

Year in Review 20/21

CELEBRATING

100

YEARS OF CAWTHRON





Contents

Foreword	04
About us.....	06
100 years of Cawthron.....	08
Inspiring the next generation of scientists	11
Delivering science excellence.....	14
Science Highlights	18
Financial Performance	24

An update from our Chair

More than 100 years ago, a retired Nelson businessman and philanthropist Thomas Cawthron made a will that would have a lasting impact on New Zealand science from the early 1920s to today.

Officially established in 1921 thanks to the last will and testament of Thomas Cawthron, Cawthron Institute is now New Zealand's largest independent science organisation with nearly 300 staff from 35 countries, working across multiple sites in Nelson. Since its establishment, Cawthron has firmly focused on research that contributes to the economic growth of New Zealand and the preservation of our special environment.

Thomas Cawthron had a vision that science could contribute to the growth of a young New Zealand, and his legacy is realised every day by our people who come from all over the world to explore and challenge the boundaries of new science. For the past 100 years our scientists have been able to identify emerging areas of research to assist industry, and New Zealand, to become sustainable and successful. We see ourselves as a bridge between science and industry, connecting R&D to commercial application.

Today Cawthron's science is strongly focused on protecting marine and freshwater environments and assisting New Zealand's economy through the sustainable development of the dairy, seafood and aquaculture sectors, as well as supporting the development of novel foods, nutraceuticals and pharmaceuticals.

Cawthron has been a pioneer of impactful science, and this past year has been no different. You can read about a selection of our science highlights on pages 18-23 of this Year in Review. One of those highlights was Prime Minister Rt Hon Jacinda Ardern opening the new Cawthron National Algae Research Centre at the Cawthron Aquaculture Park in May 2021. The Centre will enable the expansion of Cawthron's algae research and support the establishment of an exciting new industry in New Zealand, including high-value pharmaceutical products through to 'methane-busting' seaweed.

We were delighted to have Volker Kuntzsch join as our new Chief Executive in March 2021 and it's exciting to see the impact he is making on further strengthening the unique culture at Cawthron, as well as continuing to progress collaborative opportunities to ensure our science has a tangible impact.

