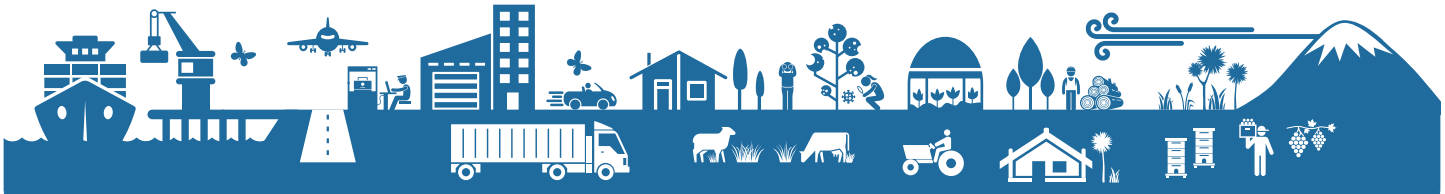
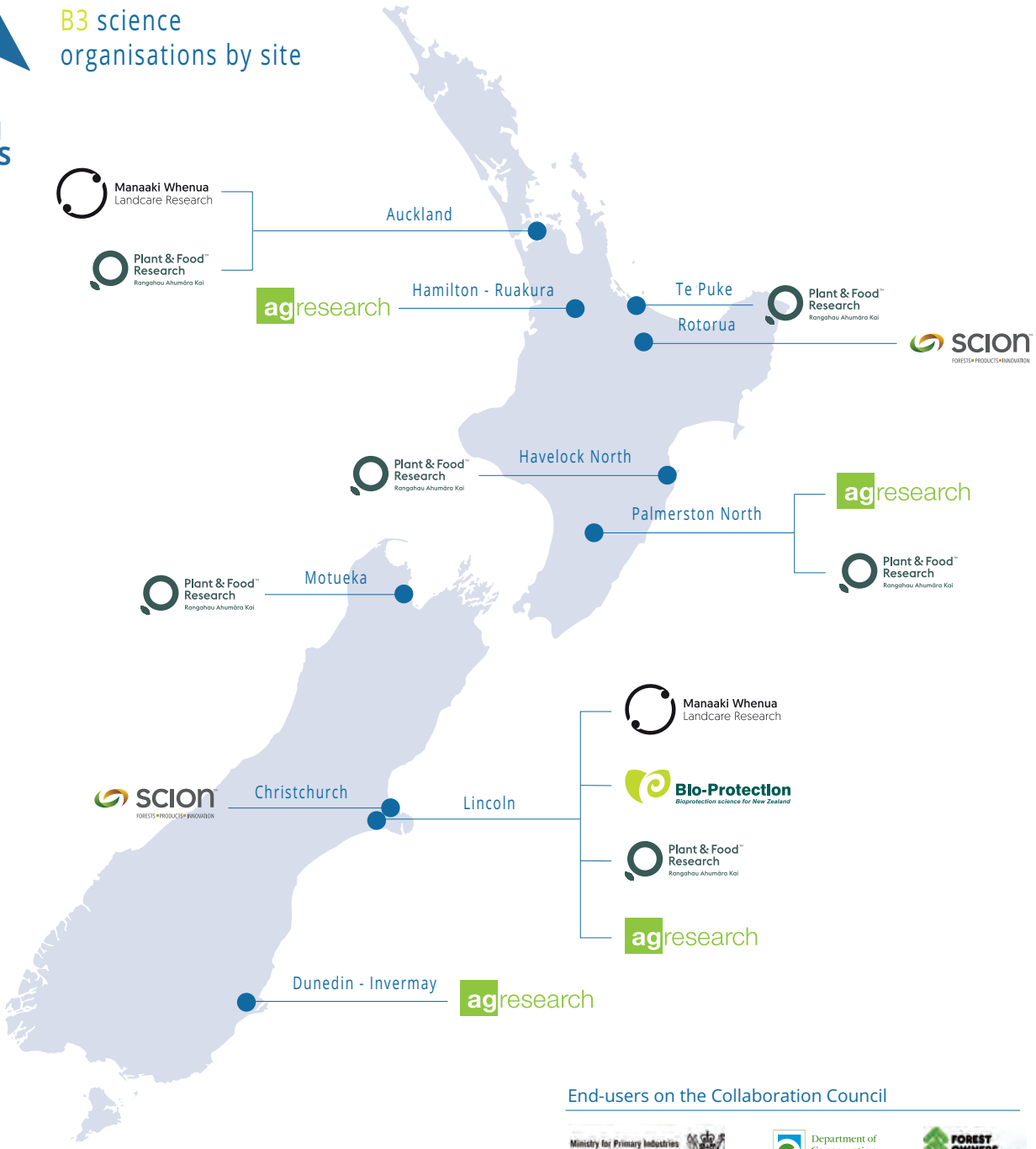
B3 Science Solutions for Better Border Biosecurity
AOTEAROA NEW ZEALAND



B3 Annual Report 2020

10
RESEARCH LOCATIONS

B3 science organisations by site



End-users on the Collaboration Council

Ministry for Primary Industries
Department of Conservation
Forest Owners Association
Horticulture
Environmental Protection Authority
beef+lamb new zealand

OUR PURPOSE

To deliver research that adds value to Aotearoa New Zealand's biosecurity system.

OUR VISION

A world-leading plant border biosecurity system for Aotearoa New Zealand.

OUR INTENDED IMPACTS

Our research results will minimise the entry and establishment of invasive pests (arthropods, pathogens and weeds) that threaten Aotearoa New Zealand's valued flora, including taonga. This will protect our biodiversity and the welfare of our environment, retain and build value in our important plant systems, underpin investor confidence for sector growth and innovation, and maintain market access for plant-based exports.

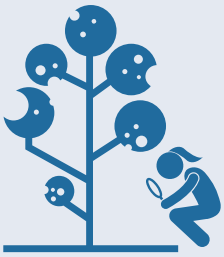
LEGEND

AGR – AgResearch
BPRC – Bio-Protection Research Centre
DOC – Department of Conservation
EPA – Environmental Protection Authority
FOA – Forest Owners Association
Hort NZ – Horticulture New Zealand
MPI – The Ministry for Primary Industries
MWLR – Manaaki Whenua Landcare Research
PFR – Plant and Food Research
Scion – Scion

www.b3nz.org.nz

ABOUT BETTER BORDER BIOSECURITY B3

B3 acts as the pre-eminent research provider for science-based plant border biosecurity solutions in NZ and provides a single point of access to the NZ science system for plant border biosecurity research. The collaboration is resourced primarily through CRI funding (MBIE Strategic Science Investment Fund), but increasingly attracts funding from additional sources. B3 CRI partners have aligned their B3 investment to New Zealand's Biological Heritage National Science Challenge (BHNSC).



SCOPE

The breadth of research carried out within B3 takes in threats to the pastoral, horticultural, arable and forestry productive sectors and to natural ecosystems. Priorities especially include cross-sectoral issues where plant pests, diseases and weeds do not respect the productive and natural system boundaries.

PARTIES

All parties work towards a commonly developed and agreed Strategic Plan and Business Plan, underpinned by a Collaboration Agreement. The current members of B3 include: **Science organisations:** Plant & Food Research, AgResearch, Scion, Manaaki Whenua Landcare Research and the Bio-Protection Research Centre hosted by Lincoln University. **End-user organisations:** Ministry for Primary Industries, Department of Conservation, Forest Owners' Association and Horticulture NZ. The Environmental Protection Authority, and Beef+Lamb NZ have observer status.

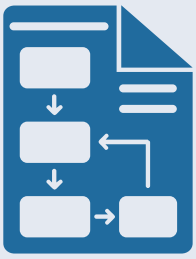
GOVERNANCE

The Collaboration Council (CC), is led by an independent Chair and consists of senior managers from the research institute and enduser member Parties, plus the Director. The CC meets quarterly to provide a governance role for B3 and provides a link between the executive arms of the members' organisations and the operational science programme. A Science Advisory Group (SAG), made up of high-ranking scientists from the B3 members, assesses and recommends research projects to the CC.

