) 12th October 2020 10.00am MFA Boardroom-

MFA Research, Development and Technology Committee (Committee Only) 16th October 2020 10am MFA Boardroom

MFA Environment Committee Meeting (Committee Only) 13th November 2020 10am MFA Boardroom

MFA Conference (Members & Invited Guests) 20th November 2020 9.30am Queen Charlotte Yacht Club, Picton

AQNZ Board Meetings (Members & Invited Guests) 26th November 2020 - Plant and Food

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President's Comment

By now most members will be aware that we have made the decision to rearrange our AGM due to Covid-19, I now look forward to seeing you all on the Zoom call, 10.30am 4th of September. We know this is going to be a little different from normal and we look forward to meeting in person later in the year for our conference and awards night. This will now be held in November for members and invited guests.

With an outbreak of community transmission in Auckland forcing the country to move back up the levels, we can consider ourselves fortunate that we live and operate in Te Tau Ihu. Let us hope the fence is firmly in place around Auckland and it remains contained.

With the rest of the world still in various states of lockdown we are seeing some impact on product sales. How long these impacts last is the million-dollar question. That said, there are some exceptions, with sales of live mussels into China and frozen salmon into the US doing very well.

Many of you will notice the increased emphasis from MFA on our Environment Programme, Amber has been tasked with driving this to lift industry environmental performance on the water. We know we start out with a light footprint when compared with other food production industries; however, there is an expectation on us to perform to a higher level given we operate in the commons.

The world is becoming much more aware of what they consume, where it comes from and the impact on the environment. With everyone having a camera and social media access, we are seeing increased levels of feedback posted online and we are always on alert for the next viral video.

I encourage all industry members from deck hands to skippers, farm managers to consent owners, to look for ways to lift performance. Consent owners need to be asking the hard questions of their contractors to ensure that environmental performance on their farm is up to scratch.

We will keep you in the loop regarding improvements to the Programme and keep an eye out for Darren who will be spending more time on the water catching up with vessel crews.

MEP continues to move at glacial pace, with both Covid-19 and procedural delays in play. That said, Ned advises that in the last week the Court has really started to exert its influence on the process by shaking up the order in which appeal topics will be handled. We expect that informal mediation will begin in late 2020, with formal proceedings and hearings likely to kick-off mid-2021.

The release date for the Aquaculture Provisions remains an unknown. The National Environmental Standard for Marine Aquaculture (NES-MA) will come into effect December 2020, and among other things, has likely further complicated the MDC process for notifying the Aquaculture Provisions. We will be sharing some further information on the NES-MA with you very soon.

On the project front, our key projects are still ticking along nicely. We have just completed the second year of king shag chick banding and adult GPS tracking. This year with the improved GPS technology we are receiving a greater amount of data which is only going to build on last year's findings. Early indications suggest that the positive interactions between king shag and marine farms identified in year one will be confirmed in year two.

It is disappointing to see that some opponents to marine farming are still using old science and out of date evidence in their submissions. The Year One Report is out, and we are expecting the Year Two Report with the recent GPS tracking to be out towards the end of this year. Mike Bell will be giving an update at the conference in November.

The Pelorus Mussel Restoration Project is ticking off the milestones, with 42 bulk bags of shell returned to seabed in August. The shell beds are being trialled as a means of lifting experimental restoration beds out of the soft sediments, allowing them to survive where they would otherwise struggle. This is a good news story and has widespread community and industry support. A special thanks to Vaughan Ellis and Andrew King for their personal commitment to the project, without which this project would not have happened.

This month in the office we have launched our new look website, this is a much cleaner easier to navigate site. You can enter beach cleans and feedback directly into it, read about our projects and our community involvement. The members only site is also now live, members can access this through our main site and register for access.

We have also just pressed go on our custom app to gather beach clean data in a more efficient manner. This should further advance the level and quality of data we get back.

Look forward to seeing all members soon on Zoom.

Jonathan Large MFA President

Environment Update



A misty morning in Clova Bay, Marlborough Sounds greeted over 40 people in late July. They gathered from the mussel industry and the local Manaroa/ Clova bay community for a beach clean of the area.

Luckily, the mist was short lived, and a stunning view of the bay was revealed.

This area had been determined a "hot spot" for debris on the beaches due to the prevailing wind and tides in that area. It was recently highlighted as an area of concern by the residents, using social media platforms to show their concern. The MFA recently met with representatives of this group and quickly identified that they had some valid concerns and immediate action was required.

As a result, an Industry beach clean day was organised for the area.

This day was a great success for a couple of reasons; a lot of debris was cleaned from the area, 90% of it was rope from marine farming activities, it also brought the mussel industry together for a common cause and showed the community we are aware of the issues and responsive to their concerns.