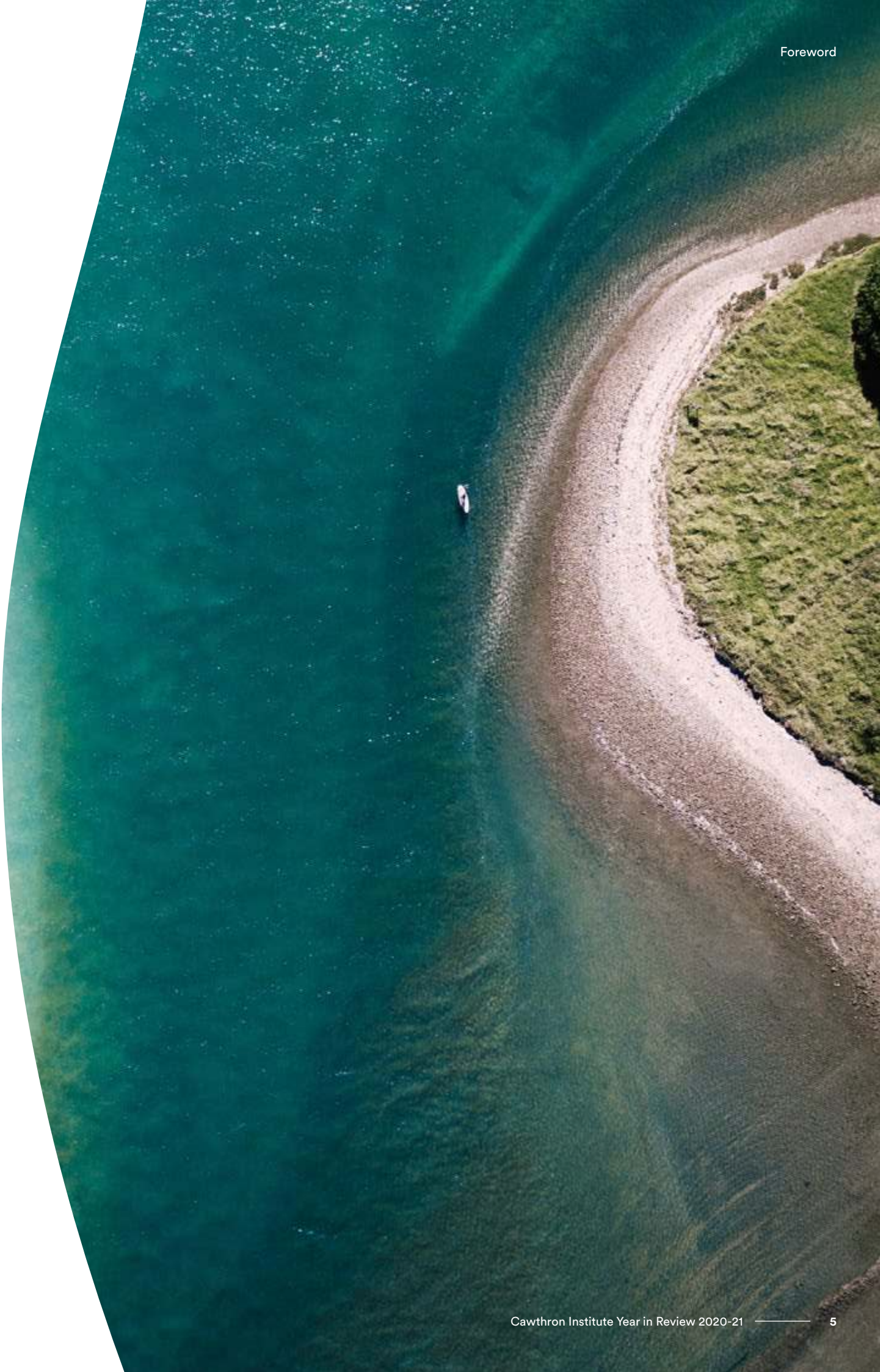
Cawthron Institute is a charitable trust, and our charitable purpose is to advance science for the benefit of Te Tau Ihu and Aotearoa New Zealand, with a focus on natural resources. In addition to delivering world-class science, acknowledging our past and celebrating our centenary has been a big part of our philanthropic focus over the past year. You can find out more about our community and education initiatives as part of our 100-year celebrations on pages 8-9.

We are extremely proud of the positive difference our research has made to New Zealand's environment and economy since our establishment in 1921. Here's to delivering world-class science for the next 100 years.



John Palmer

Cawthron Institute Trust Board Chair



World-class science for a better future

Ko te kōunga o te pūtaiao te
auahatanga ki te ao anamata

**Cawthron Institute is Aotearoa
New Zealand's largest independent
science institute, based in Wakatū/
Nelson at the top of New Zealand's
South Island.**

Cawthron Institute has a century-long legacy of delivering world-class science that supports the protection of our natural environment, the wellbeing of our people and the growth of New Zealand's primary industries through the sustainable use of natural resources.

Cawthron is owned by a charitable trust, in accordance with the Thomas Cawthron Act 1924. The charitable kaupapa of Cawthron Institute is the advancement of science to benefit Te Tau Ihu and Aotearoa New Zealand, with a focus on natural resources.

Our world-class science helps to build a better future for Aotearoa New Zealand by delivering science that supports healthy ecosystems, a prosperous blue economy and thriving people and communities.

**We draw upon the Māori value of
manaakitanga to deliver science
that has a tangible impact on
the wellbeing of people in the
present and future.**

Healthy ecosystems

We deliver research and development that supports the understanding, monitoring, protection, restoration, and enhancement of healthy ecosystems in Aotearoa New Zealand. We work in a diverse range of ecosystems, ki uta ki tai (from mountains to sea), taking a holistic approach to research design and delivery.

We draw upon the Māori worldview of kaitiakitanga (guardianship, protection, preservation and fostering) to deliver science across our focus areas, which include environmental monitoring, molecular technologies, microalgae, biosecurity and native and taonga species.