OPERATIONAL

The Director leads a group of five Theme Leaders (plus a Manaaki Whenua Landcare Research representative), who represent the research providers. They provide operational leadership to the Project Leaders who make up the B3 science programme. A twice-yearly Science Partnership Forum as well as a range of formal and informal meetings allow Theme Leaders to connect with stakeholder Theme representatives. The MPI Science Programme Engagement Lead augments engagement with MPI.

MPI and DOC, and now the members of the Government Industry Agreement (GIA), create value from B3's science and technology through their co-investment in the form of research uptake and application at the border. Researchers are managed by their own organisations, with advice coming from the B3 leadership.



ESSENTIAL DOCUMENTS

The Statements of Corporate Intent (SCI) for each of the member CRIs identify biosecurity as core to their research investments. The B3 Strategic Plan (updated in 2020) outlines the aspiration, mission, strategic priorities and scope for the research conducted within B3. The Collaboration Agreement outlines how members intend to interact with one another to enable B3 to function. The Business Plan outlines the planned activities for a given year and the Annual Report provides an account of what was achieved. The Hosting Agreement with PFR provides the resources for the Collaboration's leadership and coordination.

REPORTING

Monthly Theme Leader reports (to the Director), a monthly Director's report (to the CC), and an Annual Report are placed on the B3 internal internet site (**www.b3nz.org.nz**). These are available to the CRIs for their internal reporting.

FROM THE DIRECTOR AND CHAIR

KIA ORA KOUTOU

On behalf of the Collaboration Council members and our B3 researchers we want to acknowledge what has been an exceptionally challenging, but nonetheless productive 12 months for us.

With a new B3 Strategic Plan we are charting a new course for the collaboration that will see us through to 2025, and look forward to meeting the challenges and goals we have set.

Moving forward the new strategy will address four priority areas: (1) a meaningful connection to Treaty Partners, (2) a co-ordinated investment approach, (3) increased profile of outcomes and (4) increased value and impact from activities.

There have been substantive efforts in several of these areas already, in particular changes to the Collaboration Council with the appointment of Melanie Mark-Shadboldt and Holden Hohaia, and the advertising for a Māori Research Leader, illustrating a move towards a Treaty of Waitangi-based partnership with Māori.

It is without question that COVID-19 created challenges for B3 – most noticeable was the inability to travel to undertake research on invasive species. The impacts of COVID-19 were well managed within the programme with no long term consequences for planned outcomes/outcomes anticipated (yet) (see page 16 for more thoughts on biosecurity learnings for the ongoing COVID-19 response).

The May 2020 B3 Conference was postponed till May 2021 but was substituted with a series of very useful virtual meetings enabling a broader investigation of interactions within the programme. We were also able to continue our monthly theme leader meetings virtually.

We have been impressed and grateful to our research teams and partners for their flexibility and adaptability during these uncertain times. Our future capability in biosecurity research is buoyed by a number of excellent PhD students working within key projects and the suite of new projects for 2020/21 announced will contribute substantively to emerging risks like *Xylella*, climate change and the development of new biosecurity technologies.

We are also heartened by the strong confidence in B3 researchers and their work that continues to be displayed by our stakeholders. The value of our research teams and their work is evidenced by industry and government stakeholders increasingly turning to B3 as a first point of contact on plant border biosecurity science matters.

The relationships with our Australian counterparts at the Plant Biosecurity Research Initiative (PBRI) and the Centre for Excellence for Biosecurity Risk Analysis (CEBRA) continues to go from strength to strength as we formalise these connections and further recognise the value of sharing research, information and experiences.

We are also very pleased to report that our researchers were able to publish the most papers of any year – a total of 38 in a number of high ranking international journals.

You will see a number of the efforts highlighted in our column elaborated upon within this annual report to reveal how much was achieved despite the challenges this year presented to everyone within the plant biosecurity space.

We look forward to staying connected with our stakeholders and wider community as we move forward and pledge to keeping you informed about the contributions B3 continues to make to safeguard our natural and productive landscapes.

We encourage you to connect with either of us at any time.

David Teulon
(B3 Director)

James Buwalda
(B3 Collaboration Council Chair)

Photo: Port Nelson

PRIORITY RESEARCH AREAS

The B3 research programme targets the imminent threats of today and the emerging issues of tomorrow. This tension between re-active and pro-active research is found in many of our research projects where we look for a win-win solution by working on today's major biosecurity threats while exploring the more generic and fundamental issues of plant border biosecurity science.

In last year's Annual Report we highlighted our work on some of the immediate major biosecurity threats facing Aotearoa New Zealand. This year we highlight the high level focus of our research programme on major system-wide issues.

GLOBAL CHANGE

The world is undergoing major climate, trade, tourism, demographics/social, geopolitical and technological changes. We need to anticipate these changes to plan our future biosecurity system.

TOURISM / BIOSECURITY INTERFACE

The tourism sector is under continual flux with increasing numbers and changing origins of international visitors year on year. The medium and long term impact of COVID-19 is unclear, but the importance of tourism to the biosecurity sector will remain.

NATURAL SYSTEMS INTERFACE

The movement of invasive organisms into natural systems is often predicated by their presence in neighbouring productive systems and urban areas. The protection of our indigenous taonga species will depend on our understanding of this interaction.

TECHNOLOGY PLATFORMS

Development of new socially acceptable and fit-for-purpose tools, including the exploitation of new digital and biotechnological technologies, are required through cross disciplinary teams including biologists and technologists.

ESTABLISHING AND INTEGRATING BIOSECURITY DATA

Discovering, ordering, cleaning, interrogating and visualising past, present and predicted data improves our understanding of the changing biosecurity threats at different points on the biosecurity continuum.

HARNESSING THE POTENTIAL OF MĀTAURANGA

The unique knowledge and perspective of Māori is recognised and Māori/iwi actively participate as mana whenua (custodians) across the biosecurity system.

COMMUNITY EMPOWERMENT

Increasing awareness and knowledge, inspiring and enabling participation and developing socially acceptable tools for domestic and visiting communities is necessary to empower the team of 5M and NZ's visitors.

OPTIMISING INTERVENTION

Mitigation of biosecurity threats are undertaken within the biosecurity continuum to maximise their return on investment.

HIGHLIGHTS

THE BETTER BORDER BIOSECURITY (B3) RESEARCH COLLABORATION APPOINTED TWO MĀORI MEMBERS, HOLDEN HOHAIA AND MELANIE MARK-SHADBOLT TO ITS COLLABORATION COUNCIL.

The B3 Council agreed to appoint the two new members following its decision earlier this year to strengthen partnership with Māori as part of the B3 collaboration.

Holden Hohaia, GM Māori Partnerships at Manaaki Whenua Landcare Research, was nominated by Te Ara Pūtaiao, the across-Crown Research Institute forum of senior Māori managers. Holden's iwi affiliations are Ngāti Maruwharanui and Taranaki Whānui-Te Ātiawa. He is currently the chair of Te Rūnanga o Ngāti Maru and served recently as a negotiator for the iwi's Treaty settlement. A qualified lawyer and active advocate for his iwi in kaupapa, kaitiaki and taiao initiatives, he is also a trustee on a number of other iwi governance entities and from Māori land trusts.

Melanie Mark-Shadbolt was nominated from Te Tira Whakamātaki, as an independent member of the Collaboration Council. Melanie is of Ngāti Kahungunu ki Wairarapa, Ngāti Porou, Te Arawa, Ngāti Raukawa, Ngāti Tuwharetoa, Te Atiawa, Mackintosh and Gunn descent. She is an indigenous environmental sociologist and is currently the Kaihautū Chief Māori Advisor to the Ministry for the Environment, the Director Māori of NZ's Biological Heritage National Science Challenge and CEO of Te Tira Whakamātaki.

