

# Year in Review 2021-2022

World-class science for a better future.

KO TE KŌUNGA O TE PŪTAIAO TE AUAHATANGA KI TE AO ANAMATA



## Contents

Foreword from the CITB Chair	04
Update from the BoD Chair and Chief Executive	06
About Us	08
Mission-driven science (highlights)	12
Our People	.24
World-class facilities	.28
Sharing our science with the community	30
Our governance and leadership	.32
Financial Statement	.34



## Foreword from CITB Chair

## Celebrating a century-long legacy of science

Cawthron Institute is a remarkable organisation, focused on delivering world-class ocean and freshwater science to create a better future.

Part of Cawthron's great legacy over the past 100 years has been the ability of our scientists to identify emerging issues and find solutions to the problems of the day. With the impact of climate change bearing down, and the effects of the pandemic still ongoing, there has never been a more important time for science. Despite the continued disruption caused by Covid-19, Cawthron scientists are more focused than ever to advance innovation that helps our country to prosper.

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. There is no question that through our research, we are helping to find sustainable new ways to use these resources so that our marine and freshwater ecosystems are healthy, our people and communities are thriving, and we have a blue economy that is prosperous.

In addition to delivering world-class science, acknowledging our past and celebrating our centenary was a big part of our philanthropic focus over the past year. More than 100 years ago, 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. It was his bequest that saw Cawthron Institute officially established in 1921, so it was only fitting that a celebration was held at Parliament earlier this year, hosted by then Research. Science and Innovation Minister Hon Megan Woods. This event acknowledged the profound impact Thomas Cawthron's legacy has had on the New Zealand science system, and the research undertaken by Cawthron which has made a tangible and important difference to the improved management of our coastal and freshwater ecosystems and growth of our aquaculture sector.

Part of Cawthron's legacy is to deliver a number of philanthropic activities to share our important mahi with our community, as well as inspire the next generation of scientists. From education in schools through to public science lectures, we take great pride in opening our doors and sharing our discoveries and innovation with our community.

In December 2021 we announced the appointment of Danette Olsen to the Cawthron Institute Trust Board as we farewelled long-standing Trustee Helen Smale. With extensive experience working in the research sector, Danette brings great perspective to Trust Board on the value of philanthropic activities and the benefits they can bring. We also welcomed returning Director Lees Seymour to the Board of Directors in May, who replaced Elaine McCaw after 10 years of service.

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



John Palmer Chair - Cawthron Institute Trust Board Chair



## An update from BoD Chair and Chief Executive

## No better time for science

Science and innovation are key to helping Aotearoa New Zealand thrive, by seizing the opportunities in front of us as well as tackling our most pressing issues.

Cawthron's mission-driven research is focused on the restoration, protection and value enhancement potential of Aotearoa's freshwater and marine environments and the communities interacting with these. Building on ki uta ki tai, ki tai ki uta (from the mountains to the sea, from the sea to the mountains) we apply a holistic approach involving mātauranga Māori and western science to improve our natural environment and deliver innovative solutions. Our rivers and lakes require urgent attention to stop further degradation, while our estuaries and oceans have vast, untapped potential to mitigate climate change and create sustainable products that enhance the wellbeing of our people.

With the ocean making up 96 percent of Aotearoa New Zealand's territory, there is significant opportunity for our waters to protect and provide for us, now and into the future. Our ultimate ambition is for Aotearoa New Zealand to be revered as a climate positive economy, where our global customers are proud that they are doing good for the world when they buy a product or service from us. A greater sense of urgency is needed to realise the pivotal role the oceans play in mitigating climate change and stimulating socioeconomic development. We believe the next decade must be a period of radical transformation because what we do in the ocean will be crucial to our country's entire economic transition to a climate positive economy by 2050. We cannot go green without blue.

We are excited about and thankful for the capabilities our team of 280 scientists and technicians from over 30 countries has assembled through local, national and international collaboration, to offer research into improved land and ocean management, more equitable social outcomes, and resilience against climate change and biodiversity loss. Cawthron's expertise is focused on aquaculture and blue technology, food safety and marine bioactives, biosecurity and ocean health, freshwater ecology and social science. Our research in these areas is helping to ensure Aotearoa New Zealand thrives through an intergenerational approach to taiao, moana and whenua, as well as contributing to the United Nations Sustainable Development Goals.

With an overarching focus on delivering healthy ecosystems, a prosperous blue economy and thriving people and communities, Cawthron's activities are centred on creating economic, environmental, social and cultural value. Our location, Whākatu/Nelson, is home to a large and diverse ecosystem of marine related stakeholders, offering the ability to create an exemplary blue economy with a healthy natural environment as the basis and circularity as the ultimate ambition. We look forward to playing a committed role in developing a blue economy in Aotearoa New Zealand. Our research helped to revolutionise the mussel industry through selective breeding and sustainable aquaculture farming methods, and we are now looking at the vast potential of seaweed. Cawthron is collaborating on several seaweed research programmes underway which could signal the establishment of an exciting new industry for our country. Continued interruptions through Covid-19 has made the past year a challenging one, and we are grateful to our team for the hard work and commitment to Cawthron. The inability to visit family and friends in our home countries, the need for many team members to work long hours as essential workers and organisational change we underwent during the course of the year have taken their toll on our Cawthron whānau. We thank you all for your support!

It is our purpose to be good ancestors and create a better future. We are excited about the possibilities at hand, and Cawthron's ability to make a meaningful difference.



Meg Matthews Chair, Board of Directors



Volker Kuntzsch Chief Executive

## About Us

## World-class science for a better future

### World-class science for a better future

Cawthron Institute is Aotearoa New Zealand's largest independent science institute, based in Whakatū/Nelson at the top of New Zealand's South Island. Our world-class science helps to build a better future by delivering science that supports healthy ecosystems, a prosperous blue economy and thriving people and communities.

