



A YEAR IN REVIEW 2019-20

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

We are leaders in delivering independent scientific research and development.

Our world-class science uses new ideas and technology to support New Zealand's primary industries develop innovative, sustainable solutions, as well as protect our unique marine and freshwater environments.

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CONTRACTOR OF

Chair and CEO Update

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

Cawthron has a long-standing reputation for delivering science excellence, and our highlights over the past year demonstrate the real-world impact our research has had.

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 working to advance innovation in open ocean aquaculture, seaweed and 'aquatech' – all areas that have enormous potential for New Zealand's aquaculture industry. We were pleased to see the launch of the government's Aquaculture Strategy in September 2019, and strongly believe that the target of creating a \$3b industry by 2035 is achievable, when supported by excellent and impactful science.

We have continued to ensure our research is focused on our five strategic science themes; aquaculture, seafood safety, bioactive resources, freshwater and ocean health. These themes have proved to be well aligned with the increasing interest in consumer health, primary sector disease mitigation, environmental health, increased investment in food safety and aquaculture sectors, and investment in technology. We believe they will see Cawthron play a leading role in supporting New Zealand's Covid-19 recovery efforts.

The health of the nation, our people, our environment, and

our primary sector products have and will continue to set New Zealand apart in international markets. We hold the view that sustainable businesses will be the most successful businesses over time, and that's why we continue to transition to a clean, green, carbon neutral organisation in a wide variety of ways – from basic research which grows our understanding of climate change, its impacts and how to adapt, to practical technology development and investment in solutions to reduce agricultural emissions. It is important that we continue to grow research and innovation across all these horizons of activity.

Despite the continued disruption and uncertainty caused by Covid-19, our engagement survey results from May 2020 showed that 89 percent of our people are engaged in their work. This is up from 85 percent in 2019 and is significantly higher than global benchmarks. These results once again demonstrate the unique culture and values we uphold at Cawthron.

Nothing is more important than the health, safety and wellbeing of our people. We are pleased to report that there weren't any serious harm incidents during the year, but we know that our systems need to be continually improved to ensure we can continue that enviable track record.



In May 2020 Cawthron achieved ISO certification in health and safety conforming to the ISO 45001.2018 international standard. In addition to our people's physical safety, we continue to focus on the wellbeing of our employees through a number of initiatives such as the introduction of the KYND app, which is a risk assessment tool that measures, monitors and manages health and employee wellbeing.

During the year Cawthron has undertaken a strategic risk review which has required a fundamental shift in how we approach risk and use best practice from recognised risk standards such as ISO 31000. As a result, we have refreshed our risk management processes which are built around the five science themes and four key support risk areas across the organisation.

A focus over the past year has been the detailed investigation and planning into making the investment required in our infrastructure, to support our strategy now, and for a 50-year horizon. This includes our National Algae Research Centre, a PC2 Level facility to deliver our aquatic health and biosecurity research, and upgrading our Cawthron laboratories.

The past year has seen some changes to Cawthron's Board of Directors, with Director Lees Seymour resigning in August 2019, and Dr Dianne McCarthy retiring in December 2019.

Both Lees and Dianne made a significant contribution in guiding Cawthron through its unprecedented growth. We have since welcomed Carl Carrington, Murray King and Dr Matt Peacey as Directors, and Andrew McGlashen as our Emerging Director for a term of twelve months.

Cawthron is a special organisation with a passionate and engaged group of people who are committed to creating a better future. Our ground-breaking science is continually sought after both nationally and internationally, and we would like to extend our heartfelt thanks to our Cawthron whānau who show unwavering commitment to making a difference, particularly in an especially challenging year. There are now more than ever before opportunities to have a greater impact on the restoration and protection of waterways and the marine environment while promoting innovation to accelerate the development of a healthy aquaculture sector and exports.

We are proud of the positive difference Cawthron makes to New Zealand's economy and our environment, and together we are creating a better future.

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Meg Matthews Chair, Board of Directors

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Professor Charles Eason CRSNZ, CNZM Chief Executive

About Us

Cawthron Institute is a world leader in independent scientific research and development.

Based in Nelson, New Zealand, we focus on growing and ensuring the safety of our seafood sector, developing marine bioactive resources, and improving the health of our freshwater ecosystems and oceans.

Our world-class science uses new ideas and technology to support primary industries develop innovative, sustainable solutions, as well as protect our marine and freshwater environments.

Our scientists have expertise in aquaculture research, marine and freshwater resource management, food safety and quality, algal technologies, biosecurity and analytical testing. Our ground-breaking science is supported by substantial testing and research laboratories, state-of-the-art technology and a purpose-built aquaculture park.

The Cawthron Aquaculture Park houses a world-leading Finfish Research Centre designed to deliver commercially relevant science to enable improved stock management and husbandry and support the development and growth of the finfish aquaculture industry. Covering 20 hectares, the Park also hosts industry operations as well as teaching labs operated by Nelson Marlborough Institute of Technology. In addition, Cawthron's internationally recognised and accredited laboratories offer an independent testing service for the food and natural products sector, and to ensure products comply with New Zealand and international safety standards and export requirements.

Our scientists work closely with a number of primary sectors to

develop customised analytical solutions to support product development and to validate nutritional content. Cawthron's microalgae laboratory provides early warning of risks associated with toxic marine species at over 110 sites around the east coast of New Zealand.

Since our establishment we have firmly focused on research that contributes to the economic growth of New Zealand and the preservation of its special environment. Our scientists have been able to identify emerging areas of research to assist industry – and New Zealand – become sustainable and successful.

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





Above: Scientist Paul Barter deploying an upgraded Cawthron-designed wind and solar powered buoy in Milford Sound.

We collaborate globally and attract overseas revenue for environmental, food safety and aquaculture research. Our breadth of experience is built upon a solid understanding of commercial end market needs and we work with our partners to identify practical, cost effective solutions.