"Māori have much to contribute to successful biosecurity for New Zealand. The B3 collaboration acknowledges Māori as tāngata whenua and looks to embrace Māori perspectives through connections with kaitiaki and mana whenua. This approach enables the B3 programme to create a genuine partnership model through which we can achieve our strategic objectives," Collaboration Council Chair James Buwalda said.

"Holden and Melanie bring considerable mana to the B3 Collaboration Council. Between them, they have a lot experience relevant to the B3 programme, as well as extensive networks across iwi and hapū. I am confident they will challenge and support us to strengthen the integrity of our commitment to partnership with Māori," he added.

B3 VIRTUAL RESEARCH UPDATE MEETINGS A SUCCESS

A set of virtual meetings in May 2020 that included up to 100 people involved with, and interested in, the work of B3 was heralded a success with plans for a repeat of the event in the future already under way.

B3 Director David Teulon said the five separate virtual meetings – featuring presentations from all of B3's current research projects in the collaboration's five themes – was the first time extensive information about all B3 projects have been able to be shared at one time.

"These were B3's first virtual meetings of this size", said Dr Teulon, "and we were unsure how they would work. We learnt that we could have invited many more from NZ's biosecurity community as well as interested parties from overseas".

The virtual meetings were held over three days in early May 2020 during the COVID-19 lockdown in lieu of the postponed B3 Conference 2020. "Those people working in biosecurity research, our partners, stakeholders and end users appreciated hearing directly from the B3 teams as well as having an opportunity to ask questions and make connections," Dr Teulon said.

"The outstanding feature of this all-of-programme-approach was the identification and development of linkages across the different themes and projects". "This provided us with quite a different perspective of the B3 programme and will enable us to develop an even more effective programme in the future".

MPI's Aurélie Castinel said the B3 virtual theme meetings were an excellent way to share, discuss and assimilate the research completed to date. "It also gave an opportunity

to identify synergies and gaps across themes as all projects were presented in detail," Dr Castinel said.

DOC's Chris Green also appreciated the meetings declaring them a huge success. "It was a great show-case of what is happening across the B3 spectrum of research projects, which I found rewarding, and I got a great deal out of it," Dr Green said.

B3 has rescheduled its conference to 17/18 May 2021 in Wellington, and is planning to repeat the virtual theme meetings in 2022.

NEW ZEALAND SCIENTISTS CONTRIBUTE TO NEW PAPER ON SCIENCE DIPLOMACY FOR PLANT HEALTH

B3 Director David Teulon is among several New Zealand authors, as well as Veronica Herrera and Aurélie Castinel from MPI, to contribute to an article about science diplomacy for plant health, published in Nature Plants.

Fellow author and Euphresco Co-ordinator based at the European and Mediterranean Plant Protection Organization (EPPO) Baldissera Giovani, says as many plant health challenges are increasingly recognized as global threats, science in diplomacy is essential to support international activities and guide national decision-making processes.

"As the complexity of plant health challenges requires knowledge and specialized expertise that cannot be found in a single country alone, diplomacy for science triggers international multi-disciplinary collaborations to tackle these challenges. The development of a global phytosanitary research coordination network allows us to build stronger links between plant health science and policy in order to shape research activities and scientific collaborations to better serve the needs of countries," Dr Giovani said.

More information about this paper can be found on the International Plant Protection Convention (IPPC) website here. (**www.ippc.int/en/news/nature-plants-publishes-a-new-paper-on-science-diplomacy-for-plant-health**)

TO FIND OUT MORE ABOUT OUR PUBLISHED PAPERS SEE PAGES 23 AND 24

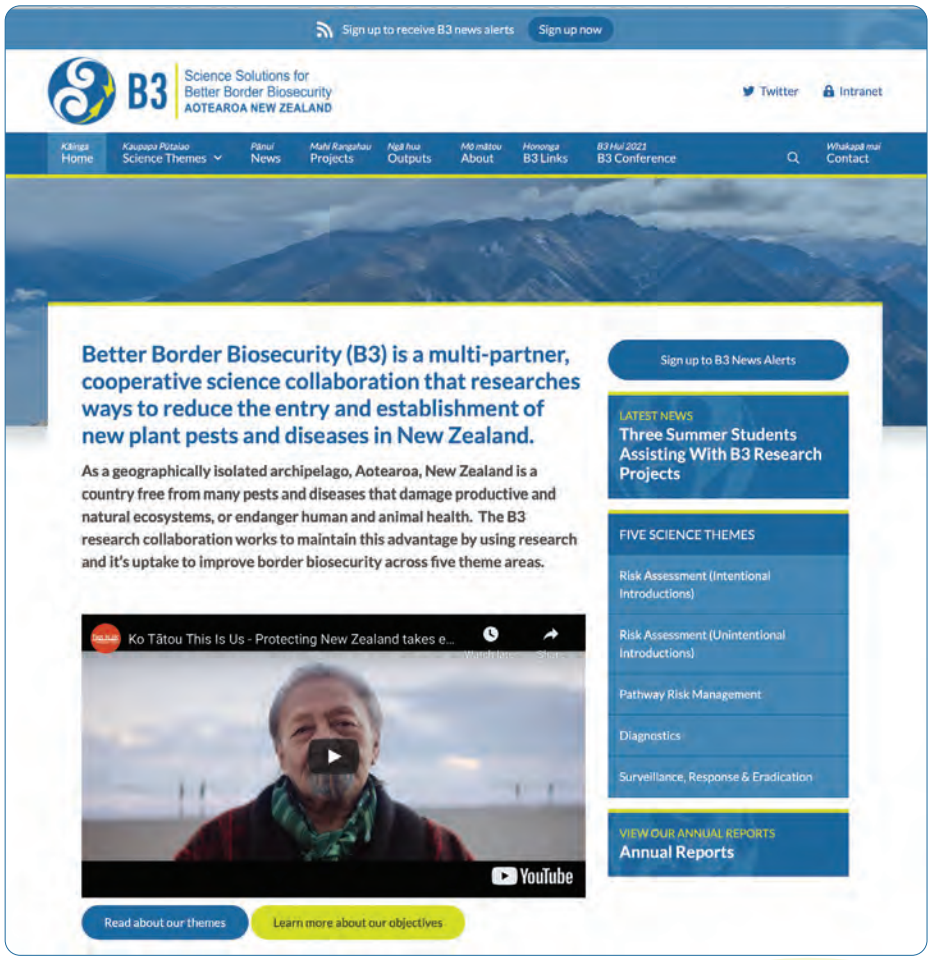
B3 LAUNCHES NEW WEBSITE AND LOGO

B3 launched a new website which now includes enhanced features and information on its work and also provides an option for people to sign up and receive regular news about what is happening at B3.

The new website, developed by a Christchurch-based company, includes a new section with information on projects underway, easy access to news, added functionality, search functions and search engine optimisation. Director David Teulon says the website is a vital communication tool for the collaboration moving forward and its new streamlined and modern look plays an important role in creating a strong brand recognition for B3.

"Our plan is to continue to build on this new design to provide even more information on what we are doing specifically within projects as we aim to keep our stakeholders and the wider community informed about the great work we do," Dr Teulon said.

