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Mussels Get their Eureka Moment! Kiwi scientists reveal startling trial results for Greenshell mussel breeding, with potential $200 million payoff

Sanford owned, Nelson based Greenshell mussel research company Shellfish Production & Technology NZ Ltd (SPATnz) is publicly releasing the startling results of its multi-year breeding programme developed in partnership with the Ministry for Primary Industries and the Cawthron Institute. The results show that selected hatchery mussels can grow up to twice as fast as those caught from the wild. The work is expected to be worth around $200 million a year to the wider New Zealand economy*.

SPATnz Programme Manager Rodney Roberts says his team, and all who were involved, are thrilled with the results.

"The final results from this seven-year Primary Growth Partnership programme have exceeded all our expectations. We have compared growth rates for mussel spat from our hatchery with those collected in the wild from both Golden Bay and Kaitaia. The trials show our mussels get to market size at a significantly faster rate. SPATnz Greenshell mussels took on average 16.7 months to grow from seed to harvest size, versus 28.3 months for the weighted average of the wild caught varieties – nearly a year faster.

"The biggest contrast was with Kaitaia mussels, which are the main seed source for the industry. The quickest of three hatchery strains halved the growing time of Kaitaia mussels in Marlborough, which is a pretty incredible result."

The mussel breeding programme results are a true team effort, the result of a collaboration between New Zealand seafood industry leader Sanford and highly respected independent science organisation Cawthron Institute. Cawthron's MBIE-funded Cultured Shellfish programme developed the fundamentals of the selective breeding programme in anticipation of hatchery spat production.

Commercialisation of the selective breeding was then jointly funded by Sanford Ltd and MPI through the Primary Growth Partnership.

MPI's Director Investment Programmes Steve Penno says the results are great news for the mussel sector.

"Faster growing mussels means more of this great product will be available to consumers both in New Zealand and around the world. MPI is investing in SPATnz as it has the potential to be a real game-changer for New Zealand's Greenshell mussel industry, delivering benefits for mussel farmers, our economy and the environment. The latest growth rate results provide solid proof that we're on the right track, and what's possible through collaboration."

Sanford CEO Volker Kuntzsch says the success of SPATnz is an excellent example of the benefits of innovation and collaboration.

"At Sanford we are real believers that you cannot achieve great things without great team work and these results from SPATnz are proof of that. Wider utilisation of this spat will see a potential increase in sales for the New Zealand mussel sector of $229 million dollars a year by 2026* which means a thriving mussel industry, more regional jobs and stronger regional economies. With an ambitious and exciting goal from the New Zealand Government for the aquaculture sector to be worth $3 billion in annual sales by 2035, this is a great stepping stone towards that target.

Mr Kuntzsch is also recognising the wider environmental benefits of the work saying "the mussel breeding programme will also help us to mitigate the impact of climate change on New Zealand's aquaculture sector."

Mr Roberts confirms that his team's work can help manage the increased uncertainty produced by climate change.

"What we have done is selectively breed by choosing some of the best mussels that nature has to offer as the parents to produce our mussel families. Careful selective breeding can help future-proof the New Zealand mussel industry against threats like ocean acidification, global warming and disease."

Cawthron CEO, Professor Charles Eason says he is delighted with the outcome of the work and the partnerships involved.

"It is really exciting for Cawthron and our partners to have these results from a long-term research and development relationship delivering real-world impact, adding value to a unique New Zealand resource and helping realise sustainable farming and employment opportunities around our country."

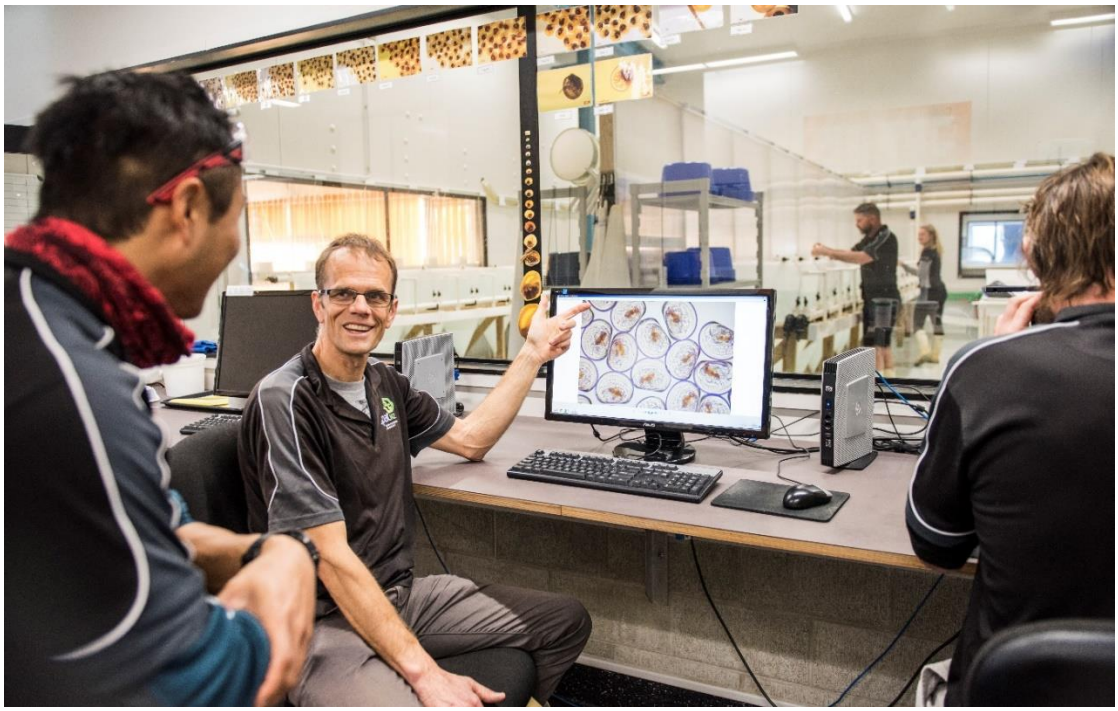
Indeed, the programme has the potential to deliver much more than just economic benefits as New Zealand's Greenshell Mussels are green in more than just name. Rodney Roberts says "shellfish generally are an extremely sustainable food and that is very true of Greenshell mussels. Compared to other forms of animal protein, they have an extremely light touch on the environment."