Our scientific expertise in algal biotechnology is internationally recognised, especially in the study of algal production and harmful algal blooms. From assisting the seafood industry to establishing monitoring systems that ensure the safety of our shellfish exports, to the care of the nationally significant Cawthron Institute Culture Collection, Cawthron provides research, technology and advice. Our work in these areas is cementing Cawthron's reputation for delivering world class science, and it is providing more commercial opportunities with partners from all over the world than ever before.

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Pioneering New Zealand science for nearly 100 years

Cawthron Institute was officially established in 1921 by the last will and testament of Nelson philanthropist Thomas Cawthron who 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 \$127 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.

Our history remains a big part of who we are. Thomas Cawthron's legacy is realised everyday by our people who come from all over the world to work with us to explore and challenge the boundaries of new science. Every fortnight we celebrate our founder by holding *TOM Talks*, which are Cawthron's internal take on TED talks.





Left: Aquaculture Technicians Dominique Cronje and Isaac Cooper monitoring gourmet algae feed at the Cawthron Aquaculture Park. Below: Cawthron Natural Compounds Technician Craig Waugh.



Our Strategy

Our Vision

To be the most sought-after scientific research institute in the world.

Our Purpose

Ko te kõunga o te pūtaiao te auahatanga ki te ao anamata. World-class science for a better future.



Our Science

Cawthron scientists bring a combination of practical experience, scientific excellence and industry knowledge to everything we do.

We are regarded as world leaders in advancing aquaculture practices, including open ocean, finfish research, breeding, and hatchery technology. This is supported by our expertise in aquatic heath. We have attracted global interest in and set international standards from our analytical and natural compound chemistry and our scientists are regularly sought out as consultants in marine and freshwater ecology, biology, and biosecurity.

In order to ensure the future value of our research is protected, we have expanded our intellectual property protection mechanisms to include a range of activities; from trade secrets through to international patents.

Above: Coastal Scientist Carlos Campos sampling water in the Monaco estuary. Right: Freshwater scientists Marc Tadaki and Joanne Clapcott.



Our science excellence recognised through **133 publications**, up from 115 in 2019.



Science Highlights

To help protect our precious marine and freshwater environments, and support New Zealand's economic growth through the sustainable development of primary sectors, we focus our research on the following science areas:

Growing our seafood sector without environmental compromise	We back New Zealand's aquaculture industry by delivering science that supports sustainable growth and resilience. Our science has been implemented by a number of New Zealand's largest seafood companies. We are committed to research and development that supports innovation and new opportunities, but also safeguards existing industry from emerging biosecurity threats, including climate change.
Ensuring the safety of our seafood harvest	We advance internationally-validated research programmes that safeguard New Zealand's \$1.8B seafood export industry. Our science has set international standards for the global seafood industry to detect existing and emerging toxins so consumers can have confidence that their seafood products are safe to eat, as well as ensuring faster market access for industry worldwide.
Realising the potential of our bioactive resources	We are creating new possibilities to meet growing global demand for nutraceuticals, pharmaceuticals and other products derived from bioactive compounds that are extracted from algae and other natural resources. We can isolate, characterise and extract unique compounds from bioactive resources, and we supply concentrated algae extracts to laboratories all over the world to use as food safety reference standards.
Improving the health of our freshwater ecosystems	We deliver innovative freshwater solutions that support robust decision making in both community and policy settings.
Improving the health of our oceans	Our research in biosecurity, aquatic technologies, marine mammals, estuarine ecosystems and monitoring activities are being used to assess ecosystem health.



Growing our seafood sector without environmental compromise

Impact Case Studies

Helping to boost our salmon farming industry

After four years of research and development, Cawthron's ground-breaking Salmon Feed Conversion Efficiency (FCE) research programme is showing promising results.

The FCE research programme aims to develop indicators for healthy king salmon, on-farm performance and environmental interactions, as well as enabling genomic selection, with a view to improving performance and efficiency. So far, the results of the programme speak for themselves:

Building the new Finfish Research Centre: Cawthron's national Finfish Research Centre was built to support research that enables improved stock management, breeding and husbandry of salmon.

Development of diagnostic health tools: For the first time, comprehensive databases are available to farmers and fish health experts providing reference indicators for King salmon health diagnostics, enabling them to make informed and improved decisions about how they manage their farms.

Leading-edge environmental monitoring technologies – Cawthron has developed monitoring tools and technologies that allow New Zealand's salmon farmers to monitor what is happening on their farms remotely. This includes multi-array sensor deployments and the development of a buoy data platform that enables near real-time access to data. **Enhancement of feeding practices** – In addition to what salmon eat, how much they eat is also important. Cawthron's research into feeding regimes has indicated that slightly reduced feeding may be more beneficial to salmon, helping farmers reduce costs by determining optimal feeding regimes to improve FCE and reduce waste.

Improved nutrient demand and growth models for freshwater chinook salmon – Feed efficiency trials have enabled the development of improved models which are being used by salmon companies to optimise feeding of fish and develop new, tailored diets to enhance efficiency.

Genotyping-by-sequencing to form a database of over 10,500 genotyped Chinook salmon – The data, developed in partnership with AgResearch, has broad value to New Zealand's salmon industry, and other organisations such as Fish and Game, and is informing the development of costeffective genomics applications for commercial breeding programmes.

Our systems biology approach has discovered other new key differences between efficient and inefficient King salmon. So far genetics, feed intake, basal metabolic rate, protein turn over and lipid metabolism have been shown to play a role in making some individuals more efficient.

This research will equip farmers with the knowledge needed to improve on-farm production, supporting the future growth of this sustainable industry.