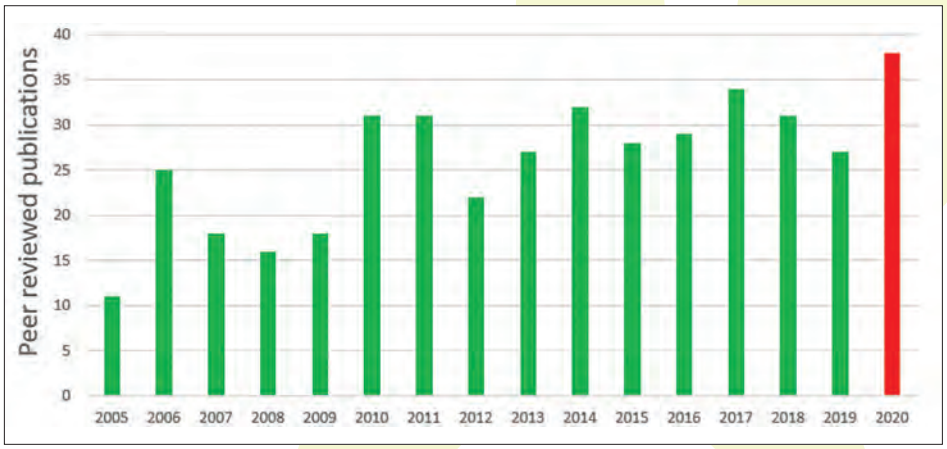
B3 has also updated its logo as part of the brand refresh, something Dr Teulon says will play a big role in identifying B3 within an international context.



The new website address is **www.b3nz.org.nz**

B3 PUBLISHES A RECORD NUMBER OF PUBLICATIONS

B3's stakeholders can be confident in B3's scientific performance, based on the measure of peer review through publications in high impact and fit-for-purpose scientific journals. "Science Solutions for Better Border Biosecurity" is the underpinning principle for B3's activities and at the heart of the scientific process is peer review and publication. Despite relatively static investment over time, B3 celebrated its highest number of published peer reviewed articles in 2019-20, an inspiring reflection of the commitment of B3 researchers for scientific excellence for biosecurity solutions. All 38 publications were in international journals and a number



of them were from our associated PhD student projects (see pages 19/20) reflecting B3's commitment to the development of future biosecurity capability.

A link to the full database of B3's outputs, including publications can be found at: https://www.zotero.org/groups/1595276/better_border_biosecurity_b3/library

IMPACTS AND ACHIEVEMENTS

THEME A RISK ASSESSMENT FROM INTENTIONAL INTRODUCTIONS

PRE-EMPTIVE BIOSAFETY APPROACH NOW EMBRACED INTERNATIONALLY

PROJECT A17.2

In what is considered a world first, the Samurai Wasp Working Group supported by B3 risk assessment research, facilitated the approval (with controls) in July 2018 from the Environmental Protection Agency for the release of *Trissolcus japonicus* in the event of a BMSB incursion. The importance of this pre-emptive biosafety approach was immediately recognised by our international colleagues and a new working group was instigated within the Euphresco collaboration, with B3 co-leadership, to examine the science and application of this approach on a global scale.

Contact: Gonzalo.Avila@plantandfood.co.nz

Publication: Charles et al. 2019. Experimental assessment of the biosafety of *Trissolcus japonicus* in New Zealand, prior to the anticipated arrival of the invasive pest *Halyomorpha halys*. BioControl. 64: 367

Brown marmorated stink bug (BMSB), *Halyomorpha halys*

Samurai wasp, *Trissolcus japonicus*
Photo: Oregon State University

NEW BIOLOGICAL CONTROL AGENT FOR EUCALYPTUS TORTOISE BEETLE

B3 capability, underpinned by risk assessment theory and research from Theme A, fronted the successful application to the EPA for approval to release *Eadya daenerys*, an effective natural enemy for this invasive pest of eucalypts. This beetle costs the forest industry $1.0-$2.6 m p.a. in chemical controls and effective biocontrol could prevent about $7.2m in annual yield losses. Laboratory tests indicated the risks from this natural enemy to non-target related native and beneficial beetles appear to be very low.

Contact: Toni.Withers@scionresearch.com

Publication: Withers TM, et al. 2020. Host testing of *Eadya daenerys*, a potential biological control agent for the invasive chrysomelid pest *Paropsis charybdis*, predicts host specificity to eucalypt-leaf feeding Paropsina. BioControl 65:25–36.

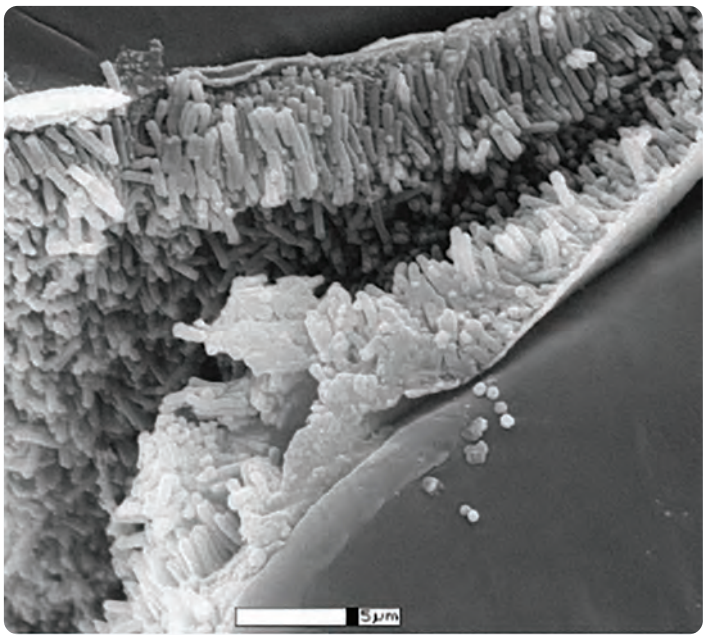
Eucalyptus tortoise beetle, *Paropsis charybdis*

NEW ZEALAND SENTINEL PLANTS IN CALIFORNIA PROVIDING IMPORTANT INFORMATION ON BIOSECURITY RISK

PROJECT B19.4

B3 has a long and formative association with the Sentinel Plant concept whereby the impact of exotic pests and pathogens can be assessed on New Zealand plants growing overseas. The presence of *Xylella fastidiosa* in California has enabled us to test the Sentinel Plant Concept further and is helping us to understand the potential impact of this devastating plant pathogen on New Zealand indigenous plant species grown there. In collaboration with U.C. Berkeley, and despite COVID-19 limitations on travel, the project has been able to apply current and validated diagnostic methods used worldwide to establish the preliminary detection of *Xylella* in herbaceous indigenous NZ species, thereby helping us to understand the potential impact of this pathogen if it reached New Zealand.

Contact: GroentemanR@landcareresearch.co.nz



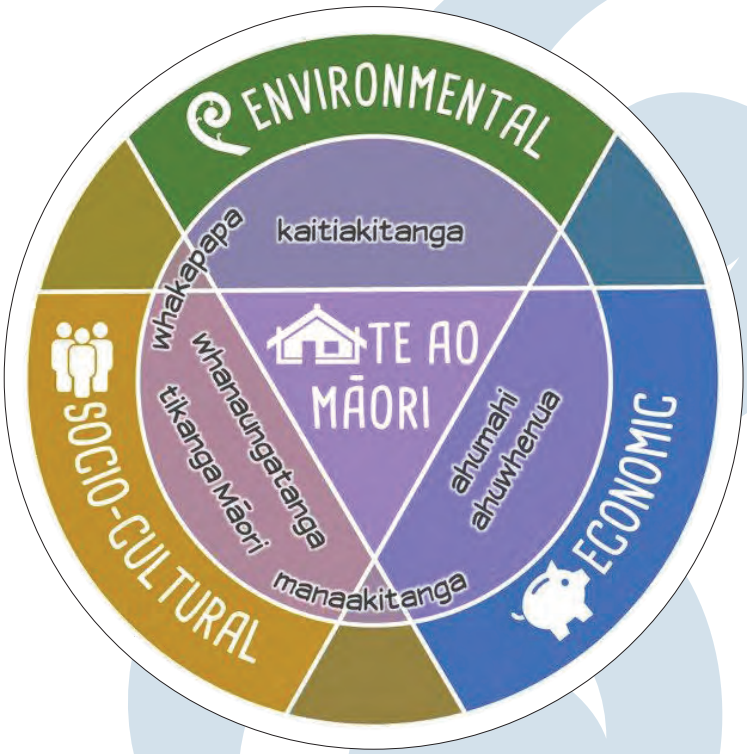
Xylella fastidiosa in *Graphocephala atropunctata* (blue green sharpshooter) – Scanning Electron Microscopy (courtesy Dr Rodrigo Almeida – U.C. Berkeley).