Manaroa Clean - 28.07.2020										
Company	Vehicles	Vessels	Vessel (hrs)	People	People (hrs)	Debris (kg)	Floats	Notes		
United Fisheries Ltd	1	0	0	2	6	168	8	3 dead floats, CW, MMC, CM, SMF, HSO		
Sanford	0	2	10	9	27	55	3	CM, MCL, SSI		
Kono	0	3	15	16	48	0	0	In UFL numbers		
Aroma Aquaculture	0	1	5	4	12	0	0	In UFL numbers		
Kotare Marine Farms	1	0	0	2	6	0	0	In UFL numbers		
Just Mussels	0	1	5	3	9	10	0	Plus a Spat Bag		
Clearwater Mussels	0	1	5	2	6	22	6			
Community	0	0	0	4	12	0	0	In UFL numbers		
Total	2	8	40	42	126	255	17			



A big thank you to all the people who responded to the call for action, to the companies who provided their vessels, vehicles and people, and especially to the local community who not only expressed their concerns but came out to help. A great result!

This is an ongoing situation at Clova Bay that the MFA will be monitoring closely with the community.

This clean was just the start, this bay is a big collection point. More monitoring and regular cleans in this area are a must in conjunction with the continuation of education and training for our staff to prevent this from happening in the future.

Grant Boyd - Chair, MFA ECSC



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A Day at the Beach

What I learned from a trip to see where most of our spat comes from.

Our day at the beach started well once we found the place. (Is it OK to admit to being lost in Pukenui?). A big welcome from Kara was followed by hot croissants and coffee straight from an Espresso machine.

Lynette and I were visiting Greg Gemmell and Kara Gordon of KADJ Fishing, who are one of a six spat collectors operating at Te-Oneroa-a-Tohe (90 Mile Beach). We had met Greg and Kara at a grower's function hosted by Kono a few years back and had promised to take up the friendly offer of "Come up and see us".

Times are changing and the spat, formerly known as "Kaitaia Weed", has a new name: "Te Hiku spat". We were there to learn where Te Hiku spat comes from. The article by Andrew Jeffs in last month's issue of this newsletter tells part of the story. We still do not really know all of it, but it is a remarkable one.

It starts with beds of mussels spawning somewhere. We do not know exactly where. The larvae go through several stages, moving long distances as they drift for weeks. The larvae eventually settle on algae growing on the sea floor off the coast of Te-Oneroa-a-Tohe. Occasional large westerly storms break off some of the algae. Then strong easterlies blow surface waters offshore. This creates onshore currents at deeper levels which bring the broken-off algae towards the beach. The reliable Tasman surf does the final piece, throwing the algae onto the beach where it bleaches in the sun and rots down. At least that is what mainly happened until "Kaitaia Weed" was discovered as a rich source of wild mussel spat a few decades ago.

Te-Oneroa-a-Tohe has supplied most of the wild spat used by our industry for decades. With other sources of spat failing, Te Hiku spat is even more critical to our industry.

For customers, the size of the spat is important, as larger spat have better survival rates. But larger spat may not always arrive in sufficient quantity. A microscope allows samples to be checked for both spat size and counts (see photo).

Spat collecting has had a roughand-tumble reputation in the past but is becoming more professionalised. A Code of Practice, brokered in part by Jono



Figure 1 - Lynette Oldham and Kara Gordon viewing spat samples with microscope

Large, was signed by spat collectors on the day of our visit. Part of the idea of the Code of Practice is to ensure that spat collecting is undertaken in ways which are safe, environmentally sound, and respectful of cultural sensitivities. It is a complicated situation as the iwi are owners of spat quota, so they are also beneficiaries of the income that spat collection brings to the region.

I was impressed by the skill, hard work, and dedication that it takes to have the right equipment collecting the weed at the right time. The loaders used to collect the spat in the surf were impressive (see photo with Greg and Kara). They come from the horticultural sector, but are highly customised, with almost every aspect tuned to successfully and reliably operating in the ultra-harsh conditions of sand, surf, and salt water. Even the wheels are customised - to move them outward for extra stability.

Our morning at the yard was followed by an afternoon on the beach. There was not any active collection of spat at the time of our visit, but it was good



Figure 2 - Greg Gemmell and Kara Gordon with KADJ loader

to see where it all happens. We drove a lot of beach – up to the Bluff. This area is culturally sensitive, so only hand gathering is allowed in the immediate vicinity under the new Code of Practice.

For the record - in our afternoon on the beach we saw a young seal, wild horses, sheets of dark grey rain, lightning, lots of sand, lots of surf, driftwood, more sand, two other vehicles, more surf, and the wrong sort of seaweed, but no spat.