Prosperous blue economy

We support the growth of sustainable marine activities that operate within healthy ecosystems. Our work aims to identify challenges and opportunities facing Aotearoa New Zealand's blue economy industries and develop solutions that will help to protect and grow them with minimal environmental impact, with a focus on finfish, shellfish and seaweed aquaculture, algae, aquatic animal health and biosecurity, blue technology, open ocean aquaculture, environmental monitoring and marine mammals. We draw upon the Māori spiritual quality of mauri (life force) to deliver science that respects the connection between all living things and the balance that must be maintained.



Thriving people and communities

Our research in food safety, seafood safety, bioactive compounds and social-ecological science helps to enhance the health and wellbeing of people and communities. Some of these research programmes are globally significant, and involve the development of novel technologies and solutions with transformative potential, like the exploration of bioactive compounds in pharmaceutical applications, the identification of new marine toxins, and the development of world-first testing methodologies and environmental monitoring technologies.

We draw upon the Māori value of *manaakitanga* (respect, generosity, kindness, hospitality and support, and the process of showing this for others) to deliver science that has a tangible impact on the wellbeing of people in the present and future.

Our science outcomes inspire research and development that draws on our diverse areas of expertise to generate new knowledge, innovations and ideas that have global impact. Our ground-breaking research is continually sought after both nationally and internationally, and is supported by substantial testing and research laboratories, state-of-the-art technology and a purpose-built aquaculture park.



100 years of Cawthron

I walk backwards into the future
with my eyes fixed on my past

Kia whakatōmuri te haere
whakamua

Thomas Cawthron had a vision that
science could contribute to the growth
of a young New Zealand.

Following his death in 1915, Thomas Cawthron bequeathed the equivalent of more than \$100 million in today's New Zealand dollars – the largest single bequest in New Zealand at the time – to establish and maintain a technical school, institute and museum.

Since then, Cawthron has grown to be New Zealand's largest independent science organisation with nearly 300 staff from 35 countries working across multiple sites in Nelson. Our scientists have been able to identify emerging areas of research to assist industry, and New Zealand, to become sustainable and successful. We believe that research, science and innovation is essential to building a sustainable future for generations to come, and our purpose of delivering world-class science for a better future reflects our commitment to being good ancestors.

In 2021 Cawthron Institute celebrated its rich history of delivering 100 years of science through a number of events and initiatives that allowed us to share our research with the community.

Cawthron has grown to be New Zealand's largest independent science organisation with nearly 300 staff from 35 countries.

Our Science Our Future – 100 years of Cawthron

Our Science Our Future – 100 years of Cawthron was a four-month exhibition at Nelson Provincial Museum held from May to October 2021, designed to share Cawthron's story and our world-class science with the people of Te Tau Ihu.

We partnered with Nelson Provincial Museum to design and curate the exhibition, which featured Cawthron's research in aquaculture, seafood safety, algae and bioactives, freshwater and ocean health. It also demonstrated our special ongoing connection to the community through our education and philanthropic work which was all part of Thomas Cawthron's original vision.

The exhibition provided a number of hands-on experiences, including an underwater world with life-sized marine mammals, a seaweed forest, the intriguing possibilities of algae and an operational monitoring buoy. There were also a number of free, public talks delivered by our scientists during this time, with topics ranging from marvellous mussels to turtles and sea temperatures.

The Museum had a record-breaking number of visitors during the exhibition period, with visitor numbers up nearly 60 percent in July. Unfortunately the August Covid-19 lockdown across New Zealand forced the



Above: Cawthron scientist Paul Barter sets up Cawthron's exhibition at the Nelson Provincial Museum

Museum to close for three weeks during the exhibition period however a virtual tour was available during this time. Although the lockdown halted momentum on the exhibition, it has still proved hugely successful in providing a focus to our centenary year activity and increasing local knowledge of Cawthron's research.

In April 2021 Cawthron threw open its doors for the Cawthron Open Day which was featured as part of Tuku21 Nelson Heritage Festival.

Around 850 people attended our Open Day, with the eleven laboratory tours fully booked out and the schedule of science talks were packed through the event. The overarching public feedback we received was a desire for us to do this more often to give our community the opportunity to better understand and support our research.