Robust science key to successful open ocean aquaculture

Collaboration, science and innovation, combined with New Zealand aquaculture's pioneering spirit will lead the way for open ocean aquaculture development around New Zealand, as highlighted at the first-ever Open Ocean Aquaculture Symposium organised and hosted by Cawthron in August 2019.

The three-day Symposium focused on unlocking the potential of New Zealand's open ocean aquaculture, discussing opportunities for shellfish, seaweed, and finfish.

New Zealand's aquaculture industry is growing in response to globally increasing demand but is constrained by limited sheltered inshore farm space. Open ocean aquaculture affords New Zealand the best opportunity to grow its blue economy, by combining appropriate environmental planning with smart farming systems. This will help to sustainably realise the value of our vast open ocean resources, as well as create jobs and futures for many people.

Now, after more than a decade of open ocean aquaculture research and development, Cawthron is helping to take aquaculture to a level where it is ready for the next step, which is developing offshore farms for mussels, seaweed, and finfish. Our role is to help advance open ocean aquaculture technology through the development of new tools and methods to cost-



Above: Photo Credit - SINTEF Above Circle: International collaborator Arndt Hildebrandt speaking at the Cawthron Open Oceans Aquaculture Symposium.

effectively farm seaweed, shellfish and finfish including the use of modelling and wave tank simulations.

The symposium brought together thought leaders from around the world, drawing 230 attendees from New Zealand, Australia, Europe, South America and the United States, including industry representatives and scientists from many disciplines.

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Cawthron's seafood safety testing method internationally validated

Late in 2019, a method developed by Cawthron scientists to detect toxins in seafood gained international validation and has helped to set a world standard for the global seafood industry. Cawthron, in partnership with food safety scientists at the Centre for the Environment, Fisheries and Aquaculture Science (Cefas), UK, concluded a four-year international study to gain international recognition of a new method to detect neurotoxins in seafood products.

The method to detect naturally occurring toxins in shellfish such as clams, mussels, and oysters was developed to include the highest range of Paralytic Shellfish Poisoning (PSP) and is more accurate and faster than current internationally approved methods.

Ultimately this testing method allows consumers to have confidence that their seafood products are safe to eat and ensures faster market access for shellfish industries worldwide.

The benefits of this faster, more accurate testing method have already been realised by the New Zealand seafood industry during two recent harmful algal bloom events. Cawthron Above: Emillie Burger, Michael Boundy and Tim Harwood working on research as part of the New Zealand Seafood Safety programme.

was able to respond quickly and provide industry partners with assurance their products were safe for market.

The project, funded by the New Zealand Seafood Safety research programme and Cefas, was a truly global study, incorporating 21 participating laboratories from five continents.

The success of this international multi-laboratory validation study is a game changer in terms of regulatory testing and for managing PSP toxins globally. It also demonstrates what can be achieved through collaboration between these internationallyrecognised research organisations.

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Realising the potential of our bioactive resources

Impact Case Studies

Cawthron's algae collection provides global reference 'library'

Algae are a core component of Cawthron's R&D activities, which include microalgae production and extraction of bioactives, microalgae for aquaculture feed, experience with macroalgae cultivation and cryopreservation of microalgae.

Cawthron also has one of the world's largest living algae collections which underpins research worldwide, and supports vital work to ensure the safety of New Zealand's seafood. The only one of it's kind, Cawthron's algae collection is highly ranked in the Asia-Pacific region, and is a member of the Asia Oceania Algae Collection network.

While Cawthron's collection of microalgae has long served as a reference 'library' for scientists around the world, Cawthron is also helping to meet the global demand for biotoxin reference material needed for research and monitoring of marine toxins that impact on seafood safety.

Cawthron's ability to isolate specific compounds from algae grown and processed on site is being used to provide purified toxins to research organisations around the world. For example, the purified algae compounds produced by our scientists are supplied to laboratories worldwide for use as Certified Reference Materials for food safety testing and research.

In conjunction with private sector partners, we have also established commercial-scale systems to maximise microalgae bioactive productivity. We are working with these partners to optimise algae strain development and to identify algal species with the exciting potential to produce high-value nutraceutical and pharmaceutical products.





Above: Research Scientist Tom Wheeler examining a specimen of Karengo.

The potential of seaweed

Seaweeds of the genus *Asparagopsis* have been shown in overseas studies to reduce methane emissions in livestock by up to 98% when fed as a supplement. In October 2019, Cawthron received \$100,000 from the Government's Sustainable Food & Fibre Futures fund for research into growing the native red seaweed (*Aspargopsis armata*) and quantifying its bioactive content. Cawthron also contributed \$150,000 towards the research programme, which is being run in collaboration with researchers from the University of Waikato and leading Australian macroalgal scientist, Professor Rocky de Nys.

The research is focused on developing an early proof of concept of the aquaculture production systems needed to develop *Asparagopsis* at scale. It is hoped that the results will help industry develop economic seaweed farming systems for the future, so Cawthron is investigating how to generate a sustainable supply of juvenile *Asparagopsis* for seeding out in farms.

This project will build on Cawthron's world-leading algae research, and *Asparagopsis* is just one of a number of seaweeds and algae that have high-value potential for New Zealand.

Micro and macro algae (seaweed) are an area of global growing interest due to their unique properties. We already work with a range of commercial partners to optimise the growth of healthy algae strains for successful aquaculture and increasingly to identify algal species, like *Asparagopsis*, with the potential to produce high-value products.

Cawthron is also researching Karengo. These red seaweeds are valued as a winter delicacy by Māori because they have a high protein content. Cawthron is looking at their functional food properties and also at characterising these species which are morphologically difficult to differentiate.



Lakes380 – understanding the health of our lakes

Lakes380 (Our Lakes' Health: past, present, future) is a five-year research project funded through the Government's Endeavour Fund that Cawthron co-leads alongside GNS Science. It is the biggest scientific study of New Zealand's lakes in our history, and aims to enrich our understanding of the environmental, social and cultural histories of 10% of New Zealand's 3,800 lakes (>1 ha).