Officially established in April 1921 with a bequest from Nelson businessman and philanthropist Thomas Cawthron, we have a century-long legacy of delivering worldclass science that supports the protection of our natural environment, the growth of New Zealand's primary industries through the sustainable use of natural resources, and the wellbeing of our people.

Thomas Cawthron's legacy is realised everyday by our highly qualified scientists, technicians, researchers and specialist staff from all over the world who come to work to explore and challenge the boundaries of new science and make ground-breaking discoveries.

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

### 100 years of Cawthron

Thomas Cawthron had a vision that science could contribute to the growth of a young New Zealand. Following his death in 1915, he 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 one of New Zealand's preeminent science organisations with 280 staff from more than 30 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 generate value for all through healthy ecosystems. Delivering world-class science for a better future reflects our commitment to being a good ancestor. 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.

### **Our Strategy**

Cawthron delivers world-class science in bold and collaborative ways. We create impact through science, mātauranga and leadership.



## Impact through world-class science, mātauranga and leadership.

## **Our Focus**

Ki uta ki tai, Ki tai ki uta From the mountains to the sea, from the sea to the mountains







People

## **Our Expertise**

Aquaculture Blue Technology Data Science Biosecurity Food & Bioactives Freshwater Ecology Healthy Oceans Microalgae Social Sciences Analytical Solutions

## **Our Outcomes**

Ko te kõunga o te pūtaiao te auahatanga ki te ao anamata For a better future



Healthy Ecosystems



A Prosperous Blue Economy



Thriving People & Communities





Cawthron Technical Operations Team Leader Marc Jary deploying an ocean monitoring buoy. 0

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### Healthy ecosystems

We deliver research and development that supports the protection and restoration of healthy freshwater and ocean ecosystems in Aotearoa New Zealand. We take a holistic approach to research design and delivery – ki uta ki tai, ki tai ki uta – from the mountains to the sea, from the sea to the mountains.

We draw upon the te ao Māori principle of kaitiakitanga (becoming agents in supporting the enhancement of natural processes) 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. We develop solutions that will help protect and grow our blue economy on the basis of a healthy ocean, with a focus on finfish, shellfish and seaweed aquaculture, algae, aquatic animal health and biosecurity, blue technology, open ocean aquaculture, environmental monitoring and restoration, and marine mammal ecology.

We draw upon the Te Ao Māori principle 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 freshwater, 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 for pharmaceutical applications, the identification of new marine toxins, and the development of world-first testing methodologies and environmental monitoring technologies.

We draw upon the te ao Māori principle of manaakitanga (care, respect, generosity) to deliver nature-based health, safety and wellbeing solutions.

### United Nations Sustainable Development Goals

We are committed to delivering impactful research outcomes that contribute to meeting the following United Nations Sustainable Development Goals:

- 1. No Poverty
- 2. Zero Hunger
- 3. Good Health and Wellbeing
- 4. Quality Education
- 6. Clean Water and Sanitation
  - 8. Decent Work and Economic Growth
- 13. Climate Action

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- 14. Life Below Water
- 17. Partnerships for the Goals



### **Delivering impact for our partners**

We work closely with our partners to deliver research solutions that support their aspirations and make a real difference to their operations, environments and communities.

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-theart technology and a purpose-built aquaculture park, aquatic animal health facility and National Algae Research Centre.

Cawthron is passionate about building stronger relationships with whānau, hapū and Māori enterprise that are consistent with Te Ao Māori values and support iwi/hapū/whānau aspirations. Across our organisation, researchers are working with Māori on a range of challenges and opportunities. Some of these projects involve consultation with Māori, some involve research partnership, and in other cases Cawthron is providing scientific support and services.

Researchers in Cawthron's Te Kāhui Āio team are working on the development and implementation of a new framework for 'research that is equitable and just for indigenous peoples' called 'He kāinga rangahau'. This framework is intended to guide Cawthron's engagement with Māori, but it is also hoped that this framework will contribute to a national and global conversation about how to ensure research that includes and affects Māori, also benefits them.

## **Mission-driven science**

To ensure we have healthy ecosystems, a prosperous blue economy and our people and communities are thriving, we focus our research on the following areas:





## Shellfish aquaculture one of Aotearoa's most sustainable growth opportunities

Cawthron researchers leading New Zealand's Shellfish Aquaculture platform, continue to deepen our understanding of shellfish/environmental interactions and likely climate change impacts to ensure we can realise shellfish as a significant growth opportunity. As part of the platform, Cawthron works with major shellfish producers, industry pioneers, and aspiring whānau/hapū/iwi, and our diverse research collaborations include six New Zealand universities and the Malaghan Institute.

The platform research targets sustainable growth through value chain innovation including reliable seed supply and improved genetics. We enable diversification through development of new and emerging shellfish aquaculture species. Our work secures shellfish production against future threats with improved shellfish health management, disease risk mitigation, and biofouling management.

Over the past year the platform has identified the potential to breed mussels for thermal resilience, as well as potential causes of juvenile mussel mortalities. Our research has enabled industry growth by supporting significant initiatives for two Māori-owned entities. Moana NZ opened Aotearoa's first commercial Pacific oyster hatchery in Nelson, while Te Whānau ā Apanui received funding to enable the next stage of its Greenshell<sup>™</sup> mussel hatchery (read on to find out more). The capability and knowledge developed as part of the Shellfish Aquaculture platform has played a critical role in enabling these initiatives, helping secure Aotearoa New Zealand's future supply of highquality hatchery spat.