Back at the yard again, I was impressed by the simple, yet effective equipment used to sort, pack, hold and ship spat to the top of the South Island in refrigerated trucks. When a truck pulled up, laden with logs, and Kara started talking of helping with traffic control on a flood-damaged highway,

I realised that it's important to be flexible if you're a commercial operator in the on-again, off-again spat catching business that we all rely on.

It was great to see where most of our spat comes from. Thanks to Greg and Kara for their generous hospitality.

Kevin Oldham

Figure 3 Plenty of sea, sand, surf, and sky on Te-Oneroa-a-Tohe/90 Mile Beach





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Aquaculture NZ Statistics

An update on the statistics we normally provide from AQNZ, the statistics that are normally printed in the MFA newsletter are just a small sample of the statistics available through the AQNZ online tool.

We now recommend that you request access to the AQNZ online tool and access these yourself. That way you can change all the parameters to what you would like to see.

To register for access, click on the logo below



Marine Biosecurity Update

Fanworm not found in Auckland western harbour surveys.

The Auckland Council found no fanworm in 2019 surveys of the Manukau and Kaipara Harbours.

This finding is significant given the large populations of fanworm on Auckland's east coast. It showed that fanworm needs in-water vectors to transport it significant distances. There is little in-water boat traffic between the two Auckland coasts. With care, this means that the western harbours could be kept clear of this invasive pest for the foreseeable future.

Three secondary target species detected in the Kaipara were the Asian date mussel, Arcuatula senhousia, the Australian droplet tunicate, Eudistoma elongatum and the clubbed tunicate, Styela clava. A. senhousia and S. clava were found at several locations throughout the harbour, and E. elongatum was detected at three locations associated with aquaculture structures.

The Asian date mussel was also prolific in the Manukau Harbour.

This all implies continued vigilance for all gear and vessel transfers into our region.

MDC Harbour Masters Update

Hot Work

A Harbourmasters Direction has been issued as an interim measure to improve the hot work system.

If you meet the requirements of the Direction then you are exempt from the requirements of the existing Bylaw. If not, the Bylaw applies.

The Direction requires that all commercial vessels have a hot work procedure and comply with this procedure at all times hot work is undertaken.

As long as you have provided an up-to-date copy of your vessels procedure to the Harbourmaster you do not need a hot work permit.

However, if you undertake work in within a port facility (i.e. at a marina or alongside a wharf) you must still notify the port facility operator before you begin the work (this will be Port Marlborough in most cases).

Action required operates in accordance with the Harbourmasters Direction;

- 1. Establish a hot work procedure
- 2. Provide a copy to the Harbourmaster
- 3. Notify the port facility operator each time you intend to undertake hot work
- 4. Operate in accordance with your hot work procedure

Alternatively, if you do not have a hot work procedure or do not want to operate in accordance with the Direction, you can still operate in accordance with the exiting Bylaw instead. This Bylaw requires all vessel to have a hot work permit from the Harbourmaster on every occasion undertake hot work is undertaken.

The full Direction is published on the MDC website along with the details about the exemption from the hot work bylaw and how it applies.

https://www.marlborough.govt.nz/environment/harbours/harbour-notices

Havelock Channel Survey

Following a survey of the inner part of the Havelock Channel the Marlborough District Council GIS team has constructed a Smart Map which is available on the MDC website.

https://marlborough.maps.arcgis.com/apps/MapSeries/index. html?appid=155a89b0beb74035bd1c4c71f6f36646

Use as follows;

- 1. Select the 'all data' tab
- 2. Zoom in on Havelock Channel
- 3. Open 'layers' menu (icon top right looks like 3 stacked pieces of paper)
- 4. Select layers for example;
 - Bathymetry Contours
 - Bathymetry
 - Aids to Navigation
 - Water depth

The data indicates that the channel depths and boundaries have not changed significantly overtime but makes it clear that at certain tides, the depths of the channel are insufficient to accommodate the draft of some larger vessels.

This does not automatically trigger a case for dredging as it is not yet clear that dredging would be the most cost effective or environmentally appropriate solution for enabling the efficient transport of product to market. For example, it may be more cost effective and have less environmental impact if shore side transport and logistics arrangements are adjusted so as to prevent the need for large vessels to transit the channel in unsuitable tide conditions. An evaluation of such options in comparison to dredging is yet to be made.



Food supply is critical for GLM spat retention

Food stress could be an important cause of spat losses from mussel longlines.

Te Hiku spat is likely to have experienced prolonged starvation prior to being used to seed mussel farms. Spat are likely to have limited access to food as they are washed ashore prior to collection at Ninety Mile Beach and then several days without food whilst they are transported to mussel farms.