A VALUES-BASED BIOSECURITY RISK ASSESSMENT FRAMEWORK FOR AOTEAROA

He Tangata (people), He Taiao (environment), He Ōhanga (economy). In the past, the biosecurity framework has emphasised economic values. B3 is teaming up with the Biological Heritage National Science Challenge to explore a new biosecurity risk assessment framework incorporating information from a holistic set of values including those of kaitiakitanga, manaakitanga, whakapapa, whanaungatanga and tikanga Māori. The framework will be dynamic and adaptable to work at national, regional and local scales, and account for changes in biosecurity risk to NZ through external influences such as climate, trade and tourism.

Contact: John.Kean@agresearch.co.nz

Link: https://bioheritage.nz/goals/stategic-objective/predicting-current-and-future-threats/



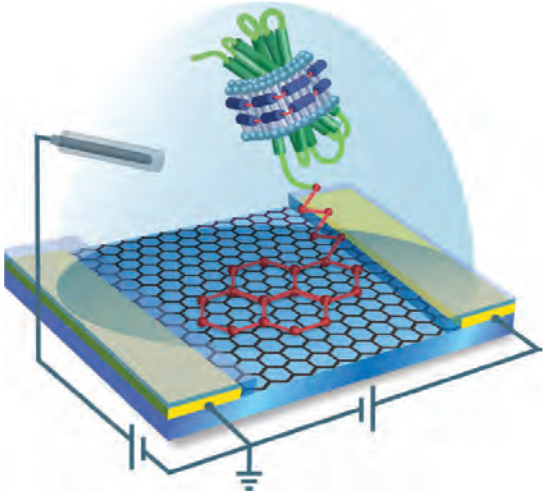
RESEARCH ON OLFACTION TECHNOLOGY LEADS TO SPINOUT COMPANY

PROJECT C17.13

A spinout company using digital olfaction technology based on insect odorant receptors partly developed in B3 has been advanced. The initial focus for this technology will not be biosecurity but will be an area that enables the core requirements of technology to be rapidly developed on a commercial scale. The company (Scentian Bio) will be focussed on the liquid detection of Volatile Organic Compounds (VOCs) working in parallel with ongoing B3 research on detection of gaseous VOCs associated with invasive pest insects such as fruit infested by Queensland fruit fly. Scentian Bio will be housed within PFR so the technology will still be accessible for the ongoing biosecurity research.

Contact: Melissa.Jordan@plantandfood.co.nz

Publication: Khadka et al. 2020. Synergistic improvement in the performance of insect odorant receptor based biosensors in the presence of Orco. Biosensors and Bioelectronics 153 112040



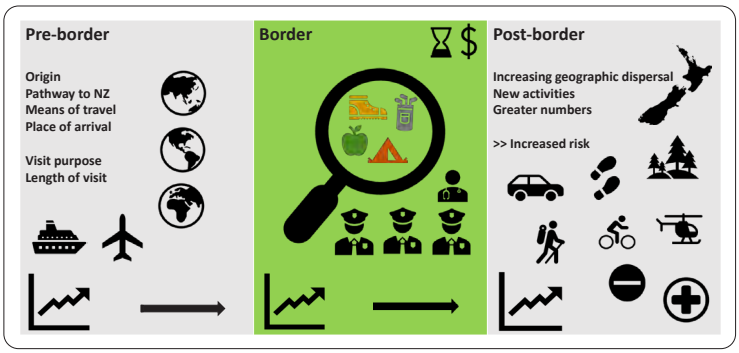
BIOSECURITY / TOURISM RESEARCH AGENDA PROPOSED AFTER MAJOR REVIEW

PROJECT C17.18

An important review of both the biosecurity and tourism landscape proposes a research agenda to generate understanding of the tourism-biosecurity risk interface. The application of a tourism lens to understand biosecurity risk brings a number of social science research perspectives, which – along with biophysical science research – can inform biosecurity mitigation and management. The report was refined from four stakeholder workshops held in early 2020. A major finding from the workshops was that outside of agencies with direct responsibility in this area – biosecurity appears to have a low profile with tourism operators. The report outlines five broad research themes within which the tourism system and its constituent parts might be examined in respect of its intersection with biosecurity.

Contact: JudeWilson@judewilson.co.nz

Report: Wilson et al. 2020. Tourism, biosecurity and pathways into Aotearoa New Zealand: towards a thematic research agenda. Lincoln University. May 2020



Passenger pathways (the tourism landscape)

SYSTEMS APPROACH MAY LEAD TO REDUCTION IN METHYL BROMIDE USE

PROJECT C17.11

While methyl bromide is a highly effective fumigant for the control of quarantine pests, it is an ozone depleting substance and is toxic to humans. Alternatives for its use are being explored including within B3. A combination of grading, high pressure washing, and hot water treatment to eliminate surface pests from taro has enabled four shipments from Samoa to enter New Zealand without the need for on-shore methyl bromide treatment. The work was undertaken in collaboration with MAF Samoa and Ah Liki Ltd and is being expanded with additional funding from Pacific Horticultural and Agricultural Market Access (PHAMA) Program in 2020-21.

Contact: Allan.Woolf@plantandfood.co.nz

Publication: Fallik et al. 2020. Advances in using heat for disinfection/disinfestation of horticultural produce. In: Advances in postharvest management of horticultural produce. Ed. Watkins CB. Burleigh Dodds Science Publishing Limited, Cambridge, UK.

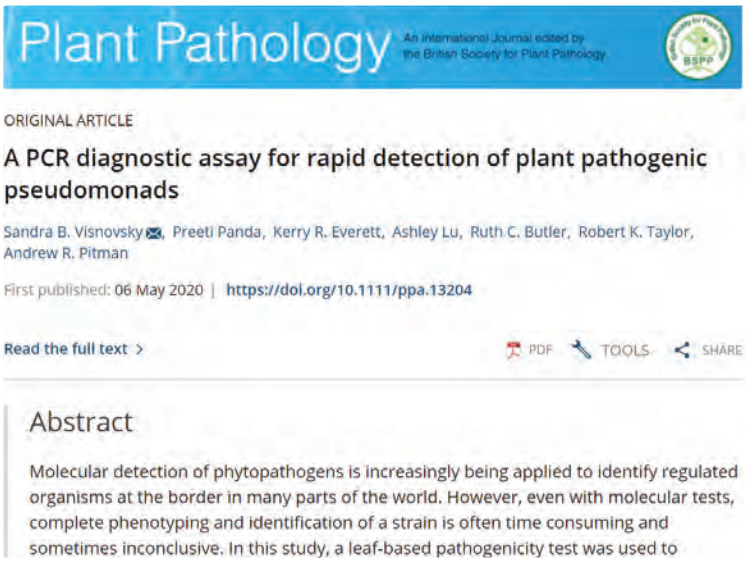
PUBLICATION ACCELERATES UPTAKE OF NEW DIAGNOSTIC

PROJECT D17.25

Screening for and detection of pathogens at the border is an essential feature of NZ's biosecurity system. However, these methods may be time consuming and sometimes inconclusive. New methods must be rigorously examined and accepted by the research and regulatory community both in NZ and overseas. The recent peer reviewed publication of a new PCR assay that clearly distinguishes between pathogenic and non-pathogenic strains of pseudomonads, to clarify the actual risk, has enabled the accelerated uptake of the method by MPI, leading to greater efficiencies at the border, including identification of uncharacterized pseudomonads.