This involves collecting and analysing lake sediments and water samples, as well as interviews and field visits.

In this third year of the project, an important milestone was reached, with the team of researchers from Cawthron, GNS

and academics from Victoria, Auckland and Otago universities sampling their 200th lake.

Capturing 1000 years of lake history will contribute new knowledge to ensure our lakes are valued and protected – now and for generations to come.

The project continues to receive media interest and stimulate public engagement. Dr Susie Wood, Cawthron Senior Scientist and Lakes380 co-lead was awarded the New Zealand Freshwater Sciences Society medal for her outstanding leadership in freshwater science and of women in science in 2019. Susie was also the introductory speaker at the 2019 Thomas Cawthron Annual Memorial Lecture, showcasing the work completed to date on the Lakes380 programme.



Left: Members of the Lakes380 team extracting a sediment core. Above: Lakes380 co-lead Susie Wood sampling lake water.



Above: Freshwater Scientist Robin Holmes looking for river health indicators.

Helping citizen scientists to assess stream habitats

Thanks to MBIE Envirolink funding, Cawthron has developed a video demonstrating how to carry out stream habitat assessments that has been used by regional councils and citizen scientists to monitor stream habitats and inform environmental planning.

The video demonstrates how to carry out the Rapid Habitat Assessment (RHA) protocol, which is a method used to record key aspects of habitat features and provides a single 'habitat quality score' for a river reach. The protocol was developed to help with national standardisation of stream habitat assessment and is designed to complement water quality and macroinvertebrate data collected as part of national State of Environment monitoring.

Aquatic life is dependent on various features of stream habitat and riparian areas. Knowing what types of habitats are present, in what amounts and how these habitats might be changing over time is vital to understanding overall stream health.

The RHA protocol ensures that consistent stream habitat assessments can be undertaken quickly, and because it is used across the county it will provide an abundant source of data to assess local and national trends over time.

Knowing what types of habitats are present, in what amounts and how these habitats might be changing over time is vital to understanding overall stream health.



Improving the health of our ocean

Impact Case Studies

Advancing eDNA tools to measure the health of our estuaries

Over the past year Cawthron researchers have played a significant role in the development of estuarine health assessment methods that are feasible to implement all over New Zealand. We have made significant progress towards the development of estuary-specific eDNA health assessment tools and research that will help link the health of estuaries to their upstream sources.

Cawthron, NIWA and the University of Waikato have also recently released a new tool called the National Benthic Health Models which can be used to assess the health of any estuary in New Zealand.

The National Benthic Health Models use information about the animals living in the seafloor sediments of our estuaries (e.g. worms and shellfish) to assign a score which indicates the health of the estuary in response to the two key coastal stressors – sedimentation and heavy metal contamination. Cawthron researchers also made a significant contribution to the development of the Parliamentary Commissioner for the Environment's 'Managing our Estuaries' report, formally reviewing drafts and providing feedback on its findings and

Above: Marine Ecologist Olivia Johnston sampling estuary water; Marine Ecologist Dana Clark.

recommendations.

Transforming how marine pests are managed

In September 2019 Cawthron was awarded \$10.5m through the Government's Endeavour Fund to develop a marine biosecurity 'toolbox' that will transform the way marine pests are managed in New Zealand.

The Cawthron-led research programme is a collaborative initiative that brings together a multidisciplinary and international science team including New Zealand's Scion Research and the universities of Otago and Auckland, and Australia's Deakin, Macquarie and Durham universities.

The arrival and spread of marine non-indigenous species around New Zealand is causing irreversible changes to our native ecosystems. Despite significant operational marine biosecurity expenditure, the domestic spread of marine pests and pathogens is ongoing. There is a need for radical, new, effective and integrated technologies to limit the spread of non-indigenous species around New Zealand's coastal environments and industries. The five-year research programme is designed around enduser needs and aims to deliver workable solutions ranging from proactive pest prevention to interactive software-based applications. Cawthron researchers work with an outstanding team of marine biologists, ecologists, modellers, engineers, Mātauranga Māori practitioners, economists and material and social scientists from New Zealand and overseas to deliver a practical, fit-for-purpose toolbox for better, proactive biosecurity management.

Cawthron researchers bring together an outstanding team from New Zealand and overseas to deliver a practical, fit-for-purpose toolbox for better, proactive biosecurity management.





Left: PhD Student Francois Audrezet. Above: Local teachers learning about Cawthron's research into marine biofouling.

Investing in our future He pūna rere ki te moana nui

A core tenet of Cawthron's sustainability is its ability to invest in staff development, state-of-the-art scientific instrumentation and specialised infrastructure. Our advantage lies in our robust relationships with our stakeholders, key industry partners, and our expanding interests with global collaborators.

This Cawthron-designed buoy uses satellite telemetry to monitor changes in weather and ocean conditions in near real time. The data-set produced by the monitoring programme represents one of New Zealand's most comprehensive ocean time series. As a result of scientific excellence, strong business performance and collaborative partnerships both locally, nationally and globally, Cawthron is able to demonstrate leadership excellence through investing in our people, our science, our infrastructure and our community.

Collaboration with our partners

We pride ourselves on being a leader in collaboration. A prerequisite for world-class science is research programmes that link our internationally recognised leading researchers with global experts from around the world and other New Zealand research institutes.

Cawthron leads MBIE's Strategic Science Investment Fund (SSIF) platforms in seafood and aquaculture, with responsibility for growing New Zealand's capability and delivering impact. We have had considerable success working with the New Zealand Food Safety Science and Research Centre and National Science Challenges (NSCs) including national leadership roles, as well as undertaking research projects within the various NSCs. In particular, Cawthron has a number of research projects in the Sustainable Seas, Science for Technological Innovation (SfTI) and High Value Nutrition NSCs. We have also joined the Our Land and Water and Biological Heritage NSCs and anticipate further projects within these challenges in the coming years.