## Supporting Te-Whānau-ā-Apanui to build aquaculture capability

Cawthron researchers have been assisting Te Rūnanga o Te Whānau to develop their new mussel hatchery near Te Kaha in Te Moana-a-Toi Eastern Bay of Plenty. The Government is backing the development of the new Te Huata International Limited Mussel Spat Hatchery through the Regional Partnership Fund. The initiative will provide skilled work as well as reducing our mussel industry's reliance on wild spat which is currently limiting industry growth. During the development process, Cawthron has been part funded by Callaghan Innovation to help Te-Whānau-ā-Apanui develop the knowledge and hatchery processes critical for the venture's success.

Cawthron is sharing its expertise to develop the capability and skills needed to build and operate a world-class shellfish hatchery, including a three-pronged research programme that will provide the foundation for a commercial spat-breeding programme.



## Technological innovation key to developing our blue economy

Farming in the ocean presents some of the greatest engineering challenges on earth because of the energy the ocean holds. Cawthron scientists are focused on enabling more sustainable ocean activities and blue economy growth through the development of 'blue technologies'.

Cawthron is a leading developer of new blue technologies in sectors such as biosecurity, open ocean aquaculture, remote sensors, environmental monitoring, ocean data and modelling solutions. Our scientists are leading a Spearhead project for the Science for Technological Innovation National Science Challenge to research precision aquaculture. The aim of this research is to develop sensors and data communication tools alongside data analytics that will enable aquaculture farmers to monitor their ocean farms remotely on their mobile phones or home computers.

#### Advancing open ocean aquaculture through Ngā Punga ō te Moana

Cawthron is leading a national, MBIE-funded open ocean aquaculture research programme called 'Ngā Punga ō te Moana', or Anchors of the Sea. This programme involves researchers from around the world who will work together to develop structures and systems for farming shellfish and seaweed in exposed waters. Cawthron researchers are working in partnership with Whakatōhea Māori Trust Board in Ōpōtiki, Te Moana-a-Toi Bay of Plenty, to support them in delivering their kaupapa Māori aquaculture vision.



#### Ngā Iwi i Te Rohe o Te Waiariki Collective's Iwi-Science Consortium

Cawthron is a signatory to the Collective's Memorandum of Understanding and is supporting the development of the Collective's Aquaculture Industry Roadmap. Members of Cawthron's Te Kāhui Āio group of researchers have also made progress towards delivering their Te Kete Rau Kotahi project which aims to assist the Collective in developing a mātauranga Māori centred, ecosystem-based aquaculture strategy (a component of the wider Aquaculture Industry Roadmap) for the Bay of Plenty.





Senior Marine Scientist Paul Barter working on the smart electronics that enable our buoys to remotely monitor changing weather and ocean conditions.



#### Seagrass restoration to help fight climate change

Cawthron has launched a seagrass restoration project that aims to fight climate change and improve ecosystem health, in partnership with the Westpac NZ Government Innovation Fund, Port Nelson Limited and forestry company OneFortyOne.

The three-year project will develop a blueprint for seedbased seagrass restoration that can be carried out across Aotearoa. The aim is to enable large-scale restoration of seagrass meadows, helping to support biodiversity, improve water quality and sequester carbon.

This blueprint approach will be trialled in a Nelson Haven case study before the findings are used to produce information and resources that could inform scalable seagrass restoration projects throughout Aotearoa New Zealand.

Project co-leader and restoration ecology team leader at Cawthron, Dr Dana Clark, says seagrass meadows support ecosystem health in coastal areas and are an important resource in efforts to mitigate climate change.

In addition, Cawthron scientists have also been commissioned by the Nature Conservancy to study the feasibility of coastal wetlands as blue carbon credit sites. It's now known that some coastal wetland areas can sequester much more carbon per unit than forest on dry land.

#### Climate change and shellfish aquaculture

Cawthron continues to invest in science that supports the resilience and success of New Zealand's shellfish aquaculture industry. In addition to being a massive economic opportunity, the growth of shellfish aquaculture in New Zealand and worldwide is desirable because it holds great potential as a low-carbon, sustainable and nutritious source of food production. Through the MBIE-funded Shellfish Aquaculture Programme led by Cawthron, our scientists are looking at a number of climate change-related stressors such as how shellfish respond to water-temperature related stress, and summer mortality syndrome. Harmful algal blooms (HABs) caused by warming waters are a known and wellmanaged risk to food safety and human health, with extensive monitoring and mitigation measures in place. However, new Cawthron research has revealed that the health of shellfish that ingest or come into contact with the algae can be negatively affected, with implications for the shellfish aquaculture industry.

This research will help gain the knowledge and tools the aquaculture industry needs to prepare for a changing environment and enable early detection and screening of HAB strains to better understand the effects of HABs and other climate change-related stressors to support effective shellfish stock management.

![](_page_14_Picture_12.jpeg)

![](_page_15_Picture_1.jpeg)

## New revolutionary antifouling technologies could help slow climate change

Biofouling on manmade structures like ship hulls, aquaculture equipment, or pontoons and jetties causes major problems because it degrades the surfaces and increases drag, which in turn significantly increases carbon emissions from the international shipping fleet.

Biofouling also represents a biosecurity threat because it allows invasive species to establish and spread within the marine environment.

'Antifouling' coatings are the traditional approach to controlling the accumulation of biofouling, and although effective, these kinds of antifouling coatings can generate unacceptable environmental damage so the need for improved antifouling technologies is urgent and globally important.

To meet the challenge, Cawthron has founded a hub for marine antifouling R&D, combining ecology and chemistry along with a network of leading international collaborators. A suite of methods has already been developed to screen for biofouling and measuring and testing the impact of antifouling activity.

New tools and technologies have the potential to make a big difference to the success of antifouling efforts in marine environments, creating efficiencies for blue economy industries and protecting New Zealand's coastal regions from invasive marine pests.