Our laboratory analyses shows that spat have reduced energy reserves following 40 hours transportation from Ninety Mile Beach. Spat starvation experiments show that spat are resilient to starvation for up to 9 days in the laboratory with less than 1.5% mortality. However, spat retention, growth, body mass and energy reserves decrease markedly with the duration of starvation (Figure 1).

Our study shows that starved spat can be recovered quickly by providing a short period of feeding prior to being seeded onto a mussel farm. However, once spat are placed on a mussel farm they are dependent on the local environmental conditions at the farm. We tested the retention of spat that were starved for different periods prior to seeding onto a mussel farm. After two weeks on the farm the retention of spat from all groups of spat whether well fed or starved) decreased to a similar level (30%) (Figure 2).

Analysis of the retained spat showed that they had a similar nutritional condition to the spat that were starved for 3 to 9 days indicating that the location of seeding at mussel farms appears to have low food supply at the time of seeding out.

Collectively, these findings suggest that ensuring spat receive enough food supply prior to seeding and after seeding at mussel farms appears to be essential to improve their retention.

Therefore, future research should include how local conditions at mussel farms at the time of seeding influences subsequent spat performance.

Written by: Supono Supono and Andrew Jeffs, University of Auckland

Graphs Below - Page 12



Figure 1. Spat performance after laboratory starvation up to 9 days. A) Spat retention, B) growth rate, C) spat tissue deposition and D) spat energy reserves measured as total carbohydrate content.



Figure 2. Retention of spat after two weeks of seeding at mussel farm for spat starved for different periods prior to seeding out.







Marlborough Sounds Mussel Farms Wanted to Buy

Buy, lease or other types of arrangements will be considered.

Please contact: Phil Bain

<u>phil.bain@avid.legal</u> 027 919 4339



Food limitation reduces mussels' resilience to heat stress

New research by Cawthron scientists shows that hungry Greenshell[™] mussels are less resilient to heat stress and more prone to cell damage during droughts and marine heat waves or during transport. While mussels have natural protective mechanisms to cope with cell damage, they can be easily overwhelmed when exposed to very stressful situations, resulting in cell damage and ultimately death.

This research is part of a wider programme to help better understand stress in mussels to inform industry practices. The MBIE funded research is investigating natural stressors such as changes in temperature, water chemistry and food availability as well as stressors related to the farming environment and practices such as transport and biofouling. The research aims to develop new tools for health assessment that can be easily applied in the field to improve practices and inform farming decisions.

Cawthron Institute scientist and research lead Dr Natali Delorme said juvenile Greenshell[™] mussels that were fasted for a period of 54 hours had a reduced ability to cope with subsequent heat stress.

"Fasted mussels experienced increased oxidative damage and decreased activity of antioxidant enzymes after exposure to heat stress, which is not a good result because oxidative stress can damage cells, proteins, and DNA," Dr Delorme said.



Transport of juvenile mussels to different farm locations can take as long as 72 hours and during this time mussels are exposed to different stressors such as emersion, changes in temperature and mechanical stress.

Dr Delorme said scientists at Cawthron are now investigating the effect that air exposure has on the physiology of juvenile mussels and how this relates to mussel performance after they are returned to the water. These results will ultimately inform the mussel industry about improved transportation methods for juvenile mussels.

Another area of research is specifically looking at how biofouling might stress Greenshell[™] mussels. 'Biofouling' is the accumulation of microorganisms, plants, algae, or small animals like barnacles on underwater surfaces including mussel ropes. Biofouling causes negative impacts throughout the farming process from spat retention to processing, product sale and marketing. In addition, biofouling is a potential cause of stress for farmed mussels because it creates competition for food and space on mussel ropes, potentially compromising the health of mussels and making them more vulnerable to events such as heatwaves.

"Cawthron's research team has been running trials on farms in Kenepuru Sound to explore the effects of biofouling pressure on Greenshell[™] mussels and their stress levels and condition. We expect to analyse these data soon with results expected in late 2020," Dr Delorme said

"Our hope is that our research findings will provide mussel farmers and those in the industry with the knowledge and tools to improve their aquaculture processes in a way that benefits both mussel and farmer."

For more information on Cawthron Institute's research and services visit www. cawthron.org.nz.

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Mussel Bed Restoration Project Marlborough Sounds – August 2020

July mussel sampling

Survival of the mussels that were placed on the seabed in late January was high at all five sites after five months. The highest mortality was at Grant Bay, which had a mean loss of 16% of the mussels, while all other sites were less than 5%. The higher mussel mortality at Grant Bay is likely the result of starfish predation with 140 large starfish being found there, which was more than double the number collected from all the other sites (Figure 1).