In June we held our inaugural Cawthron Community Day for our people to contribute back to the Nelson community in the spirit of Thomas Cawthron. This event saw around 100 Cawthron staff planting 1,300 trees beside the Maitai River to support Project Mahitahi. Our Chief Executive Volker Kuntzsch and Nelson Mayor Rachel Reese unveiled a commemorative plaque to recognise 100 years of Cawthron Institute delivering world-class science. This event was a very positive and successful collaboration with Nelson City Council.



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Inspiring the next generation of scientists

He pu tangata

Each year, in the spirit of our founder Thomas Cawthron, we invest in science-based community activities in Te Tau Ihu.

Our programme of annual philanthropic activity includes community initiatives to connect our scientists with the community, specific educational activities, and recognising those in our community who are committed to restoring our environment.

Sharing science with the community

In October 2020 Cawthron delivered its first-ever fully virtual Thomas Cawthron Annual Memorial Lecture. It was lauded by online audiences as a huge success after attracting an audience of thousands from New Zealand and abroad.

The 77th Annual Lecture built on a long legacy of talks from distinguished scientists and scholars, from Sir Ernest Rutherford to the Rt Hon Helen Clark, however the 2020 Annual Lecture was the first lecture event Cawthron has delivered on a digital platform due to changing Covid alert levels.

The event featured keynote speeches from Dr Siouxsie Wiles, Associate Professor at Auckland University, and Dr Serean Adams, Aquaculture Group Manager at Cawthron Institute, who offered their perspectives on the lecture's theme 'Science Matters', exploring the value of scientific research and development to New Zealand's society, both now and in the future.

These addresses were followed by a Q&A panel discussion with both speakers, and joined by Dr Chris Cornelisen, Group Manager for Coastal Sciences at Cawthron Institute.

Hundreds of questions were submitted by audience members on subjects including the Covid-19 pandemic, aquaculture industry potential, New Zealand's investment in R&D, social media and misinformation, and STEM career pathways.

The full lecture is available at:

➤ cawthron.org.nz/our-news/science-matters





Above: Cawthron Summer Scholars 2020

Recognising efforts to restore and protect our environment

Cawthron Institute is proud to support the Marlborough Environment Awards, held bi-annually in Blenheim to showcase and celebrate Marlborough community and business projects that protect and enhance the environment.

The Marlborough Sounds Restoration Trust was announced as the Supreme Winner at the Awards ceremony held in April 2021 for their wilding pine programme, which has had a huge impact on landscape of the Sounds as they work to restore native bush.

Cawthron's other flagship Awards programme, the New Zealand Rivers Awards which recognise communities, farmers and industry who are achieving significant improvement in water quality in their local rivers, was cancelled in 2020 due to Covid.

Nuturing enquiring minds

Each summer Cawthron hosts undergraduate students as part of a 10-week scholarship programme, providing them with an opportunity to contribute to an active scientific research project and be mentored by a top Cawthron scientist.

In 2020 we welcomed five scholarship students who contributed to a wide range of research from lake health, shellfish behaviour and larvae development, through to salmon exercise and seafood safety science communication.

- **Megan Exton** received the Kathleen Curtis scholarship to focus on how to improve the reliability of hatchery production of triploid Pacific oysters using tetraploid parents;
- **Shana Dooley** received the Theodore Rigg scholarship with a focus on social science and GIS analysis to understand how people view and access lakes;
- **Alyssa Thomas** received the Te Pitau Whakarei Karahipi scholarship, which is offered in partnership with Ngā Pae o te Māramatanga, to understand how shellfish behaviour can be an indicator of health and performance. Alyssa's work was featured in the media and a short video made to describe her findings;



Above: Year 13 students participating in Mussel Biology workshops at the Cawthron Aquaculture Park

- **Anita Bentley** received one of two Emerging Scientist scholarships offered for the first time in 2020, to apply science communication techniques whilst learning more about Cawthron's seafood safety research platform;
- **Effie Gledhill** received the second Emerging Scientist scholarship to look at the effect of exercise on juvenile salmon performance.

Connecting with our future scientists

In addition to the scholarship programme, Cawthron is now the proud sponsor of the INSPIRE festival held each year in Nelson. The annual two-day festival has been running for nine years and provides challenging discussions and workshops focused on STEAMS (Science, Technology, Engineering, Arts, Maths and Society) education for students aged 8–13 years.