![](_page_15_Picture_8.jpeg)

![](_page_16_Picture_1.jpeg)

## Using eDNA to detect and protect marine and freshwater species in Aotearoa

To help protect our freshwater species, we need to know where they live, how many there are and what is causing their populations to decline. When we can understand where species populations are declining, we can target these environments for protection or restoration. Current animal monitoring techniques used in Aotearoa can be labour intensive, potentially disturb or interfere with the animals, and require a high level of expertise and expense to undertake. To overcome these challenges, Cawthron scientists have been developing molecular tools to assist with the detection and monitoring of our marine and taonga freshwater species.

Due to the simplicity and cost effectiveness of these new sampling methods, eDNA tools also have the potential to be used by a greater range of people, for example community groups and citizen science programmes. Ultimately, Cawthron hopes for the eventual incorporation of eDNA methods into standard procedures when carrying out monitoring and restoration programs in Aotearoa New Zealand.

## Virtual reality innovation helping to deliver vision for restoration at Lake Moawhitu

Cawthron freshwater researchers have been involved in supporting Ngāti Koata to deliver their long-term vision for the health of Lake Moawhitu on Rangitoto Ki Tonga/ D'Urville Island. Our involvement is largely through the Lakes380 research programme, a five-year MBIE-funded programme we co-lead with GNS Science that has captured the environmental, social and cultural histories of 10 percent of New Zealand's 3,800 lakes to ensure they are valued and protected for generations to come.

Through this programme, Cawthron supported the development of a cutting-edge virtual reality experience of Lake Moawhitu that is helping iwi members connect to the restoration kaupapa and become engaged in the wider project.

![](_page_16_Picture_9.jpeg)

![](_page_16_Picture_10.jpeg)

#### **Fish Futures**

Cawthron kicked off a five-year MBIE-funded research programme to provide innovative approaches for freshwater fish management. This research will address the increasing stress on Aotearoa New Zealand's freshwater fish from pressures such as human activity, climate change, pollution and threats from other species.

The programme embraces a transdisciplinary and coproduction approach to generating knowledge with research partners. The research approach aims to foster local relationships, empower fish managers, enhance the mana of kaitiaki, and help bring traditional knowledge systems together with science on a level field to generate new knowledge that will improve freshwater ecosystems and the lives of people living within them.

![](_page_17_Picture_4.jpeg)

## Understanding the impacts of microplastics in Aotearoa New Zealand

Cawthron researchers are contributing to Aotearoa Impacts and Mitigation of Microplastics (AIM<sup>2</sup>), being led by ESR. This national research programme aims to determine the impacts of microplastics, and is the first comprehensive research investigating the impact of microplastics and the threat to New Zealand's bioheritage systems, environments and ecoservices.

Microplastics are pieces of plastic less than 5mm in size, and worldwide there is increasing public and regulatory concern about the impact of microplastics on our environment, food, and health.

AIM<sup>2</sup> is improving our understanding of the levels, distribution and impacts of microplastics on Aotearoa New Zealand and its unique ecosystems and taonga. It will also help to further the international knowledge and understanding in this area of research. The project team is working closely with a range of primary sector industry bodies, regional councils and territorial authorities, NGOs, iwi and communities.

![](_page_17_Picture_9.jpeg)

## Development of a new Pest Alert Tool for flagging species of concern

To help with biosecurity preparedness, Cawthron researchers are leading a programme to develop a Marine Biosecurity Toolbox that will assist government, industry and education providers to protect New Zealand's marine environments from the impacts of non-indigenous species.

Significant progress has been made, including the development of a Pest Alert Tool. This online app screens high-throughput sequencing (HTS) datasets for marine species of concern. These datasets are generated from environmental DNA (eDNA) metabarcoding data from land, freshwater and marine ecosystems. Researchers and environmental authorities worldwide are increasingly using this approach for biodiversity assessments, new species discovery and monitoring of ecological trends.

It's hoped this app will help to ensure new pest incursions are detected early. The tool is currently accessible at: http://pest-alert-tool-prod.azurewebsites.net

## New Beneze tool helping fish farmers to tackle parasites

Cawthron aquatic health researchers have developed an innovative new web tool called 'BeNeZe' to enable support for fish farmers manage flatworm infections in Kingfish and Amberjacks (Seriola species).

Research leader Dr Kate Hutson says parasites are a persistent problem in kingfish aquaculture globally and can be challenging for start-up aquaculture businesses, because Kingfish are susceptible to several ecto-parasites, and left untreated, numbers can build quickly on fish in aquaculture farms and compromise their health.

New Zealand is investing significant effort into scoping the establishment of a Kingfish aquaculture industry, and Cawthron has aquatic animal health expertise and science capability that can support this potential expansion.

![](_page_17_Picture_18.jpeg)

Aquatic Health Scientist and PhD candidate Jo Copedo (left) and Aquatic Animal Health Senior Technician Karthiga Kumanan (right).

![](_page_18_Picture_1.jpeg)

#### Potential for a prosperous rimurimu/ seaweed sector

A series of reports co-authored by Cawthron scientists on behalf of the Sustainable Seas National Science Challenge shows how a prosperous rimurimu/seaweed sector has massive potential to improve the health and wellbeing of Aotearoa New Zealand.

The reports published over the past year show Aotearoa New Zealand could reap economic, environmental, social and cultural benefits – both nationally and locally. Seaweed makes up almost a third of global aquaculture production volume, with production tripling over the last 20 years.

Cawthron scientists are helping to identify unique characteristics of our native species and develop these native species into high value products and services, as well as remove barriers holding the sector back.

A final seaweed sector framework was published by Sustainable Seas in October 2022.

![](_page_18_Picture_7.jpeg)

## Growing 'methane-busting' seaweed at scale to fight greenhouse gas emissions

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.