Figure 1: The total number of starfish collected across each site at deployment, 1-month and 5-months after deployment.

Recycled Shell Experiment

Our next mussel experiment is now underway. In mid-August we were able to deploy recycled mussel shell in two locations in the inner Pelorus Sound. The team at Sanford sourced and deployed the recycled shell, while Aroma provided boat support and NIWA divers went down to organize the shell plots. In early October we will deploy mussels onto these shell plots and monitor

them. Other studies have shown that adding recycled shell leads to higher mussel survival and recruitment, and increased biodiversity on the seafloor.

Trevyn's looking for Interviewees

Trevyn Toone is performing interviews with long term



Figure 2: NIWA divers performing a 5-month check on a restored mussel plot in Grant Bay.

residents of the Sounds to understand historical intertidal populations of green-lipped mussels.

He would be keen to hear from you if you can help - please contact



Figure 3: Sanford's boat Lady Marie full of bags of recycled shell ready to deploy to the seabed.

Trevyn at ttoo112@aucklanduni.ac.nz.

If you have any questions or comments on this project, please feel free to reach out to Emilee Benjamin via email at egol669@aucklanduni.ac.nz.



Figure 4: Sanford's crew deploying the recycled shell at entrance to Kenepuru Sound.



Website refresh

This month saw the refresh of the Marine Farming Association Website.

The last refresh happened 7 years ago, so it was well and truly time for a review.

Next time you have a couple of minutes spare; jump on and have a look -www.marinefarming.co.nz

The next stage of this update will be the members only site, we'll let you know when this is up and running.





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Back in the day

It wasn't a very positive start. The opening page of the first MFA (actually Marlborough Sounds MFA) newsletter, published in January 1986, began: Price undercutting continues to plague our industry and mussel farmers' incomes continue to be drastically affected. (I HAVE SAID THIS BEFORE) wrote President John Seggie, who continued: "It is difficult for me as President to indicate, when, if ever, our industry will come of age and co-operate, one sector with another."

He went on to comment on how mussel growers were disadvantaged by being part of the Fishing Industry Board (F.I.B) which was refusing to accept recommendations from the Mussel Industry Advisory Council on a pricing structure and levies.

"It is up to farmers to continue to support and participate in the MIAC; nothing that is worth having is attained easily," John Seggie concluded.

The first newsletter then has an article on scales to weigh crops now being available via the MFA at Port Underwood, Havelock, Rai Valley and Blenheim. Some five pages (admittedly only A5 size) were contributed by Bob Hickman of Wellington on measuring steamed vs green weight and the need for a standard weighting method. The MFA recommended that yield be determined on a sample of 10 cleaned, trimmed mussels with meat weight measured on drained raw meat from the total sample.

There are advertisements from companies offering equipment such as this one.

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Reseeding Farm Establishment Farm Management Kaitaia Spat Supply General Contract Work The first letter to an MFA newsletter was introduced thus: Feelings are starting to run high and some members are actually letting the 'powers that be' know that there are marine farmers out there who really care and want a solution to the problems. Take Andrew's latest epistle –

A two-page letter from Andrew King follows on how larger companies are very influential in the F.I.B and had done some dramatic price undercutting to get a share of the market at the expense of independent operators and those who developed the Greenshell market.

He said the F.I.B was 'unable to fairly administer the mussel industry. They have forced on the industry a strategy for rationalisation where it is a foregone conclusion that a certain type of company will survive..."

The Editor added: We wonder how many more feel like this!!

The next article recounts a speech to an MFA seminar by Dr Don Brash who at that time was managing director at the New Zealand Kiwifruit Authority. He had suggested GSMs where not fish and required a separate way to market them as with kiwifruit.

The last article recounts a mussel grower's experiences chasing some Kaitaia spat, air delivery of which got delayed into Blenheim and which somehow ended up on rubbish truck, caught en route to the dump. "Sorry mate, thought it was decomposed grass clippings," explained the truckie.

The MFA office also holds copies of the 1982 and 1983 marine farming seminars held in Blenheim. We will carry some gems from those in our next e-newsletter







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Hatchery plans emerge from Havelock meeting

A project now underway to research and build New Zealand's second greenshell mussel spat hatchery started nine months ago - at the Havelock Bowling Club.

Auckland-based technology specialist Pat Verryt is Head of Sales in NZ for a global Fortune 100 technology and infrastructure company.

Spurred by Fisheries Minister Stuart Nash's announcement to the September 2019 NZ Aquaculture conference that this would become a \$3b industry in 15 years, Pat began to look for opportunities. Zane Charman, who chairs the Smart+ Connected Value & Innovation group, was an old family friend. He invited Pat to their now annual Havelock forum.