The festival is organised and run by the Ministry of Inspiration – a Nelson Tasman based charity that aims to encourage interest in science to create a more scientifically literate society. As part of the line-up several Cawthron scientists provide hand-on workshops. Due to the Covid lockdown this festival was postponed until late October 2021.

Each summer
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In April and May 2021 we successfully held the Year 13 Mussel Biology workshops, which were introduced by Otago University and Cawthron in 2011. Run in collaboration with NMIT and SPATnz, students from across Te Tau Ihu visit Cawthron's Aquaculture Park to fulfil requirements of the NCEA Level 3 Biology 3.1 Curriculum Assessment. For the first time students from Dunedin secondary schools John McGlashan and Columba College took part.

And to celebrate International Day of Women and Girls in Science in February, we invited a group of promising senior students from across Nelson to speak with Cawthron scientists before taking a tour of Cawthron laboratories. The visit aimed to broaden ideas about what a career in science in could look like.

Our annual Cawthron Scitec Expo (school science fair) was cancelled in 2020 due to Covid.

A reputation for delivering science excellence

Cawthron's highlights over the past year demonstrate the real-world impact our research has had. Some of our key highlights over the past 12 months include:

Appointment of new Chief Executive Volker Kuntzsch

In February 2021 Volker Kuntzsch was announced as Cawthron's new Chief Executive. Cawthron began the search for a successor for former Chief Executive Prof. Charles Eason who led Cawthron for 12 years following his retirement at the end of 2020.

Volker has a distinguished international career in the seafood industry spanning more than 30 years and was previously CEO for seven years at New Zealand seafood company Sanford. Prior to that he was formerly the President of Nippon Suisan (USA), and President and CEO of King & Prince Seafood Corp (USA), before joining Sanford as CEO in 2013. He has also held senior executive roles in Tokyo, Namibia, Germany, and the United Kingdom, and holds a Master of Science from the University of Stellenbosch.

At the time of his appointment Volker said he was humbled by the privilege to lead Cawthron's highly reputable team in delivering world-class science for a better future, and was excited about moving to Nelson with his family.



151

Our science excellence recognised through **151 publications** in 2020/21. Up from 133 in 2019/20.

Cawthron is a special organisation with a passionate and engaged group of people who are committed to creating a better future.

Science excellence recognised

Cawthron's science excellence continues to be recognised with 151 publications in 2020/21. This is up from 133 publications in 2019/20, and 115 in 2018/19.

Providing essential services through changing Covid alert levels

Cawthron is a special organisation with a passionate and engaged group of people who are committed to creating a better future, and this is demonstrated by our staff who continue to show an unwavering commitment to making a difference during challenging times. Our laboratories are recognised as an essential service during Covid lockdowns, providing food and water safety testing to customers all over the country, and our people have provided an exceptional service throughout the multiple changes in alert levels.

Strict, high standards of hygiene, physical distancing and contact tracing are in place to keep our people and customers safe, and regular communications are sent out to our customers to keep them informed of services available, turnaround times and sample delivery updates.







Above: Prime Minister Rt Hon Jacinda Ardern with Cawthron Aquaculture Group manager Dr Serean Adams at the opening of the Cawthron National Algae Research Centre

The vision for the proposed precinct is to attract companies from a variety of sectors.

Science and Technology Precinct – a hub of innovation and creativity

In March 2021 Cawthron confirmed it was looking to relocate our existing laboratories from our main Halifax Street East campus in Nelson as major upgrades are required. These upgrades would cause significant disruption and take several years to complete, and with a major pipeline of research Cawthron has opted to invest in world-class laboratories on a new site.

After looking at several options in the Nelson Tasman region, Cawthron, in collaboration with Port Nelson, announced the proposed development of a Science and Technology precinct on Port Nelson land. The vision for the proposed precinct is to attract companies from a variety of sectors who will work together to provide solutions to some of our most pressing challenges in science and research, information technology, software development, health, agritech and aquatech. It is hoped the precinct will create a hub of innovation and creativity and further augment Nelson's leading position as a location for value-add companies working in the science and technology sectors.