Cawthron receives substantial industry investment for research and development and environmental research and monitoring. There is strong demand for our professional consultancy and advisory services, particularly in the Coastal and Freshwater science area.

Cawthron is working with partners to ensure our research and advisory capability is aligned with emerging technology.

Our world-leading researchers are linked in with national and global expertise in environmental research institutes and commercial entities. This momentum, along with our unique culture, is attracting exciting new opportunities with short, medium and longer-term horizons.

Cawthron is working with partners to ensure our research and advisory capability is aligned with emerging technology.

Managing our risk

Cawthron's risk focus over the past 12-24 months has firmly been on managing significant growth and dealing with a wide range of deferred maintenance issues exacerbated by the pace of growth and change. The traditional risk register system was recognised as being cumbersome and impractical and has not kept pace with the organisation's operations. Over the last six months Cawthron undertook a strategic risk review, with assistance from KPMG, which required a fundamental shift in how we approach risk.

Using best practice from recognised risk standards such as ISO 31000, risk is defined as "the effect of uncertainty on objectives:".

We have refreshed the process to focus more positively on *what must go right*. This has informed bottom-up work built around the five science themes and four key support risk areas across the organisation.

Leading in our community

As one of the largest employers in the Nelson Tasman region, Cawthron exercises a great deal of regional leadership. We support a wide range of local primary industry clients, local authorities and community organisations and schools to achieve their objectives. This is consistent with our status as a charitable trust and our history in the region.

Cawthron is a member of the Nelson Tasman Innovation Neighbourhood (NTIN), a diverse group of local organisations who have come together in collaboration to tackle common business challenges and identify joint opportunities.

One of the key focus areas over the past year has been looking at ways to attract top talent to the region, connecting tertiary graduates with local opportunities to effectively create brand ambassadors for the region. Over the summer Cawthron took on four summer interns as part of the NTIN collaboration, and we've subsequently offered a 12-month contract to one of the graduates to work as part of Cawthron's Digitech team.

One of the other local leadership opportunities previously identified has been to hold a 'Cawthron Community Day', which would see Cawthron staff volunteering in the community. Plans were made for a mass tree planting activity in the Nelson Tasman region due to take place in May 2020. The decision was made to cancel this event due to the Covid-19 lockdown, however plans are in place to reschedule this for 2020/21.



Sustainability He pū tū roa

Cawthron continues to have a key focus on sustainability in our research and in our practices, with a substantial number of programmes focused on environmental restoration and protection.

R&D focusing on sustainability

We do this through our research and development, for example looking at health products, pharmaceuticals and future foods, and in our aquaculture research. We play a big role in supporting the development of sustainable foods, such as aquaculture, as well as looking at how to protect consumers by ensuring the safety of their food. We also lead and contribute to a number of freshwater and ocean ecosystem health research programmes.

Cawthron measures and tracks the amount of greenhouse gas emissions from our activities as we make progress towards carbon neutral. In FY20, tonnes of CO_2e reduced by 32% per FTE staff member, and 24% per \$1000 of revenue.

We partner with those whose values align with our own, which is a big part of why our staff come to work each day. Cawthron is a leader locally working closely with councils and being actively involved in the Nelson Tasman Climate Forum and the Business Forum for Climate Change.

Embedding sustainability

In addition, we have completed several sustainability initiatives over the past year ranging from electric vehicle charging stations through to waste disposal. We have worked hard to move sustainability from being a policy to becoming embedded in our daily activities and part of our way of working.

- The new administration wing at the Cawthron Aquaculture Park included sustainable building principles;
- EV charging stations at our Halifax Street site are now in use by staff, visitors and our new hybrid vehicle fleet;
- Investment in electronic communication and cybersecurity has reduced the need for travel.
- A project to look at the feasibility of producing fresh water using a reverse osmosis unit at the Cawthron Aquaculture Park is still under investigation as part of wider infrastructure planning.



In FY20, tonnes of CO₂e reduced by 32% per FTE staff member, and 24% per \$1000 of revenue.



Opposite page, top: New office accommodation at the Cawthron Aquaculture Park. Bottom right: New EV charging station at Cawthron Halifax Street. Above: The Envirotech Wing at Cawthron Halifax Street.

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Investing in our people Manaaki tangata

Our success is underpinned by our exceptional people and culture. 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.

We work hard to ensure our work environment is positive, respectful and encourages people to bring their whole self to work. With such a diverse workforce of 280 people from 26 different countries, we are nurturing a culture where people can be themselves, are valued for their contribution (both personally and professionally) and feel like they belong.

In FY20 Cawthron became the first scientific institute in New Zealand to gain the Living Wage accreditation. The engagement survey results in FY20 showed improvements in how our people felt their efforts and successes were appropriately recognised and rewarded, but we are aware there is still more work to be done to address an overall market remuneration gap.

An engaged workforce

Our engagement survey carried out post-lockdown showed that 89 percent of Cawthron people are engaged in their work, up from 85 percent in FY2019 and substantially above global engagement benchmarks.

As we continue to grow our areas of scientific expertise, we have worked hard to ensure we have the right capability in place, and Cawthron's management team and people leaders have worked hard to foster a culture that is adaptable, innovative, and collaborative. Effective internal communication is vital to our success. During the Covid-19 lockdown, an internal survey showed that 93 percent of our people felt that Cawthron had done a good job of supporting them through the lockdown period, with 91 percent satisfied with our internal communications approach.

Cawthron prides itself on flexible working arrangements for staff to enable our people to achieve work life balance, which were in place prior to lockdown but this practice strongly continues amongst many Cawthron staff where possible.