One speaker who particularly impressed Pat was Wakatu's Andy Elliot, talking about how Greenshell mussels could make up \$1b of the new industry target; Andy suggested the future industry approach needed to be an integrated, value and nutrition model akin to that used by Zespri.

"That's what really captured my attention. Zane and I then got talking and his enthusiasm is pretty catching."

Zane outlined that spat production was essential to GSM growth, yet shortages were emerging; he had already looked at a potential location for a hatchery in Te Kaha, 60km from Opotiki in eastern Bay of Plenty.

As it happens, Pat's mother is from Opotiki; he still has family there and knows the area well. He also had an old contact Dr Haydn Reid who was with the district council there and about to move to a role with local iwi Te Whanaua-Apanui.

The planets were starting to align. The iwi has 5,000 hectares of space allocated for marine farming off the coastline out from Te Kaha; and was interested in how aquaculture could be bought to life in the region.

Pat and Zane had set up Aotearoa Mussels Ltd as 50/50 partners and soon formed a JV with Te Whanau-a-Apanui.

"What we really like is the attitude of the people there. Their approach to both community and the way they welcomed us so readily to discuss and ultimately agree on a hatchery was staggeringly refreshing."

Pat and Zane, working hand in hand with Te Whanau-a-Apanui put together a proposal to Callaghan Innovation for funding to research the development of GSMs which will meet future market needs. Callaghan Innovation was 'exceptionally supportive' and provided a 40% contribution towards the research which is expected to start before the end of this year at Cawthron Institute working with people bought in by Te Whanau-a-Apanui.

At the same time, designs are advancing for the hatchery at a site near Te Kaha with building expected to start within a year for opening by late 2022 or early 2023. By 2030, the plan is to be producing enough spat for 35,000



Zane Charman in action at last year's Smart+Connected Aquaculture forum

tonnes of mussels a year. This will be provided on a commercial basis with no tie-back requiring supply of mussels.

Meantime, Pat is still working in the Infrastructure industry and Zane enjoys his role helping New Zealand King Salmon with projects such as the Blue Endeavour Open Ocean initiative and the Tentburn salmon hatchery upgrade.

Zane continues to chair the Value+Innovation group and says the JV with Te Whanau-a-Apanui may not

have happened without the annual forum.

"This is a really good example of how bringing people together at a Smart+Connected Aquaculture forum can bring about such positive outcomes for everyone."

While this is the first story to be written about the JV, word has been quietly circulating and there's already keen mussel farming industry interest, says Pat.

With the iwi funding much of the research and development, the pair see their role to provide the IP, project management, training and to bring the venture to life.

"The ambition is to hand it back to the iwi within 24 months of getting it operational."



Pat Verryt (at the back table) listens as Mayor John Leggett opens the forum at the Havelock Bowling Club

Pat agrees that there may be potential for further development at Te Kaha; perhaps a future Smart+Connected Aquaculture forum at the Havelock Bowling Club can again get the ball rolling!



Te Kaha



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First greenshells returned to Sounds

Just days after resource consent approval, scientists worked with marine farmers to drop the first greenshell mussel shells back into Pelorus Sound as part of an ongoing effort to test restoration methods re-establish wild mussel beds.

Sanford vessel Lady Marie supported by an Aroma vessel were used to deposit 42 bags of clean shells from mussel processing at sites near the entrance to Kenepuru Sound and at Fairy Bay in mid-August.

Auckland University's Emilee Benjamin and NIWA's Dr Sean Handley returned the following day with dive gear to rake the shells into a more level deposit

"The Sanford team did a pretty good job with the spread," says Emilee who is doing her PhD on the return of mussel beds project.

Stretching over three years, the restoration project was initiated by Pelorus mussel farmers who shared community concerns at the loss of natural greenshell beds due to over-fishing in the 1960s prior to the mussel farming industry emerging.

This was picked up and supported by the Marine Farming Association which brought in marine farmers and suppliers, alongside MPI, NIWA, the University of Auckland and The Nature Conservancy.

The first step came in January with the depositing of live mussels at sites in Pelorus and Kenepuru Sounds, covered by a One News item.

Now the project has extended to putting shells across three 64 square metre sites at both a Kenepuru entrance site - where the seabed is mostly silt - and at Fairy Bay which is mostly sandy.

Emilee says live mussels will be put onto shell plots and adjacent mud plots in October to compare results. With silty seafloor habitats common across much of the Sounds they want to test if mussel shells will prevent the returned mussels sinking into the sediment and so enhance their survival.