## Developing the world's first algae-based local anaesthetic

An algae-based pain medication that could improve the care of patients undergoing surgery is now closer to reality thanks to a collaboration between Cawthron Institute and medical researchers at Boston Children's Hospital (a Harvard Medical School teaching hospital) and Chilean biotech company Proteus.

Cawthron has developed a reliable and commercially scalable method for producing neosaxitoxin, a potent toxin from the paralytic shellfish toxin family, that can be combined with existing local anaesthetics for use as a local anaesthetic during and after surgery.

This drug provides more effective pain relief for both children and adults following surgery. Opioid analgesics produce side-effects and can be addictive, so there is a great interest in developing better non-opioid approaches to pain relief. Work is currently underway to take the drug through to Phase 2 clinical trials.

![](_page_19_Picture_1.jpeg)

#### Karengo as a potential alternative protein source

Karengo, a native red seaweed, could provide the answer to alternative sources of protein, meeting the demand for better ethical food choices without compromising the eating experience. Cawthron is leading a collaboration of New Zealand and Singapore research organisations, as well as Wakatū Incoporation and Te Rūnanga o Ngāi Tahu.

Karengo has great potential as a high-value functional food and a unique food ingredient, and the research has so far found that karengo contains 30-35% protein as a percentage of dry weight – which could be a higher level of protein than any terrestrial food plant, 2% omega-3 fatty acids, almost all of which is eicosapentaenoic acid (EPA), and up to 70 ug/100g vitamin B12. Karengo extracts could be the basis of future meat substitutes which look and taste like the real thing and provide a good nutritional substitute.

It is hoped these advances in knowledge, together with increased research and funding support for the sector, will pave the way to commercial-scale production of karengo based on its unique attributes.

#### Seaweed as a sun skincare product

Aotearoa New Zealand has one of the highest skin cancer rates in the world. Studies have shown that sunscreen is vital to help prevent skin cancer and aging from sunburn and ultraviolet (UV) damage. The search is on for new effective suncare products that do not harm people or the environment.

Some seaweed and algae species have compounds that can protect them from damage caused by UV rays. Cawthron scientists are part of the Sustainable Seas National Science Challenge investigating the potential of seaweed to investigate the potential of native and endemic seaweed and algal species for use in environmentally friendly and innovative suncare products. The project is drawing on mātauranga Māori and western science to identify which species are best to develop for sunscreen protection.

![](_page_19_Picture_10.jpeg)

![](_page_20_Picture_1.jpeg)

#### Ensuring our food is safe to eat

Food safety is critical to our welfare and central to the prosperity of New Zealand, which is reflected in the fact that close to a third of Cawthron staff work in the field of food safety research and monitoring.

Cawthron's Chief Science Officer Dr Cath McLeod and Food and Bioactives Manager Dr Tim Harwood have played an integral role in developing the Food Safety Plan for Aotearoa New Zealand. The plan represents the shared and ongoing commitment to ensuring New Zealand's food safety system continues to achieve the best outcomes for our food and our people.

## Providing early warning to keep seafood consumers safe

Cawthron has a team of dedicated scientists and technicians who are world experts in seafood safety research and development. We lead New Zealand's Seafood Safety platform, which supports research that ensures the safety of our seafood and its continued access into high-value international seafood markets.

While New Zealand's seafood is generally safe to eat because of our strong regulatory framework and proactive monitoring, harmful algal blooms (HABs) are a naturally occurring threat, and whilst well managed, have the potential to negatively impact human health and cause significant economic and reputational damage to the seafood industry. As sea temperatures increase, so does the potential for more HABs.

Our expertise in developing monitoring tools and technologies for HABs provides early warning to the seafood industry and keeps consumers safe. In addition to automated monitoring, we also conduct manual monitoring activities in coastal areas including ports, harbours and outfalls, including microbial and faecal source tracking.

![](_page_20_Picture_10.jpeg)

![](_page_21_Picture_1.jpeg)

#### Upskilling kaitiaki to monitor for shellfish toxins

Cawthron scientists participated in a Paralytic Shellfish Poisoning (PSP) wānanga with Te Arawa Ki Tai Trust whānau and other guests from around the motu, which involved kaitiaki from Te Arawa Ki Tai in Maketu, from the Tauranga Moana area, Patuharakeke Te Iwi Trust and Ngāti Kuri.

Hosted by Te Arawa Ki Tai Trust at Whakaaue Marae in Maketu, the goal was to upskill kaitiaki in their knowledge of PSP and learn how to use testing equipment to monitor for the toxin in their own coastal areas. Cawthron gifted Te Arawa Ki Tai a testing kit, including a digital scanner that can confirm the presence of PSP causing marine toxins in shellfish in five minutes.

## Implementing community-led cyanobacterial monitoring at Lake Whakakī

Cawthron scientists are supporting a New Zealand Food Safety Science and Research Centre project with the Whakakī Lake community near Wairoa to implement community-led monitoring for cyanobacterial toxins (cyanotoxins). This project received funding through the Government's Vision Mātauranga Fund and aims to help the lake community better understand the risks posed by the toxins which are present in the tuna (eels) harvested there. In addition to working with the Whakakī Lake Trust, the project will be run in partnership with local iwi including Ngāti Hinepua, Ngāti Hine and Ngai Teipu.

## A one-stop shop to ensure safe drinking water for New Zealanders

Earlier this year Cawthron has collaborated with Lutra (experts in water and wastewater operations) to offer a complete cyanotoxin management service that will help ensure safe drinking water for New Zealand.

New national drinking water standards came into effect from 1 July 2022, and include increased risk assessment requirements for water providers around cyanobacteria, a type of algae commonly found in freshwater environments, including drinking water supplies, some of which can produce potent toxins which can cause serious health issues.