Cawthron Senior Scientist **Dr Susie Wood** awarded NZ Freshwater Sciences Society medal for her outstanding leadership in freshwater science and of women in science.

Lifting our capability

Our science themes weave across all Cawthron science groups and link directly to our strategic areas of focus. The themes represent the research areas aligned with New Zealand's marine and freshwater environments and resources, where our capability can generate the greatest economic, environmental, and societal impact.

Over the past year we have strengthened leadership across these science themes. Johan Svenson joined Cawthron in November 2019 as the Group Manager Algae and Bioactives. Johan leads Cawthron's development of a New Zealand algae sector by exploring collaborative R&D programmes.

In addition, existing Cawthron scientists were appointed as Co-leaders of the Seafood Safety science theme. Kirsty Smith and Tim Harwood now play a lead role in setting the strategic direction of Cawthron's research within their theme, and work with the senior management team to ensure activities across our five science themes are aligned with Cawthron's strategic objectives.

Cutting across our five science themes is a strong focus on values-based relationships and leadership from Cawthron's Māori Business Development and Research team. Through deep



Above: Cawthron laboratory technicians Vatanpreet Kaur and Ravneet Kaur. Right: Aquaculture Technician Dominique Cronje.

strategic engagement with these Māori groupings and their networks, we want to co-develop strategies for value creation opportunities, partnerships, and engagement. To assist with this work, in late 2019 we appointed Anaru Luke as General Manager Māori Business Development.

Part of Anaru's focus has been to ensure the work of our Māori Business Development and Research Team aligns with the Te Tau Ihu Intergenerational Strategy in terms of responsibility, to be good ancestors, and ensure we maintain and enhance the natural resource for those generations to come. In doing so Cawthron aims to represent mātauranga Māori together with science in achieving our purpose of world-class science for a better future.

Creating career pathways

At Cawthron we endeavour to attract talent through a number of mechanisms, including deliberate career pathways. We are currently supporting 9 people through their PhDs, which is an investment we are very proud of.

We are able to invest into the development of our people through the Capability Investment Fund (CIF), which provides internal funding to support the development and growth of our science capabilities that are directly connected to our science theme focus areas. Through an internal process, applications are made to Cawthron's Science Committee which then makes investment recommendations to the Board.

As capability develops, project leaders proactively seek external funding so that the need for ongoing CIF support is reduced. The CIF deliberately includes projects that strengthen our capability to engage effectively and meaningfully with Māori.



In 2019/20 we invested \$1.6M in science capability development. This included:

\$133k for Ko Te Pae Tata – to increase bicultural capability and enhance

capacity to engage in cutting edge

mātauranga Māori research.



\$222k

communication.

\$150k towards our Asparagopsis armata research programme.



Clockwise from top left: Aquaculture Technician Michael Scott at Cawthron's Finfish Research Centre; Aquaculture Scientist Jess Ericson; Environmental Toxicologist Louis Tremblay.

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 goals for health, safety and wellbeing are:

the workplace

Provide a safe and healthy workplace There were no serious harm incidents at work during the past year. In May 2020 Cawthron achieved ISO certification in health and safety conforming to the ISO 45001.2018 international standard. Cawthron also achieved Sitewise 'green status' certification, meaning Cawthron has demonstrated that it has quality health and safety systems in place.

In addition to our people's physical safety, we continue to focus on the wellbeing of our employees through a number of initiatives such as the introduction of the KYND app, which is a risk assessment tool that measures, monitors and manages health and employee wellbeing.

Cawthron also ran its unique summer wellness initiative called the RACE (Revolution Against Carbon Emissions through Rewarding All Cawthron Employees). Running for the past six years, the RACE is designed to encourage and reward staff who choose active and sustainable transport options to get to and from work.

Our people profile

Diversity and inclusion

2%

Roles

25%

Diversity and inclusion are celebrated at Cawthron. We were pleased to publish an Equity, Diversity and Inclusion Policy in November 2019. We recognise that science is a dynamic, innovative sector, and attracting and retaining the many skilled and experienced specialist scientists and technicians from all over the world ensures diversity of thought. With such a diverse workforce of 280 people from 26 different countries, we are nurturing a culture where people can be themselves, are valued for their contribution and feel like they belong.

The differences we all bring to work help us to create an innovative environment. The way we individually think and the unique experiences we've had, help us to look at things from various perspectives and try new ways of thinking, making it possible for us to deliver world-class science for a better future.

40%

Technicians

Scientists

Support

Senior

Management

We recognise that science is a dynamic, innovative sector, and attracting and retaining the many skilled and experienced specialist scientists and technicians from all over the world ensures diversity of thought.

*We acknowledge that we have an underrepresentation of women in senior leadership, science and Board roles, and continue to work to address this.

Cawthron National Algae Research Centre

Advancing world-leading algae research

Opening 2021

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STATE OF THE

Cawthron Institute Year in Review 2019-20

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Investing in our science He pū tai-ao

Despite the uncertain economic outlook caused by Covid-19, Cawthron remains in a strong position to continue to make the investment required in our infrastructure.

Future forecast infrastructure

During FY20 our focus has been on advancing our detailed planning and investigation into future facilities that support our science, including;

- National Algae Research Centre MACRO plans have been signed off and contractors in place. It is expected the facility will be complete by April 2021.
- National Algae Research Centre MICRO planning for this facility has been included in the wider infrastructure upgrade investigations.
- A PC2 Level facility to deliver our aquatic health and biosecurity research – planning for this facility has been included in the wider infrastructure upgrade investigations.
- Upgraded Cawthron laboratories this involves rigorous site planning and is necessary to ensure Cawthron's laboratory infrastructure has the necessary functionality to enable delivery of our five strategic science themes now, and for a 50-year horizon.