Official opening of the Cawthron National Algae Research Centre

In May 2021 we celebrated the official opening of the new Cawthron National Algae Research Centre. The first stage of the Centre was officially opened by Prime Minister Rt Hon Jacinda Ardern, just two years after \$6m of funding was provided by the government's Provincial Growth Fund (plus \$2m contributed by Cawthron).

The Centre will enable the expansion of Cawthron's algae research and support the establishment of an exciting new industry in New Zealand. From the extraction of bioactive compounds from microalgae for high-value pharmaceutical products, through to 'methane-busting' seaweed, the Centre will allow Cawthron researchers to build on their existing expertise to meet growing global demand for algae-based products and solutions.

The second stage of the National Algae Research Centre will see a separate facility constructed as part of the new laboratories at the proposed Science and Technology precinct in Nelson to continue Cawthron's specialist work in extracting high-value bioactive compounds from microalgae.

Science highlights

Delivering world-class science is at the heart of what we do, and our ability to be at the forefront of emerging opportunities has seen us advance innovation in algae and bioactives through our seaweed research and the opening of our National Algae Research Centre, as well as open ocean aquaculture through our shellfish tower and partnership with industry and iwi.

Our freshwater and ocean research supports the restoration and protection of our unique environments, and we continue to look at ways to safeguard our health through food safety monitoring and testing as well as researching novel foods.

For more detail on our Science highlights please visit

➤ www.cawthron.org.nz







Helping to solve ‘green bottom’ lake puzzle

Cawthron scientists are co-leading a collaboration of international scientists working to understand an emerging environmental threat to lakes all over the world that were previously considered to be in good health.

In a paper published early this year in Bioscience Magazine, the team of researchers explained that from Lake Tahoe in the USA, to Whakatipu wai-māori/Lake Wakatipu in Queenstown, pristine lakes around the world are being carpeted by bright-green slimy algae growing on the lakebed, especially during the summer. The fact that these blooms are occurring in essentially pristine lakes is an indicator that freshwater ecosystems are rapidly changing, and this could be the early-warning indicator of ecosystem change. It is hoped further funding can be secured to continue research into determining why these blooms are occurring and improve our understanding of lake ecosystems.

Pristine lakes around the world are being carpeted by bright-green slimy algae growing on the lakebed.



New ‘Shellfish Tower’ structure a practical solution for open ocean aquaculture

A study published in early 2021 has shown that an innovative new open ocean aquaculture structure is a promising solution for marine farming of shellfish and other species in exposed waters.

Cawthron aquaculture researchers worked with a team of international researchers and industry partners to design and test the ‘Shellfish Tower’ structure through an MBIE Endeavour Fund project that began in 2016.

Five years on, a full-scale prototype of the Shellfish Tower has been trialed in partnership with Ōpōtiki’s Whakatōhea Mussels and shown great potential as a farming system for mussel spat and oysters, and other species like scallops, lobsters, sponges and tunicates.

With limited space in sheltered coastal areas for farming, environmental pressures like climate change and the desire to diversify aquaculture species, structures that enable offshore farming in challenging high-energy environments are an essential part of aquaculture’s future.



Developing a better understanding about New Zealand's high-value salmon product

Cawthron has delivered significant research to help better understand King salmon physiology, health and dietary requirements.

King salmon are recognised as a high-value export product that contribute to the government's goals of achieving \$3billion in aquaculture sales by 2030.

Working closely with salmon industry representatives, Cawthron has delivered the MBIE-funded Salmon Food Conversion Efficiency research programme, which aimed to develop indicators for healthy King salmon, on-farm performance and improved environmental interactions. The programme has delivered a range of ground-breaking firsts, including diagnostic health tools and enhanced feeding practices.

Cawthron has also wrapped up a seven-year collaboration between Cawthron scientists, industry partner New Zealand King Salmon and Seafood Innovations Limited which has led to a selection of advanced diets that keep the fish happy and healthy and improve feed conversion.



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Advancing seaweed research

We are advancing our world-leading algae research at our recently completed National Algae Research Centre. Based at Cawthron's Aquaculture Park at the Glen, the National Algae Research Centre at this site will predominantly focus on macroalgae (seaweed).