Catherine Moisan leads Cawthron's Natural Toxins team and said the collaboration with Lutra means that drinking water suppliers now have a one-stop shop option that can provide the most extensive cyanobacteria management in the country.

![](_page_21_Picture_11.jpeg)

## The need for impactful science funding

The research, science and innovation competitive funding processes are costly to Aotearoa New Zealand. Whilst Cawthron is able to generate revenue through consultancy and commercialisation, we still have a significant reliance on revenue through contestable government funds. Cawthron has an excellent track record stemming from our close relationship with stakeholders and iwi, however there are several aspects of the system that are challenging.

For example, the effort expended collectively in establishing the process, developing the bids, assessing the bids, managing the investment process, is likely higher than (or at least equivalent to) the funding paid out to successful bids.

In addition, although we work as collaboratively as possible with other research organisations, we often end up preparing bids for contestable funds that overlap and become directly competitive, as organisations are motivated to 'chase the money' rather than focusing on growing their unique areas of expertise.

Cawthron welcomed the opportunity to put forward submissions as part of the government's Te Ara Paerangi – Future Pathways Green Paper consultation in early 2022. Our vision for a revitalised research system for Aotearoa New Zealand is a system that empowers researchers, research organisations and the broad community of interest, makes a real difference to the lives of New Zealanders today and creates opportunities for a better tomorrow.

A system such as this, with intentional focus on high priority areas of research, science and innovation which fosters collaboration between community, science and industry (rather than competition), will provide a robust pathway towards a more prosperous and resilient future for all of Aotearoa New Zealand.

Cawthron looks forward to working with MBIE on the development of such a vision.

Cawthron is calling for a revitalised research system that makes a real difference to the lives of New Zealanders

![](_page_22_Picture_9.jpeg)

![](_page_23_Picture_1.jpeg)

## **Our People**

## United through our commitment to a better future

Our people are our greatest asset, and it is our culture at Cawthron that underpins our success. The reason why many people choose to work at Cawthron and are successful in what they do, and how they do it, is embraced by a commitment to a better future, environmental protection and restoration, sustainability and advances to protect environmental and human health.

With such a diverse workforce of 280 people from over 30 different countries, we are nurturing a culture where people can be themselves and are valued for their contribution (both personally and professionally).

Our location in Whakatū/Nelson at the top of New Zealand's South Island provides an inspirational setting for our marine and freshwater research and enables us to carry out cutting-edge field work research on our back doorstep.

Throughout the disruption caused by the Covid-19 pandemic, our many essential workers across our laboratories and animal research facilities stepped up to continue to deliver Cawthron's services. The ability to provide this service was demonstrated by our exceptional people and culture.

![](_page_23_Picture_8.jpeg)

### Our people profile

![](_page_24_Figure_2.jpeg)

The past year has been challenging as we navigated through the disruption and uncertainty caused by Covid. Many of our people felt the impact of the border closures, as with such an international team some were unable to see family and friends overseas for a substantial period of time. The Omicron outbreak also impacted on our ability to carry out some of our planned fieldwork. However, our culture of adaptability, innovation and collaboration meant we were able to support each other and remain highly engaged and motivated by our purpose to deliver world-class science, no matter the circumstances.

![](_page_24_Picture_5.jpeg)

![](_page_25_Picture_1.jpeg)

#### Strengthening our science focus

Over the past year we have strengthened our internal collaboration through a change programme called One Cawthron, which was designed to ensure we are well positioned for the future by setting ourselves up in a way that highlights our relevance and strengths.

Through this process, two new leadership positions were created to ensure a greater focus on strategic areas of research. Dr Cath McLeod was appointed as Cawthron's first Chief Science Officer, and former Coastal Group Manager Dr Chris Cornelisen stepped up into the role of Chief Science Capability Officer. Cath and Chris are leading the development of a strategic science plan for Cawthron with a 10-year horizon.

#### **Creating career pathways**

We endeavour to attract talent through a number of mechanisms, including the deliberate career pathways. We invest into our people through a Capability Investment Fund to develop and grow capabilities that are aligned with our strategic science focus, and/or strengthen our engagement with whānau, hāpu and Māori enterprise in a meaningful way.

In 2021/22 we invested almost \$300k in science capability development. These projects included:

- Aquaculture nutrition capability
- Micro algae taxonomy
- Ciguaterra fish poisoning
- Elucidating the origin of Tetrodotoxin in New Zealand shellfish
- Understanding, protecting and restoring New Zealand's estuaries
- Lake science and communication
- Establishing bioinformatics capability
- River metaphors

![](_page_25_Picture_16.jpeg)

Cawthron's Chief Science Officer Dr Cath McLeod and Chief Science Capability Officer Dr Chris Cornelisen.

![](_page_26_Picture_1.jpeg)

Cawthron Research Assistant Jacqui Stuart in the Cawthron Culture Collection.

#### Health, Safety & Wellbeing

Tūmanakotia te oranga tāngata, kia haere āhuru mai, kia hoki āhuru atu! Our priority is to ensure staff wellbeing, so they arrive protected (safe), and they leave protected (safe).

The health, safety and wellbeing of staff has always been a major focus at Cawthron, and our aim for health, safety and wellbeing is to enable an active safety culture where people look out for each other, and to support the physical, mental and social wellbeing of our staff — both at work and at home.

There were no serious harm or notifiable incidents at work during the past year. Cawthron continues to maintain our ISO 45001 accreditation. In addition to our people's physical health and safety, we continue to focus on the wellbeing of our employees through a number of initiatives; including our unique summer wellness initiative called the RACE (Revolution Against Carbon Emissions through Rewarding All Cawthron Employees). Running for the past eight years, the RACE is designed to encourage and celebrate employees who choose active and sustainable transport options to get to and from work.