Protecting our research

In addition to our physical infrastructure planning, Cawthron has also undertaken a review of our biosecurity procedures at the Cawthron Aquaculture Park. Our aim is to have effective biosecurity and risk management that protects the marine environment while achieving the strategic deliverables of a multi-use aquaculture facility, and to ensure we are meeting regulatory requirements.

Cawthron has also worked hard to strengthen our IT security measures. We collect and store large amounts of sensitive information every day, and there is an ever-increasing risk of real data breach, scan and cyberattacks. In FY20 two-factor authentication was rolled out across the organisation, along with a training and awareness campaign called 'Living a Cyber Safe Life'. This included an e-learning module, *TOM Talk* presentation, and a short video featuring Cawthron staff discussing how to keep yourself safe online.

Capex investments during Cawthron in 2019/20:

on buildings, including the new office accommodation constructed at Cawthron Aquaculture Park **P2m** on new and replacement plant and equipment

\$850k

enhancements and equipment (to enable our staff to work away from the office)

Top right: Analytical Chemist Donato Romanazzi

Inspiring the next generation of scientists He pū tāngata

As a community-minded organisation – and in the spirit of our founder Thomas Cawthron – last year we invested \$340k in science-based community initiatives, projects and education activities in the Nelson Tasman region from the Cawthron Institute Trust Board.

Nurturing enquiring minds

Over summer 2019/20 we hosted three undergraduate students through our three scholarship funds. The scholarships offer 10-week internship work at Cawthron each summer contributing to a scientific research project.

The Sir Theodore Rigg Scholarship Fund provides a scholarship for an undergraduate student, the Kathleen Curtis (Lady Rigg) Scholarship Fund provides a scholarship for an undergraduate woman, and the Te Pītau Whakarei Karahipi scholarship provides a scholarship for a Māori undergraduate student, specifically to support Māori research capability and capacity building in partnership with Ngā Pae o te Māramatanga, New Zealand's Māori Centre of Research Excellence.

In 2019/20 our scholars contributed to the development of a national register of sustainable land-use actions to improve water quality, understanding the effects of commercial transportation of different shellfish species out of the water, and enabling open ocean aquaculture through the development of electronic monitoring equipment.

Recognising efforts to improve our rivers

Cawthron is proud to run the New Zealand River Awards. These awards were established to draw attention to the state of our rivers, but more importantly, to recognise where communities, councils, farmers and industry were achieving significant improvement in water quality in one or more of their local rivers.

The Awards were established by the Morgan Foundation and the NZ Rivers Trust in 2013 and have received valuable support from regional and local councils, and many other partners in the freshwater space. The 2019 Supreme Award for Most Improved River winner went to Environment Southland's Waihopai River.

Connecting our scientists with community

Each year Cawthron aims to promote a greater understanding of science through a number of community education programmes.

The Cawthron Scitec Expo (Science Fair) continues a tradition of science fairs in Nelson that goes back more than 30 years. Cawthron Institute has been heavily involved for much of that time – originally as a sponsor and now as manager of the event. The Expo brings together scientists, students, teachers, local and national businesses – all working together to create a pipeline of future scientists. Due to Covid-19 the decision was made to cancel this event in 2020.

The Year 13 Mussel Biology workshops were introduced by Otago University and Cawthron in 2011. They are run annually with the collaboration of SPATnz and NMIT. During the workshops, students fulfil requirements of the NCEA Level 3 Biology 3.1 Curriculum Assessment, which includes a small animal investigation. Due to Covid-19 the decision was made to cancel this event in 2020.

The Thomas Cawthron Memorial Lecture is a free annual community event to commemorate the legacy of Thomas Cawthron and to share science with the public. Over the years many distinguished scientists and scholars have shared their knowledge on a wide range of subjects. In 2019 we hosted Gideon Henderson, Chief Scientific Advisor for the UK government's Department for the Environment who spoke about research into the mitigation of climate change by removing greenhouse gases from the atmosphere. More than 650 people attended the lecture. Alongside Gideon, our own scientist Susie Wood showcased the work she has been doing to date on the Lakes380 programme.

Cawthron accepts donations and bequests to support the Institute's research programmes.

Covid-19 lockdown

Cawthron took the initiative to create a series of online science experiments and activities to keep children entertained at home.

Science at Home with Cawthron Institute!

In response to the Covid-19 lockdown earlier this year, Cawthron took the initiative to create a series of online science experiments and activities to keep children entertained at home.

Over the course of six weeks six videos were posted featuring different scientists fronting a range of science-themed activities that kids could complete at home or in their backyard with a bit of adult assistance.

The response to these videos from the community was fantastic and led to a significant bump in our monthly social media metrics. Over the period we saw a 1800% increase in Facebook post engagement. We also know the videos were viewed as far away as America and the UK. This was also a great morale booster for the scientists involved to be able to entertain the community.

Creating accessible science and science education is a key part of Cawthron's values, and we are looking at how we continue to engage with school children using digital technology in future.

Above: 2019 Cawthron Foundation Scholarship recipients Fern Kumeroa, Mena Welford, and Kevin Tang being welcomed by Cawthron.

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Cawthron Institute Management Team

Cawthron has three core science groups; Analytical Science, Aquaculture, and Coastal and Freshwater. These groups are supported by the Group Manager Māori, Chief People Officer and the Commercial Group.

Professor Charles Eason CRSNZ, CNZM Chief Executive

Charles joined Cawthron in June 2012, providing strong sciencebased leadership. His experience in progressing core research through to practical industry solutions is wellsuited to Cawthron's philosophy. Charles' science background includes senior research and management positions overseas in multinational pharmaceutical companies, and experience in New Zealand with a Crown research institute, a university and a manufacturing business.