As well as faster growth, SPATnz and Cawthron are focusing on other characteristics that selective breeding can promote, such as better mussel condition, as well as looking at enhancing the renowned anti-inflammatory qualities of Greenshell mussels.

Volker Kuntzsch says with mussel powder and oil highly sought after on global markets, there is so much potential here for growth.

“Sanford is already exploring the incredible opportunities in the nutraceuticals market. Greenshell mussels have proven anti-inflammatory benefits and this work can only enhance that. We have something very unique and exciting on our hands here.”

Mr Roberts is also feeling very optimistic about the future. “There may be no Olympic Games for mussels, but if there were, you could certainly say our Greenshell mussels are taking the motto ‘faster, higher, stronger’ to heart, except in our case, it is more like faster, fatter, stronger. We believe they are a wonderful kiwi success story for both science and business.”



Above: SPATnz Programme Manager Rodney Roberts (seated at PC) with some of his Nelson-based team studying swimming Greenshell mussel larvae through a microscope.

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A selection of images and video are available for media use on request or via this Dropbox link.

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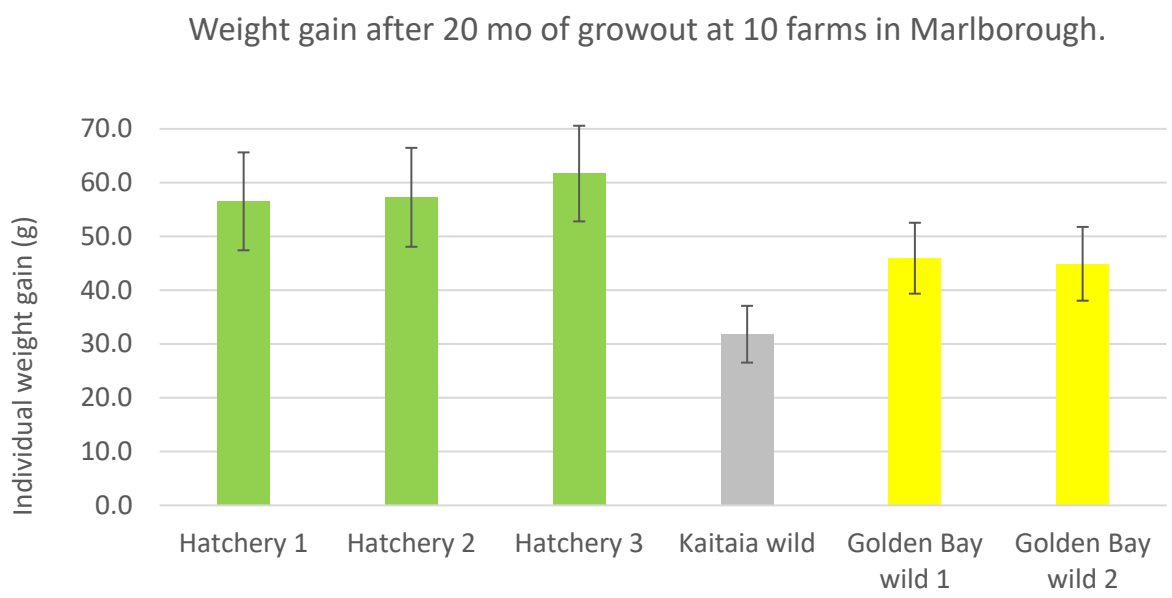
The Facts: the numbers behind the success of SPATnz

*The BERL analysis of predicted economic benefits quoted above, was based on an assumption of 35% more product from existing space by 2026 (BERL publication *2010, Scenarios of the wider economic impacts in 2026 of the New Generation Shellfish Industry*).