Contact: Sandra.Visnovsky@plantandfood.co.nz

Publication: Visnovsky et al. 2020. A PCR diagnostic assay for rapid detection of plant pathogenic Pseudomonads. Plant Pathology 69: 1311


Plant Pathology An International Journal edited by the British Society for Plant Pathology

ORIGINAL ARTICLE

A PCR diagnostic assay for rapid detection of plant pathogenic pseudomonads

Sandra B. Visnovsky, Preeti Panda, Kerry R. Everett, Ashley Lu, Ruth C. Butler, Robert K. Taylor, Andrew R. Pitman

First published: 06 May 2020 | https://doi.org/10.1111/ppa.13204

Read the full text > PDF TOOLS SHARE

Abstract

Molecular detection of phytopathogens is increasingly being applied to identify regulated organisms at the border in many parts of the world. However, even with molecular tests, complete phenotyping and identification of a strain is often time consuming and sometimes inconclusive. In this study, a leaf-based pathogenicity test was used to

INCREASED INVESTMENTS IN ISOTOPES LEVERAGED THROUGH THE GIA AND RRD4P (AUS) MAKE IMPLEMENTATION GO FASTER

PROJECT D19.8

Scientists based at the BPRC are primed to give biosecurity agencies the confidence to decide where high-risk exotic pest insects that call for urgent post-border responses came from. They have been working to gather environmental stable isotope reference data that will enable the quick distinction between insects that have just arrived and those that may have already established here. Isotopes are nearly identical forms of an element whose ratio in the environment provides a signature of a place that becomes incorporated in insect tissue through diet. Once collected, all the stable isotope data will be fed into a geographically scalable map – a comprehensive "isoscape" that indicates the probability of where an insect is from. The map will enable agencies to quickly figure out if an invasive insect is established in New Zealand – requiring a much higher level of response than if it is a new arrival from overseas.

Contact: Karen.Armstrong@lincoln.ac.nz

Publication: Holder et al. 2019. Natal origin of the invasive biosecurity pest, brown marmorated stink bug (*Halyomorpha halys*: Penatomidae), determined by dual-element stable isotope-ratio mass spectrometry. Pest Management Science 76 (4); 1456.

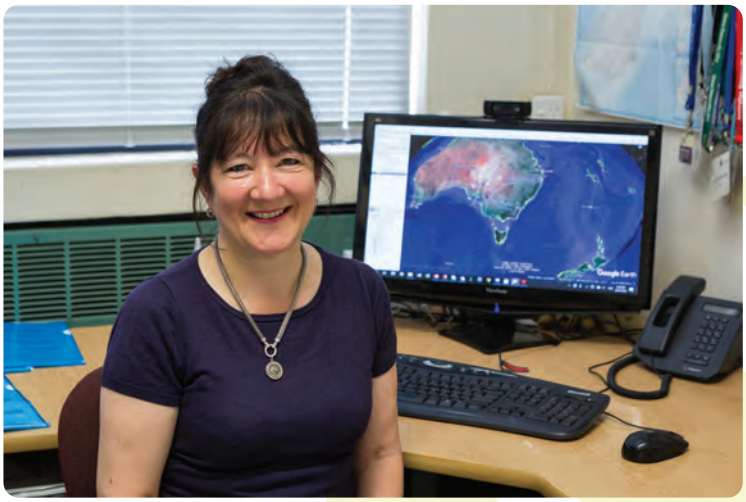


Photo: BPRC.

FRESH PARTNERSHIP TARGETS MAJOR SURVEILLANCE CHALLENGE

PROJECT E19.11

B3 is collaborating with Cesar Australia to advance the use of eDNA surveillance technology. In particular they are considering fruit washes, for use against invasive insects with weak attractive lures such as the brown marmorated stink bug (BMSB). Protocols for insect eDNA extraction have been designed, shared and optimised. The project is also utilising capability and infrastructure from another B3 project examining the most effective insects in the Port of Tauranga environment. The green vegetable bug is turning out to be a very valuable 'lab rat' until COVID-19 restrictions, enabling the necessary interaction with BMSB researchers in the USA.

Contact: Simon.Bulman@plantandfood.co.nz

NEW UNMANNED AERIAL VEHICLES (UAVS) ARE PROVING PROMISING FOR TARGETED AERIAL SPRAYING

PROJECT: E20.9

Accurately targeted application of pesticides, including biological pesticides, minimises non-target impacts. Recent advances in UAV avionics potentially allow more accurate targeting of sprays which would be of benefit to incursion response operations. A next generation UAV has demonstrated the ability to accurately release spray over a targeted area in trials. However, wind displacement and drift of spray droplets after release and before interception by the target remains a limiting factor. Linked research on spray droplet trajectories in UAV rotorwash indicates that smaller spray particles can be delivered to the target through the zone of strongest rotorwash, thus reducing wind displacement. Work is underway to test how a next generation UAV performs delivering spray to the canopy of a tall tree with a focus on the amount of spray penetration to lower and deeper foliage.