Serean Adams Aquaculture Group Manager

Serean is the Aquaculture Group Manager at Cawthron and is passionate about New Zealand's Aquaculture industry and its future. Serean has led a number of scientific programmes at Cawthron and currently leads Cawthron's Shellfish Aquaculture Programme. Serean's primary areas of technical expertise are shellfish developmental biology, cryopreservation and triploidy.

Stuart Cooper Chief Commercial Officer

Stuart joined Cawthron in 2017 as the Chief Commercial Officer, with responsibility for identifying and developing commercial opportunities for Cawthron. He also oversees and manages Cawthron's support teams including Finance, Administration, Technology and Innovation, Communications and the Cawthron Aquaculture Park. Stuart has extensive global experience in business leadership and management with a background in the primary sector, along with strong sales, marketing and financial analysis skills.

Chris Cornelisen Coastal and Freshwater Group Manager – Coastal

Chris is the Group Manager for coastal sciences at Cawthron. Chris's primary area of expertise is in estuarine and coastal processes, and the interaction between the physical environment and biological systems. Chris plays national leadership roles in the Science for Technological Innovation and Sustainable Seas National Science Challenges.

Anaru Luke Māori Business Development Group Manager

Anaru joined Cawthron in 2019 to lead Cawthron's Māori Business Strategy, which aims to enhance Cawthron's Māori capability profile internally and externally. Anaru provides organisational leadership and strategic guidance for mātauranga and Kaupapa Māori for Cawthron staff.

Tim Turnbull Chief People Officer

Tim has extensive Human Resources experience in complex environments, and is skilled in organisational development, change management, resourcing, workforce planning, health & safety and wellbeing, equity and diversity, employment relations, remuneration & rewards.

Johan Svenson Algae and Bioactives Group Manager

Johan joined Cawthron in 2019 to lead Cawthron's development of a New Zealand algae sector by exploring collaborative R&D programmes to generate algal based products, novel bioactives for commercial applications, as well as analytical standards.

Johan brings a chemical viewpoint and a commercial perspective to algal research at Cawthron. Johan is a prolific writer and has co-authored 50 research papers and more than 30 miscellaneous and popular science articles.

Nico van Loon Analytical Science Group Manager

Nico started as laboratory services manager at Cawthron in 2001. He came to New Zealand in 1995 after working for an environmental consultancy company in the Netherlands. He managed chemical testing divisions of contract laboratories in Hamilton and Auckland before coming to Nelson. Nico was appointed member of the Professional Advisory Committee (PAC) – Chemical, Biological and Dairy – for International Accreditation New Zealand (IANZ).

Roger Young Coastal and Freshwater Group Manager – Freshwater

Roger is the Group Manager for freshwater sciences at Cawthron. Roger's work involves a mix of government-funded research on river ecosystems, and commercial projects assisting a range of clients with freshwater management issues. He is internationally recognised for development of new tools for measuring river ecosystem health using direct measurements of ecosystem processes and functions. He is also a member of the steering group for Land, Air, Water Aotearoa (LAWA) website launched in mid-2014 to share environmental information from councils throughout New Zealand, including state and trend data from more than 1100 rivers.

Cawthron Governance

Cawthron Institute Trustees 2019/20

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.

John Palmer Chair (appointed November 2019)

Helen Smale Trustee

Mayor Tim King Trustee (appointed September 2019)

Archdeacon Harvey Ruru QSM

Hon Nick Smith Trustee

Sarah-Jane Weir Trustee

Bev Doole Trustee

Mayor Rachel Reese Trustee

Anglican Bishop of Nelson **Richard Ellena** (retired Trustee December 2018)

Bob Dickinson Chair (retired September 2019)

Dr Pamela Williams Trustee

Mayor Richard Kempthorne Trustee (retired September 2019)

Anglican Bishop of Nelson Steve Maina-Mwangi (appointed Trustee September 2019)

Trustee

Board of Directors 2019/20

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

Lees Seymour Director (resigned August 2019)

Carl Carrington (appointed October 2019)

Dr Dianne McCarthy CRSNZ CNZM Director (retired December 2019)

Murray King (appointed October 2019)

Meg Matthews Chair

Elaine McCaw Director

Dr Matt Peacey (appointed January 2020)

David Kenning Director

John Cunningham Director

Andrew McGlashen Emerging Director

Financial Performance

for year ended 30 June 2019

2019 \$000's		2020 \$000's
43,788	Income from research contracts, analytical services, consultancy & other scientific projects, lease income and other income	45,097
40,645	Expenses including depreciation	43,180
3,143	Net operating surplus	1,917
(78)	Community initiatives	(70)
(2)	Bequests movement	-
3,063	Trust Surplus	1,847

Financial Position as at 30 June 2020

2019 \$000's		2020 \$000's
	The Institute's Trust Capital is represented by;	
1,756	Trust capital	1,756
189	Special bequests	133
440	Trust investment funds	440
10,293	Reserves and provisions	10,455
22,081	Accumulated funds	23,822
34,759	Total Trust Capital	36,606
	Trust Capital funds the following Net Assets;	
6,227	Working capital	6,372
33,532	Fixed assets	35,234
(5,000)	Long term liabilities	(5,000)
34,759	Total Net Assets	36,606

Movement in Equity for the year ended 30 June 2020

2019 \$000's		2020 \$000's
31,694	Opening balance	34,759
-	First year of NZ Rivers Trust brought in	-
3,063	Trust Surplus	1,847
-	Revaluation of property	-
2	Bequests movement	-
34,759	Closing Balance	36,606

J.PALMER, Chairman

Cawthron financial statements have been Audited by Crowe Horwath New Zealand Audit Partnership.

Integrity Kōunga

We are trusted to do what's right

Collaboration Ngātahitanga We work with others to get results

- 01 - - To

Innovation Auahātanga

We create, we challenge, we take risks World-class science for a better future

98 Halifax Street East Nelson 7010, New Zealand