#### Celebrating our people

Our people continue to be recognised for their impactful work across a multitude of research areas. Our science excellence was recognised through 160 publications, up from 151 in 2021, and 133 in 2020.

- Cawthron Freshwater Scientist and Molecular Ecologist Dr Susie Wood was awarded the prestigious International Society of Limnology Kilham Memorial Lecture Award.
- Cawthron researchers took out two top prizes in the 2022 New Zealand Biosecurity Awards – Dr Patrick Cahill won the AsureQuality Emerging Leader Award, and our Aquatic Animal Health team won the Bioprotection Aotearoa Science Award for their MBIEfunded Aquaculture Health Strategies programme.
- Mailys Picard and Katie Brasell were recognised at 11th International Wetlands Virtual Conference (INTECOL) for their Lakes380 research — Mailys for Best Oral Presentation and Katie won the New Zealand Freshwater Sciences Society Best Student Paper.
- Research assistant Jacqui Stuart was awarded the Antarctica NZ Scholarship for her phytoplankton research.
- The High-Value Nutrition National Science Challenge Musseling Up Team led by Cawthron was nominated for the Science and Research Award at the 2022 Primary Industries New Zealand Awards.

In addition, Cawthron scientists are regularly sought out for expert comment on topics such as aquaculture, freshwater, seaweed, seafood safety, biosecurity and toxic algae.

## World-class research facilities

Our world-class science is supported by world-class infrastructure, including the Cawthron Aquaculture Park, the Cawthron National Algae Research Centre, our commercial laboratories, our internationally significant Microalgae Culture Collection, and our new aquatic animal health biocontainment facility, Te Wero Aro-anamata.

#### Ngā Pūkaha o Tangaroa – National Algae Research Centre

The National Algae Research Centre, opened at our Aquaculture Park in 2021, is enabling the expansion of our algae research. From the extraction of microalgae properties for high-value nutra and pharmaceutical products, through to 'methane busting' seaweed, there are endless possibilities for algae-based products and solutions. Our Centre is an innovation hub, providing a bridge between science and commercial application. In 2022 the Centre picked up a Merit Award in the CBRE Industrial Property category at the New Zealand Property Council Awards.

## Te Wero Aro-anamata – protecting aquatic animal health

In 2022 we opened Te Wero Aro-anamata, an aquatic animal health research facility which is an important national asset in protecting aquatic health and marine and freshwater ecosystems. This facility is one of just a few in New Zealand and is uniquely equipped to safely handle and research fish and shellfish diseases caused by aquatic bacteria, viruses, and parasites. Research will also include work on aquatic pests, invasive organisms, harmful algae, pollutants and microplastics that represent a threat to New Zealand's biodiversity. This facility ultimately contributes to innovative economic and positive environmental outcomes for Te Tau Ihu, Aotearoa New Zealand and beyond.

## Keeping our food safe through our commercial testing laboratories

Close to a third of Cawthron staff work in the field of food safety research and monitoring. Food safety is critical to our welfare and central to the prosperity of New Zealand. Our internationally recognised and accredited laboratories offer comprehensive, independent testing services for the food and natural products sector. Our capability ensures products comply with New Zealand and international safety standards and export requirements, enabling fast market access and food safety assurance.

#### Leading the way in managing scientific data

Another one of Cawthron's core strengths is extracting scientific value from data, and the volume of data Cawthron is producing is growing exponentially. Over recent years Cawthron has collaborated with Datacom to develop a scalable data platform that stores data live from multiple sources in its original format, which is then made available to scientists in the way that they need it. This means scientists have a direct feed from sensors and other producers of data to update their research in real time.

#### Science and Technology Precinct – a hub of innovation

Progress continues on the Science and Technology Precinct, in collaboration with Port Nelson Limited. The vision for the proposed Precinct is to attract organisations from a variety of sectors who will work together to solve some of our most pressing challenges in science, 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 (blue) technology sectors.

10

World-class research facilities

# Sharing science with our community

## Inspiring the next generation of scientists - He pu tangata

Each year, in the spirit of our founder Thomas Cawthron, we invest in sciencebased 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.

#### Engaging with our community

Over the past 12 months Cawthron has held two Thomas Cawthron Annual Memorial Lectures, to allow for scheduling disruption caused by the impacts of Covid.

The 78th Annual Lecture became the platform for Cawthron's exciting announcement about the potential for the world's first algae-based local anaesthetic, and Dr Charles Berde, a world-leading clinician who co-founded the Pain Treatment Centre at Boston Children's Hospital, was our keynote speaker.

The 79th Annual Lecture aptly focused on the challenge of climate change. Keynote speaker Professor Bronwyn Hayward, a Professor in Political Science and International Relations, urged the audience that it is not too late to act.

The Annual Lectures build on a long legacy of talks from distinguished scientists and scholars, from Sir Ernest Rutherford to the Rt Hon Helen Clark.

## Recognising efforts to restore and protect our environment

Cawthron's 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 held in 2021. Winners were announced virtually due to the ongoing disruption of Covid. Congratulations to the Manawatu River Leaders' Accord, who won the Supreme Award for Catchment with Most Progress Towards River Health for improving the health of the Manawatu River.

We are also 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 next Award winners will be celebrated in 2023.

#### Nurturing 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.

![](_page_29_Picture_16.jpeg)

Cawthron Senior Marine Scientist Paul Barter leading an engaging workshop at the INSPIRE Festival.

In 2021 we welcomed the following four scholarship students:

- Te Pītau Whakarei Karahipi Scholarship, offered in partnership with Ngā Pae o te Māramatanga – Breanna Hindmarsh who worked on seagrass restoration.
- Emerging Scientist Scholarship Rachel Hooks who also worked on seagrass restoration.
- Theodore Rigg Scholarship Layla Sudol who studies the unique features of an ecologically important polychaete species.
- Kathleen Curtis Scholarship Emma Warmerdam who focused on developing detection tools for bacteria in shellfish.