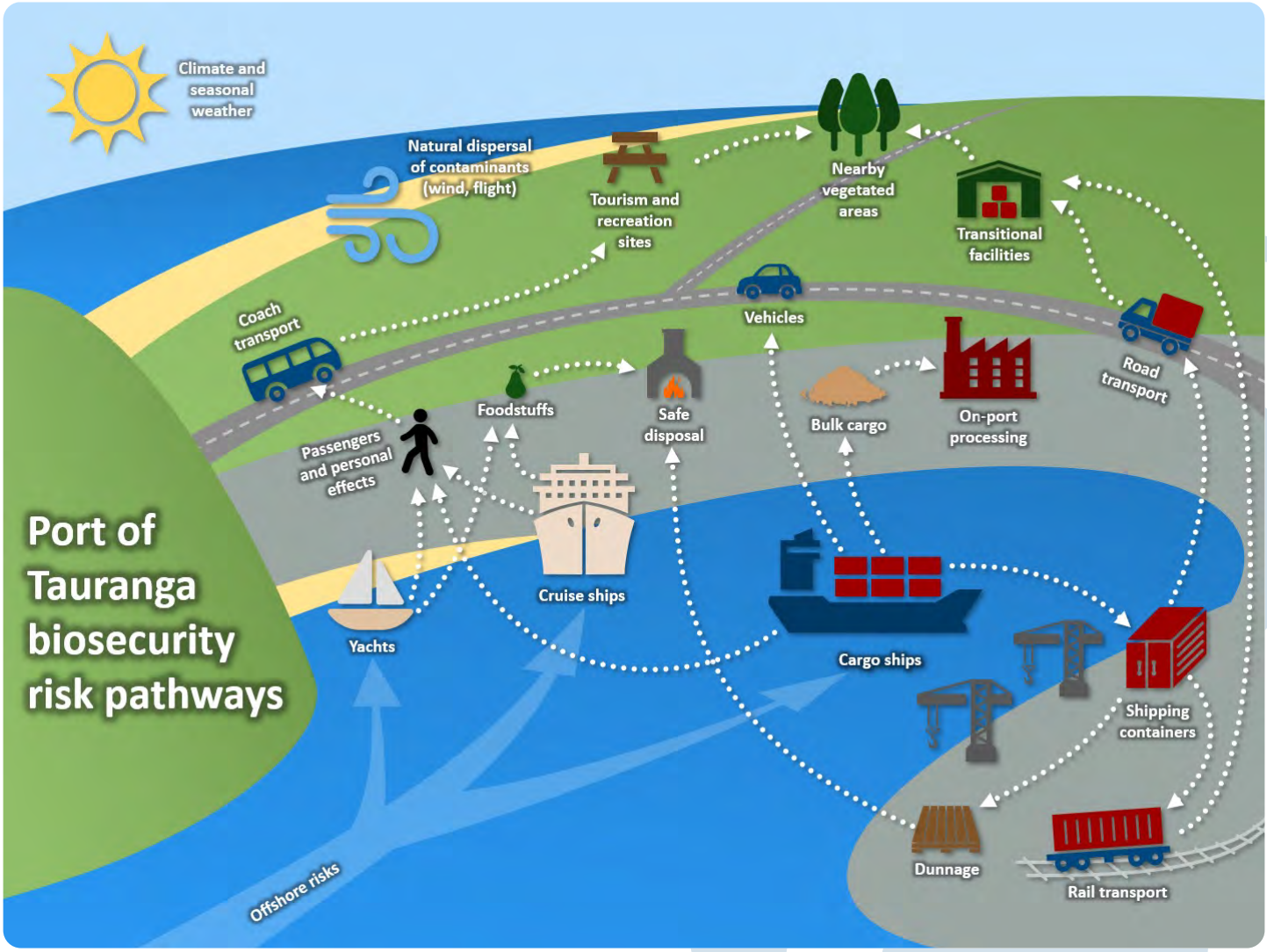
Contact: Justin.Nairn@scionresearch.com

PROJECT E17.28 BIOSECURITY EXCELLENCE IN PORT COMMUNITIES

The graphic below outlines the local biosecurity risk profile of this port community.

The five year project began in 2017 and has a number of science and biosecurity outcomes that include:

- A "best practice" template for measuring baseline biosecurity performance in a particular area (e.g. port and surrounds) and monitoring of change
- Better ways to understand, measure, and influence biosecurity awareness in port communities, including general surveillance and social licence to operate
- Improved understanding of the constraints and opportunities for the better targeting of pathway interventions, surveillance, and eradication practices in and around port environments
- New social science tools for measuring and maximising impacts of promotional activities on public awareness and support for local biosecurity activities
- New knowledge, tools, and techniques for managing biosecurity, biodiversity, and ecology in industrial areas.



FACING COVID-19 AND FUTURE PANDEMICS. WHAT CAN WE LEARN FROM NEW ZEALAND'S BIOSECURITY SYSTEM?

BY DAVID TEULON

Reprinted from Scoop 15 June 2020

Moving forward, an important question raised by COVID-19 now facing New Zealand, is, how will the country be able to interact with the outside world without risking further infection from this or future pandemics?

While the potential impacts from human epidemics can be very different, I believe we can look to how our country has – for the most part over many years - dealt successfully with challenges posed by border biosecurity threats to our plant and animal systems – both native and productive.

We have developed a range of activities – informed by science - to manage border risks. While not perfect, we do now have a biosecurity system that is the envy of many in the world.

Our biosecurity system was not developed overnight and benefits from many years of trial and error and significant past and current investment in infrastructure, capability and science. COVID-19 has dramatically reminded us that we need to think proactively about human biosecurity as well.

Our well-honed biosecurity system has allowed us to safeguard our economy which relies heavily on trade and tourism. The need to protect our valued plants and animals in both natural and productive landscapes underpins our economic, environmental, social and cultural well-being. Being an island nation far from anywhere else has also helped this undertaking.

I think there are many similarities between what we have faced in plant and animal biosecurity for many years and what we now face with COVID-19 as we move out of lock-down.

My thoughts on what we can we learn from plant and animal biosecurity that could be relevant for human epidemics are listed below.

1. NZ understands that there is a range of biosecurity threats which can have significantly different impacts, fruit flies, for example, would provide huge challenges to our horticultural export industries if they established in NZ – our approach for them is 'keep them out' and 'eliminate'.
2. NZ does not work in isolation. We have a world-leading biosecurity system, led by MPI, which reflects the biosecurity imperatives of New Zealand and is fully integrated into international biosecurity initiatives.
3. NZ has a system approach that coordinates activities across the biosecurity spectrum starting with risk assessment (what/where are the risks?) and follows through with pathway management (how do they get here and how do we stop them getting here?), diagnostics (how do we identify them?), surveillance (how do we survey for them if they do get here?), eradication (how do we get rid of them?) and if all else fails, how do we mitigate their impact if they establish?
4. Partnerships with industry are important. Our biosecurity system is reinforced by formal partnerships between MPI and industry to make sure their input goes into designing and resourcing biosecurity activities
5. Biosecurity is underpinned by science drawing from multi-organisational, multi-disciplinary science collaborations such as Better Border Biosecurity, the BioProtection Research Centre and the Biological Heritage National Science Challenge.
6. Trans-Tasman partnerships are very relevant and working together reduces threats to both our countries more effectively.
7. The connection with big players - like USA and China - needs to be cultivated to facilitate close working relationships, as well as with scientists and agencies from around the world to understand risks to NZ.
8. Community involvement has real potential to be a game changer as we have experienced through biosecurity engagement and participation initiatives for the biosecurity system.

New Zealand's world-leading plant and animal biosecurity system really has been successful in allowing the country to trade and connect with the world for a long time in the face of many biosecurity threats. Managing the risks presented by different fruit flies and brown marmorated stink bug are good examples of how we do this work by applying many of the eight points I have just laid out.

If we are to minimise the impact of human epidemics / pandemics we could well learn from the aspects that make NZ's biosecurity system work so well.

TARGETING ISSUES OF RELEVANCE TO MĀORI

B3 may look back to 2019-20 as a watershed year in its intent to partner with Māori.

While it is widely recognised that much of the activity within the B3 research programme is fully relevant to Māori, the lack of meaningful representation of Māori within B3 and therefore the ability to partner with Māori, became glaringly exposed. The annual research call for new proposals in October 2019 emphasised the need for projects of relevance to Māori and a number were received. However, the Science Advisory Group felt they had neither the mana nor the expertise to evaluate these projects. This culminated in several initiatives within the 2020-21 B3 Business Plan to seek and appoint Māori representatives for the Collaboration Council and for the appointment of a Māori Research Leader. As a result Holden Hohaia representing Te Ara Pūtaiao, and Melanie Mark-Shadbolt an independent, were appointed to the B3 Collaboration Council in June 2020 (see page 7).

Significant contributions were made to engage Māori within the B3 research programme in 2019-20 including:

Enabling of young Māori researchers to present to the biosecurity community:

- Hone Ropati at the NZ Plant Protection Conference, August. Auckland. E whakarite ana he tūāpapa e mārama ai i ngā kino o te ngārara pīhau parauri ki ngā tipu e whai hua ki te Māori.
- Alesie Puketapu 2019 at the Plant Biosecurity Research Initiative Symposium. August 2019, Brisbane. Bi-cultural partnerships to optimise biosecurity outcomes with respect to BMSB.

Engaging with Te Tira Whakamātaki on:

- The views of Māori on the introduction of biological control agents expressed in EPA applications
- The location and health of New Zealand indigenous plants as risk from *Xylella* in California

The addition of Māori perspectives:

- To the information supplied for indigenous plant species or taonga on the Auckland Botanic Gardens Biosecurity Trail

Close alignment of B3 and Biological Heritage NSC research

- B3 risk assessment projects in Theme A and B are closely aligned to the BHNSC SO3 project He Tangata, He Taiao, He Ōhanga through co-leadership (see page 11).

Māori Tourism Hononga aimed to connect members of NZ Māori Tourism (He Toa Takitini) (HTT) to NZ's biosecurity system and to improve understanding and awareness of biosecurity within the Māori tourism sector. At the conclusion of the project a working group of committed and experienced cultural tourism operators that are cognisant of biosecurity's significance with regard to the tourism sector was established. The Hononga (or union) will provide the foundation for ongoing consideration of the Māori tourism / biosecurity interface.