Wider benefits will emerge if this is confirmed. "Mussels are one of the foundations of an ecosystem; once they are thriving on the seafloor, they'll create an environment for fish and all other species to live in, help remove suspended sediment from the water column and stabilize the seabed."

MFA General Manager Ned Wells says a range of potential benefits are seen from supporting the project.

"Marine farmers want to support restoring the wild green-lipped mussel beds

in the Marlborough Sounds and then measure the ecological benefits. And if it helps with increasing spat numbers, that would be very welcome too."

The Marine Farming Association, which represents top of the South aquaculture operators, worked with other community groups University of Auckland and NIWA to develop the research plan. All vessel time and on water expertise is being provided in kind by MFA members (worth \$200,000) alongside \$64,000 in MFA and industry financial support.

The project has also attracted funding and specialist technical support from the New Zealand branch of The Nature Conservancy, a global conservation organisation which wants to help progress mussel bed restoration initiatives in New Zealand and other parts of the world.



Click this Image and be taken to a link to a TVNZ Channel 1 story

Sacks of clean greenshells aboard Sanford MV Lady Marie ready to deposit on one of the six trial sites in Pelorus Sound



Emilee Benjamin and Sean Handley did some final raking to get an even spread of returned shells

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Industry funding for Golden Bay school renewed

The marine farming industry has re-signed funding agreements with Golden Bay High School to support its Aquaculture Academy.

Principal Linda Tame says the refreshed support arrangements are timely, with many residents unaware of the emerging expansion in the industry locally.

The Marine Farming Association provides water space to Clearwater Mussels and United Fisheries under the renewed agreements; in turn, each manage, at cost, a line of Greenshell mussels and provide the profits when sold to the school.

Linda Tame says without the funding, the school would not be able provide classes in aquaculture every year as it does.

All students at the year 7-13 school are introduced to aquaculture studies, building in year 11 and by year 12 and 13 students can join a specialised class. As many as 15 senior students are on the course depending on the year. Currently there are 6 on the course, led by biology teacher Mark MacKenzie who runs the Aquaculture Academy.

She says the industry funding encourages her Board to invest in aquaculture, such as the \$500,000+ spend in 2017/18 towards building a biology laboratory with dedicated space for aquaculture including dissection tables and more tanks.

"It's 1+1=3," says Linda.

The Aquaculture course for senior students includes the Coast Guard Day Skipper course and UHF Marine Radio Operators' certificate.

All students to year 11 are required to do science and Linda believes this contributes to the interest in aquaculture studies.

"Science isn't about knowledge; it's about using skills and ours is very much a hands-on course."

Students can go on to tertiary studies in aquaculture as some have done at NMIT where an annual scholarship is provided by MFA; others go straight onto working on mussel industry boats.

Linda says she's aware of one former student, now 24 years old, who is buying his first house after just a few years working in the industry.

Industry support is not limited to mussel growers. Both NZ King Salmon and Anatoki Salmon provide fish, food and work experience opportunities including the Gateway scheme which puts senior students into industry one day a week. The support from the sector is greatly valued by the school and viewed as part of a greater whole. In her first summer holidays at the school, Linda and a couple of other staff had to visit every day to put ice in the fish tanks to keep the salmon from over-heating. By last summer, money from the mussel lines had funded a chiller which kept the water cool, among other benefits.

"The students learned about the importance of temperature to all marine life," says Linda.

With mussel farming expanding in Golden Bay, she sees the Aquaculture Academy playing a role to inform all residents.

"We want our whole school and community to become aware of the increasing aquaculture activity."

Linda says industries like dairying and tourism 'are in your face' but because marine farms are out on the water, many Golden Bay residents don't know the scale of what's emerging and what this will bring for the community, for iwi and yes, the school and its students.



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Thanks to Ted (Sanford), Jono (MFA), Paul and Damian (New Zealand King Salmon) – and all their supporters - who together raised over \$44,000 in Drop For Youth 2020.

> A big thumbs up from the thousands of local kids who will benefit.

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Marine waste feeds 3D printer production

Matthew O'Hagan wants a more sustainable world, so he is helping build it, using marine farm and fishing net plastic waste.

As we write, Matthew has two weeks to complete his master's thesis in design innovation at Victoria University. He has been testing how to feed marine waste materials into 3D printers to create things made of the recycled material.

Growing up on the coast near Wellington gave him a passion for the ocean and his under-graduate work convinced him he wanted to focus on sustainability in some form.

When he heard last year that Sanford had offered to support Victoria University on 3D printing using waste streams, Matthew made an approach to the company's innovation leader Andrew Stanley.

Sanford's support included hosting a visit to its Havelock site processing greenshell mussels and its Timaru fish-processing plant. More than 40kgs of disused mussel floats, ropes and nets were then dispatched to Victoria University for trials.