#### Connecting with our future scientists

In addition to the summer scholarship programme, Cawthron is proud to sponsor the INSPIRE festival held each year in Nelson. The annual festival 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 hands-on workshops, and following the cancellation in 2021 due to Covid, we were excited to have Cawthron's Sam Murray and Paul Barter take part in the 2022 event. In May 2022 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, 90 students from across Te Tau Ihu visited Cawthron's Aquaculture Park to fulfil requirements of the NCEA Level 3 Biology 3.1 Curriculum Assessment.

Our annual Cawthron Scitec Expo (school science fair) was able to go ahead in 2021, which saw students from 26 different schools across Te Tau Ihu enter around 250 projects. More than 50 judges helped to crown the three Supreme Award winners from Waimea, Nayland and Nelson Colleges.

A new initiative launched in 2022 was a student workshop in schools focusing on lake health. As part of the workshop, students learn to extract DNA from a banana, which demonstrates the tools and techniques our scientists use to look for clues in lake history to determine the causes of deterioration in lake health.

We would like to thank all of our volunteers, including our own Cawthron people (past and present), as well as family members, local kaiako and members of the community who willingly give up their time to help us to deliver these important initiatives.

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## Our Governance and Leadership

#### **Cawthron governance**

We are owned by a charitable trust, established in accordance with the Thomas Cawthron Trust Act 1924. In keeping with the original Act, the Trust includes the Member of Parliament for Nelson electorate, the Mayor of Tasman District, the Mayor of Nelson and the Anglican Bishop. These Trustees appoint six additional trustees, who bring scientific and business expertise to the Trust.

The Trust appoints our governing Board of Directors, who establish our strategic objectives and policy framework and appoint our Chief Executive.

### Cawthron Institute Trustees 2021/22

![](_page_31_Picture_6.jpeg)

John Palmer Chair

![](_page_31_Picture_8.jpeg)

Mayor Rachel Reese

![](_page_31_Picture_10.jpeg)

Danette Olsen Appointed December 2021

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Nelson MP Rachel Boyack

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Mayor Tim King

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Archdeacon Harvery Ruru QSM

![](_page_31_Picture_18.jpeg)

Sarah-Jane Weir

![](_page_31_Picture_20.jpeg)

Bev Doole

![](_page_31_Picture_22.jpeg)

Anglican Bishop of Nelson, Steve Maina-Mwangi

![](_page_31_Picture_24.jpeg)

Helen Smale Retired December 2021

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Jan Hania

### Board of Directors 2021/22

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Meg Matthews <u>Ch</u>air

![](_page_32_Picture_4.jpeg)

Nagaja Sanatkumar

![](_page_32_Picture_6.jpeg)

Elaine McCaw Retired May 2022

![](_page_32_Picture_8.jpeg)

Dr Matt Peacey

![](_page_32_Picture_10.jpeg)

John Cunningham

![](_page_32_Picture_12.jpeg)

Lees Seymour Appointed May 2022

![](_page_32_Picture_14.jpeg)

Carl Carrington

![](_page_32_Picture_16.jpeg)

Murray King

### Core Management Leadership Team

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Volker Kuntzsch Chief Executive

![](_page_32_Picture_21.jpeg)

Dr Cath McLeod Chief Science Officer

![](_page_32_Picture_23.jpeg)

Dr Chris Cornelisen Chief Science Capability Officer

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Anaru Luke Tumuaki Te Kāhui Āio

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Stuart Cooper Chief Commercial Officer

## Science Leadership Team

![](_page_32_Picture_30.jpeg)

Dr Johan Svenson Science Impact Manager

![](_page_32_Picture_32.jpeg)

Dr Kirsty Smith Molecular Algal Ecology Manager

![](_page_32_Picture_34.jpeg)

Dr Roger Young Freshwater Ecosystems Manager

![](_page_32_Picture_36.jpeg)

Jim Sinner Social Science Manager

![](_page_32_Picture_38.jpeg)

Dr Grant Hopkins Healthy Oceans Manager

![](_page_32_Picture_40.jpeg)

Dr Seumas Walker Aquaculture Group Manager

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Dr Tim Harwood Food and Bioactives Manager

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Dr Patrick Cahill Biosecurity Manager

## Financial Performance

### for the year ended 30 June 2022

<b>2021</b> \$000's		<b>2022</b> \$000's
43,598	Income from research contracts, analytical services, consultancy & other scientific projects, lease income and other income	43,208
43,114	Expenses including depreciation	42,742
484	Net operating surplus	466
1,766	Revaluation of land and buildings	(1,208)
2,250	Trust Surplus	(742)

#### Financial Position as at 30 June 2022

<b>2021</b> \$000's		<b>2022</b> \$000's
	The Institute's Trust Capital is represented by;	
11,704	Asset revaluation reserve	10,496
130	Special projects and bequests reserve	69
27,022	Accumulated comprehensive revenue and expenses	27,549
38,856	Total Trust Capital	38,114
	Trust Capital funds the following Net Assets;	
4,222	Working capital	14,356
39,628	Fixed assets	31,590
(4,994)	Long term liabilities	(7,832)
38,856	Total Net Assets	38,114

#### Movement in Equity for the year ended 30 June 2022 2022 2021 \$000's \$000's 38,856 36,606 Opening balance 484 **Trust Surplus** 466 1,766 Revaluation of land and buildings (1,208) 38,856 **Closing Balance** 38,114

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.

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![](_page_35_Picture_0.jpeg)

98 Halifax Street East — Nelson 7010, New Zealand