SPATnz Greenshell mussel spat is already growing fast enough to exceed that target, with wild caught spat from Kaitaia and Golden Bay averaging 69% longer growout time than hatchery mussels in Marlborough (based on a weighted average calculated by the proportions of spat from each location used in industry).

The table below shows this result. Results are from SPATnz trials over 10 growing sites in Marlborough, 2017-2019.

Strain	Average months from 7 to 55 grams	% longer growout time than hatchery average
Selectively bred hatchery strains	15.4 to 17.7 Av 16.7	
Golden Bay wild caught mussels	22.7	36%
Kaitaia wild caught mussels	30.8	84%
Average for a 70/30 mix of Kaitaia/Golden Bay wild mussels	28.3	69%



The Background: Useful information on Greenshell mussels and mussel breeding

- Greenshell mussels (*Perna canaliculus*) are endemic to New Zealand.

- Normally they release their gametes into the ocean. The eggs that are fertilised will hatch into swimming larvae after about a day. The larvae swim in the water column for several weeks until they latch onto seaweed which can later be collected from 90 Mile Beach / Te-Oneroa-a-Tōhē. Farmers also catch as much mussel spat as they can by hanging ropes in Golden Bay and Tasman Bay in the Tasman District. There is limited predictability to these sources and commercial mussel farmers looking for spat to grow on their mussel farms don't know how much spat they will get from year to year or when it will arrive.

- The SPATnz hatchery opened in 2015 at the Cawthron Aquaculture Park in Nelson New Zealand and hatchery spat are currently growing on mussel farms in Pelorus Sound in Marlborough.

- 23 people are employed by SPATnz at present.

- There is NO genetic engineering involved in the selective breeding. The scientists pick the cream of the crop as parents for selective breeding so their offspring are among the best that nature provides.

- Aquaculture generally is worth around $616m to New Zealand annually (including $435m in exports).

- SPATnz has developed hatchery facilities and methods capable of producing spat for around 30 thousand tonnes a year of adult mussels. Last year the industry produced a total of 90 thousand tonnes of Greenshell mussels.

- When the SPATnz programme is fully operational and the spat are taken up across the New Zealand industry, it will add nearly $200 million a year GDP.

- The SPATnz breeding programme relies on conventional selective breeding, similar to the way terrestrial farmers breed more productive sheep and cows. This programme is not aiming to produce a single "super mussel" but maintains a wide range of high performing lines to choose from.

- The selective mussel breeding programme was a finalist in the 2019 Kiwi Innovation Network Research Commercialisation Awards in the Commercial Impact section. SPATnz also won the 2017 New Zealand Innovation Award in the Agribusiness and Environment category, and the New Zealand Marine Farming Association Research and Development Award in 2015.

- Greenshell mussels are a highly sustainable source of high quality protein with a light environmental footprint. Mussel farming is a sink (rather than source) for nutrients like nitrogen and phosphorus, has low freshwater consumption and high productivity per hectare.

The Team: the group behind the successful result

SPATnz
SPATnz is a Sanford-owned company established to commercialise hatchery production and selective breeding of Greenshell mussels. SPATnz is based in Nelson and employs 23 staff.
The monthly mussel production cycle begins with the spawning of about 3 billion mussel eggs, which are transferred to marine farms a couple of months later as baby mussels (called spat). Hatchery production allows the industry to grow beyond the constraints imposed by wild spat, and to implement selective breeding for faster growth, enhanced products, and resilience to future challenges.

Sanford Ltd
Sanford is New Zealand's oldest and largest seafood company - we have been listed on the New Zealand stock market since 1924. We are focused on sustainability and on maximising the value of the resources we gather from our oceans, enabling long term value creation from oceans teeming with life. Sanford sites can be found in eleven locations around New Zealand and we are a team of 1700 staff and sharefishers across the country. We are committed to innovation: we have a team of scientists whose mission is to find new ways to make the most of the life-enhancing properties of seafood, from anti-inflammatory supplements to skin-nurturing collagen. Our latest annual report can be found here.

Cawthron Institute
Cawthron Institute is New Zealand's largest independent science organisation, offering a broad spectrum of services to help protect the environment and support sustainable development of primary industries. Cawthron's scientists have expertise in aquaculture research, marine and freshwater resource management, food safety and quality, algal technologies, biosecurity and

analytical testing. Its ground-breaking science is supported by substantial testing and research laboratories, state-of-the-art technology and a purpose-built aquaculture park.

Based in the Nelson region, Cawthron works with regional councils, government departments, major industries, private companies, and other research organisations throughout New Zealand and around the world. Cawthron is a diverse organisation employing more than 250 scientists, laboratory technicians, researchers and specialist staff from 26 countries.

Ministry for Primary Industries (MPI)
MPI works to safeguard New Zealander's way of life well into the future. Its vision is for New Zealand to be the world's most sustainable provider of high-value food and primary products. This vision is grounded on prosperity, sustainability and protection from biological risk.
A key part of MPI's work is backing good, workable ideas to help give them the best opportunity for success. MPI invests in a range of projects and programmes, including those that will make a positive and measurable impact in the food and fibre sectors, from the paddock, forest or ocean to consumers. SPATnz is one of those programmes.