Matthew's first task was to clean the material to the pristine condition required for processing.

"I hand washed it all with a scrubbing brush; it was days on end."

Then the plastic material had to be cut up and put into an industrial oven, with the resulting slabs then granulated. It was then processed into spools of filament to feed into the university's 3D printer.

A few polyethylene bottles were granulated and added into the ropes and floats material to provide a consistent filament with a diameter of 2.2 -2.9mm.

Sanford is focused on being a sustainable seafood company and this extends to investing in technology and science to achieve this. So, Matthew decided to programme the 3D printer to turn out items which supported ocean activity - paddles for paddleboards, nesting boxes for little blue penguins and durable plastic seats for a beachside environment.

"I wanted to try and turn the marine waste into things that someone who loves the ocean can enjoy."

Some of the items are only on a small scale but Matthew says larger 3D printers are already available to turn out products on a commercial scale.

He is not yet focused on what can be done - right now he is working all

hours to get his thesis complete – but already he's attracting attention. In TechWeek2020 in late July, Matthew featured in a streamed highlight package of presentations which will be seen at the MaDE (Manufacturing Design Entrepreneurship NZ) conference in Auckland in December. His is titled: From Line to Loop

After that, you might say after that Matthew's world is his oyster – perhaps one grown in a cage produced from recycled marine material.



Matthew with some of the sorts of materials he worked with



Nesting boxes for little blue penguins



Every paddleboard needs a paddle



Matthew making recycled 3D printing filament out of buoys



Some of the ropes after scrubbing



Fishing nets before processing

Artificial intelligence for mussels Seeing more than meets the eye!

Imagine being able to photograph a freshly picked iconic Greenshell mussel off a mussel line and know instantly whether it is in peak condition and ready for harvesting for food or even better, harvesting for its bioactive content.

The innovation team at Sanford have been working on artificial intelligence technology that can do just that. It has the potential to help marine farmers decide when to harvest and what the best outcome is for the harvested crop. This new technology also has potential for use in other parts of the primary sector.

The technology is needed because even the best trained human eye isn't able to assess all the variables that can determine how good the mussel is for nutraceutical use.

Sanford's General Manager of Innovation, Andrew Stanley says, "our mussel sourcing teams and third-party suppliers are highly experienced, but what we are looking for is really difficult for any human to measure, particularly while out on the water. Providing new high-tech tools to those making harvesting and sourcing decisions is going to help improve quality and consistency".

The approach involved gaining better understanding a how individual mussels vary. The team selected mussels from a range of areas across the Marlborough and elsewhere Sounds and measured multiple features over an extended period. The team spent many hours dissecting and testing mussels, including using Near Infrared Spectroscopy (NIR).

Logan Nutsford joined the Sanford innovation team in Dec 2019, bringing with him new skills and knowledge in automation, mechatronics, and artificial intelligence. Logan set about delivering a working prototype of a system which would prove artificial intelligence could predict



outcomes for mussels. He was able to show, after several weeks of work that Al could in fact learn to understand quality.

The next step was building the first version of a photographic and sensor system which would deliver repeatable and consistent results. Because neural networks can be trained more accurately by removing changing backgrounds, Logan designed a vision box that controlled the lighting and other conditions for assessing the product. These consistent images had the added benefit of allowing time-lapse capability and size assessment. Building the system involved using a combination of custom designed 3D printed components and off the shelf parts.

Over several weeks, around 1000 mussels were photographed and tested. The final output of these trials was 90% accuracy in predicting the quality outcome.

The Sanford team have progressed to the next version of "mussel vision" which now features two cameras, a weigh scale and a touch screen with an improved user interface. The on-board computer is capable of capturing sample location and other details, measuring length, width, height and weight, and providing an assessment of quality using model predictions.

The platform has been designed to be duplicated with relative ease to allow multiple machines to gather data about crops simultaneously, with units linked to a central database. The future goal is to make these devices so that they can be used anywhere, in any condition for a range of purposes.

The Sanford-developed technology may have application in other industries according to Andrew.

"In the primary industry often individual plants and animals are subtlety unique. The differences may not be visible to the untrained eye, but that doesn't mean they aren't significant. This technology can identify those differences and assess how we can best take advantage of them. We are yet to fully explore how far we can go, but who would have thought, even a year ago that AI and Greenshell mussels would be spoken about in the same sentence."

MFA Newsletter Stories

If you have a story that you would like to see published in our newsletter, please forward it to info@marinefarming.co.nz for consideration.

Our newsletter comes out every two months – February, April, June, August, October, and December.

The due date for articles is the 20th eg: for something to appear in the February edition we will need it before 20 February.

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