Seaweed cultivation is the world's fastest growing aquaculture sector, with the global seaweed industry worth more than US\$6bn per year. There are many species that have the potential to be transformed into a range of commercial products as well offering environmental benefits to counteract climate change. Cawthron's seaweed research, alongside our other aquaculture research, could significantly contribute to achieving the government's target of aquaculture becoming a \$3bn industry by 2030.

Research continues into developing an early proof of concept of the aquaculture systems needed to develop native red seaweed *Asparagopsis armata* at scale, which has been proven in overseas trials to reduce greenhouse gas emissions in livestock by over 90 percent when used as supplementary feed.

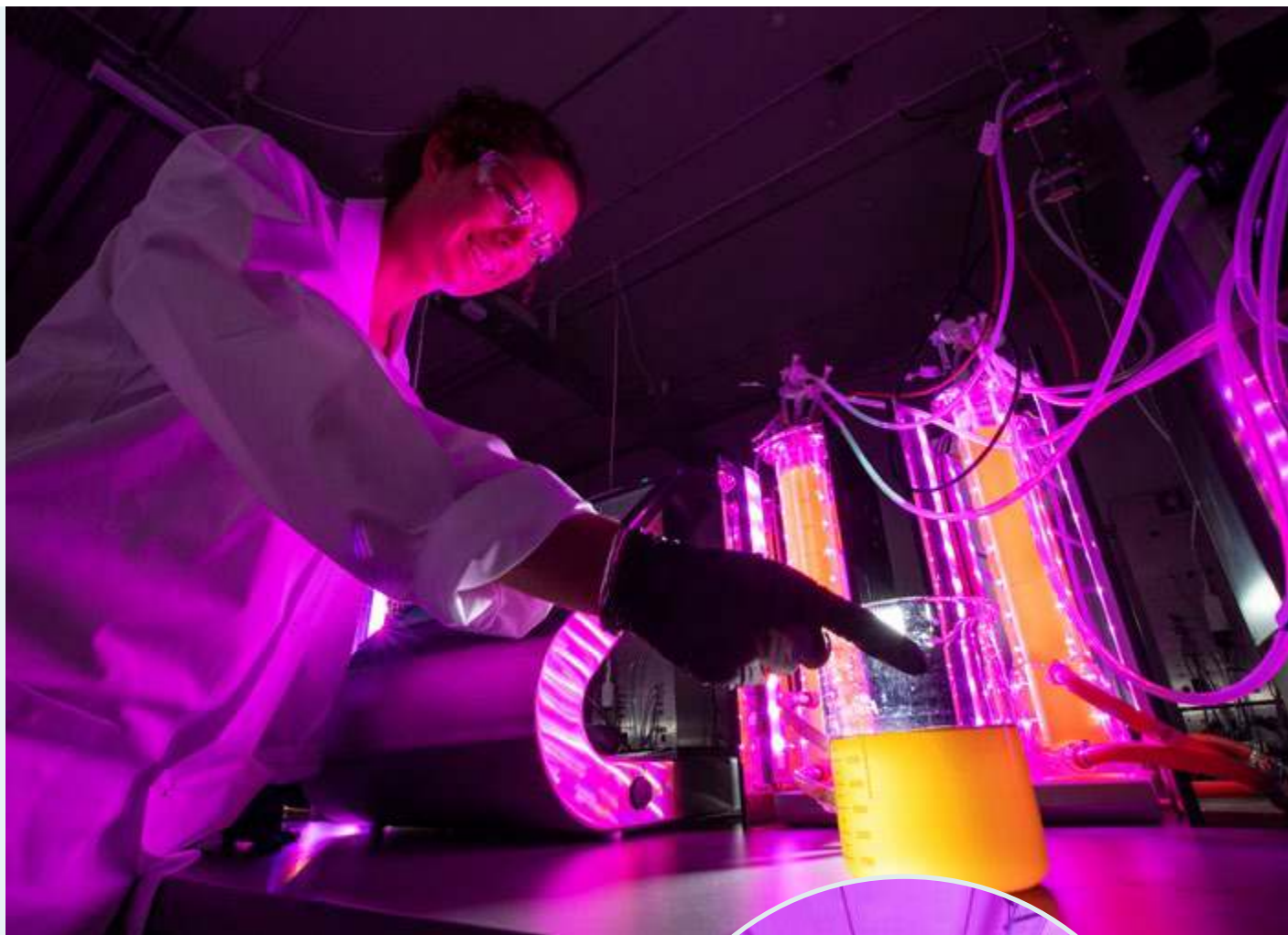


Investigating alternative protein sources

A Cawthron-led study could see two 'superfood' algae species become nutritious sources of protein used in everyday food items.

The study was awarded \$3 million through the Ministry of Business, Innovation and Employment's Catalyst: Strategic fund in 2020 to investigate the potential of the red seaweed Karengo, and the microalga *Chlorella* as everyday alternative protein sources. Both types of algae have high protein content but require an innovative approach to fully realise their nutritious potential.

Cawthron is working alongside researchers from the Riddet Institute, hosted by Massey University, the University of Auckland and Plant & Food Research, as well as international partners at Singapore's Agency for Science, Technology and Research (A*STAR), Singapore Institute of Food and Biotechnology Innovation (SIFBI) and Bioprocessing Technology Institute (BTI).



International collaboration could transform post-operative pain relief

Cawthron has made a major global scientific breakthrough that could allow the development of the world's first algae-based pain medication.

For decades, the global medical profession has been waiting for a breakthrough in post-operative pain relief that would provide an alternative to addictive opioid medications, particularly for use in relieving the pain of children. Several years ago the medical fraternity identified a potential miracle drug that would incorporate a toxin produced by algae called neosaxitoxin, but there was no way to consistently reproduce it with guaranteed high purity.

Cawthron's researchers have achieved a global scientific breakthrough by developing a world-first method of producing neosaxitoxin at a very high level of purity that will enable the world's first non-opioid, algae-based pain medication to be taken from the laboratory to the market.

This neosaxitoxin-based medication has the potential to transform post-operative pain relief world-wide. So far, the drug has no known side effects and is not addictive.



In addition to being a suitable pain-relief medication to administer to children, the impact of this breakthrough in the context of a global opioid crisis is enormous.

The three research partners – Cawthron Institute, Boston Children's Hospital and Chilean-based Proteus – are currently seeking investment in a second stage of research involving scaling up the production of neosaxitoxin to commercially-relevant quantities and taking the drug through to Phase 2 clinical trials.

Financial Performance

for the year ended 30 June 2021

2020 \$000's		2021 \$000's
45,097	Income from research contracts, analytical services, consultancy & other scientific projects, lease income and other income	43,598
43,250	Expenses including depreciation	43,114
1,847	Net operating surplus	484
-	Revaluation of land and buildings	1,766
1,847	Trust Surplus	2,250

Financial Position as at 30 June 2021

2020 \$000's		2021 \$000's
	The Institute's Trust Capital is represented by;	
9,938	Asset revaluation reserve	11,704
146	Special projects and bequests reserve	130
26,522	Accumulated comprehensive revenue and expenses	27,022
36,606	Total Trust Capital	38,856
	Trust Capital funds the following Net Assets;	
6,372	Working capital	4,222
35,234	Fixed assets	39,628
(5,000)	Long term liabilities	(4,994)
36,606	Total Net Assets	38,856

Movement in Equity for the year ended 30 June 2021

2020 \$000's		2021 \$000's
34,759	Opening balance	36,606
-	First year of NZ Rivers Trust brought in	-
1,847	Trust Surplus	484
-	Revaluation of land and buildings	1,766
36,606	Closing Balance	38,856

The Cawthron Institute Trust Board is a charitable trust established in accordance with the Thomas Cawthron Charitable Trust Act 1924 to oversee the Cawthron Institute.



Integrity Kōunga

**We are trusted to
do what's right**



Community Manaakitanga

We care



Impact Whakaaweawe

We make a difference



Innovation Auahātanga

**We create,
we challenge, we
take risks**



Collaboration Ngātahitanga

**We work with others
to get results**

World-class science for a better future.

Ko te kōunga
o te pūtaiao te
auahatanga ki te
ao anamata.