Funding came from the MBIE Vision Mātauranga Capability Fund, HTT and B3. B3 scientists with expertise in kauri dieback, myrtle rust and brown marmorated stink bug illustrated the actual and potential impact of invasive alien species to taonga species at a series of hui. Alby Marsh led the project.

COLLABORATIONS AND PARTNERSHIPS

At the core of B3, is the research/industry/government collaboration formalized in the B3 Collaboration Agreement, whose mission is to deliver world-leading science and technology, enabling stakeholders to implement results for *Better Border Biosecurity*. The B3 community meets together in this capacity twice a year at the B3 Conference and/or B3 Science Partnership Forums, events that provide a national focus to discuss research on plant border biosecurity.

Building on this foundation, B3 partners and collaborates with many other entities in New Zealand, Australia and throughout the world to undertake its mission.

Key partners in New Zealand include the Biological Heritage NSC (to which B3 is fully aligned) and the Plant Biosecurity Council, both of which share common biosecurity goals. At the project level, B3 works closely with a range of universities, research institutes, commercial companies, botanic gardens, not for profits, and iwi entities.

By its very nature, biosecurity research requires considerable collaboration with international countries and entities, and especially our close neighbours.

In Australia, B3 has strategic collaborations with the Plant Biosecurity Research Initiative (PBRI) and the Centre of Excellence for Biosecurity Research Analysis (CEBRA) who invest collaboratively in a number of research projects, and with whom B3 is looking to refresh or initiate MOUs, respectively, in 2020-21. B3 teams also work closely with Cesar, SITplus, several universities, state departments for primary industries, and biosecurity specialists.

In the Pacific, the Samoa Ministry of Agriculture and Fisheries, Scientific Research Organization of Samoa, Ah Liki (Samoa) Mellow Foods (Samoa), Institut Agronomique néo-Calédonien are important collaborators with B3.

Further afield, B3 scientists work with many collaborators in Europe (ANSES , SCIC, Fundazione Edmund Mach), North America (USDA, USFS, AgriFood Canada, several universities and commercial companies) and Asia (IPP-CAAS, China Agricultural Univ., Suncheon University, Korea, CABI).

In 2019-20, MPI joined Euphresco, a global organisation comprising 50 countries that enhances the ability of international experts to study and share information in the phytosanitary area.

The B3 Director is the associate member for New Zealand with B3 scientists currently contributing to four projects. This is an important opportunity for New Zealand scientists to engage with international specialists on key biosecurity issues of concern to New Zealand.

B3 is fully aligned to
New Zealand's Biological Heritage National Science Challenge.

National Science Challenges | NEW ZEALAND'S BIOLOGICAL HERITAGE | Ngā Koiora Tuku Iho

INTERNATIONAL BIOECONOMY FORUM

B3, as the New Zealand representative, is also actively engaging with the International Bioeconomy Forum Plant Health Working Group through workshops and virtual meetings. This engagement is working to facilitate the creation of a network-of-networks that will share information and increase capacity to respond to plant health threats in the changing environment.

SUPPORTING FUTURE CAPABILTY – PHD STUDENTS

B3 recognizes that it has an important role in mentoring future generations of biosecurity professionals. To this end, B3 undertakes various activities across the education spectrum with primary (e.g. working with House of Science), secondary (e.g. Unlocking Curious Minds projects) and tertiary students. In last year's Annual Report, we highlighted some of the amazing summer students working with us. This year we highlight some of the PhD students that we were privileged to work with during the year and to contribute to their professional development.

TOM SAUNDERS, UNIVERSITY OF AUCKLAND

APPLYING CHEMICAL ECOLOGY TO HOST RANGE TESTING

THEME A

Tom started his PhD in October 2017 with Gonzalo Avila and Greg Holwell (UoA) with critical support from Kye Chung Park and Lee-Anne Manning. His research supports a project in Theme A: "Improving Risk Prediction and Reducing Uncertainty Pre-release for Classical Biocontrol".

Tom's research explores the use of chemical ecology for host range testing of new classical biocontrol agents (BCAs) before they are approved (or not) for release into New Zealand. He is using the BMSB parasitoid, *Trissolcus japonicus* (the Samurai wasp), as his case study. The ultimate goal is to ensure that BCAs will not have a detrimental effect on valued non-target organisms.

MAIKOL SANTAMARIA GALINDO, NATIONAL UNIVERSITY OF COLOMBIA

FRANKLINIELLA PANAMENSIS IN PLUM IN THE HIGH TROPICS

THEME B

Maikol is a PhD candidate in the Faculty of Agricultural Sciences, National University of Colombia (NUC), Bogotá, Colombia, and supervised by Helena Luisa Brochero (NUC). He is linked to B3 (Theme B) through David Teulon as co-supervisor in a project initiated through a Royal Society of NZ Catalyst Fund. For his PhD Maikol is studying the biology, ecology and management of *Frankliniella panamensis* in deciduous fruit crops, especially plum, in the high tropics of Colombia. This thrips species is native to the Americas and not yet found in New Zealand, but it can be a contaminant on goods such a cut flowers imported into New Zealand.

JAMAL CHEMMA, UNIVERSITY OF AUCKLAND

DEVELOPMENT OF A BIOSENSOR BASED ON INSECT OLFACTORY RECEPTORS

THEME C

Jamal's PhD is a joint project between PFR (Andrew Kralicek, now CTO of Scentian Bio) and the University of Auckland (Jadranka Travas-Sejdic). Jamal's project is characterising the utility of insect odorant receptors as sensing elements on biosensors for the detection of volatile organic compounds. Jamal has characterised three different substrates as suitable base materials to develop an electrochemical sensor using insect odorant receptors. He has also helped characterise a new receptor display format that will provide a stable way to sense with these receptors. In the future such biosensors will enable the development of portable sniffer devices that MPI and DoC officers can use in the field to detect the fingerprint aromas of pest insects e.g. BMSB and QFF.

CAROL BEDOYA, UNIVERSITY OF CANTERBURY (GRADUATED APRIL 2020)

ACOUSTIC DETECTION OF BARK BEETLES AND STINK BUGS

THEME C

Carol recently completed his PhD working with Ecki Brockerhoff, Michael Hayes and Ximena Nelson (UoC) in collaboration with USDA (especially Tracy Leskey) and Richard Hofstetter (NAU). His work was linked to B3 activity in Theme C - Pathway Risk Management. In his PhD, Carol examined the role of acoustic signals in the communication of bark beetles and vibratory signals in stink bugs, and whether these signals could be used to develop detection tools for use along importation pathways. He concluded that acoustic or vibration detection is feasible, but eliciting ad libitum acoustic/ vibrational behaviour is the crux of the matter in both insect systems and still requires further investigation.

JESSE RUBENSTEIN, LINCOLN UNIVERSITY

ASSESSING THE RISK OF WEED SEED CONTAMINATION WITHIN NEW ZEALAND'S SEED FOR SOWING INDUSTRY

THEME C

Jesse is a BPRC PhD student supervised by Phil Hulme and John Hampton (LU). His co-supervisors are Phil Rolston and Chris Buddenhagen from AgResearch. His work is co-funded by the Seed Industry Research Centre (SIRC) and aligned with Chris Buddenhagen's B3 project in Theme C: "Network Modelling of Biosecurity Risk Associated with Seed Imports." The project has strong links to MPI, Foundation for Arable Research (FAR), and industry. Jesse's modeling research aims to a) determine the risk factors associated with weed seed contamination in seed imports; b) investigate whether New Zealand's inspection processes are fit for purpose and; c) use seed lot purity tests to determine how contamination rates and weed diversity have changed over time; and how improvements in seed cleaning technology have reduced contamination rates.

KIRAN HORROCKS, UNIVERSITY OF AUCKLAND

CAN STERILE PARASITOIDS BE EMPLOYED FOR ERADICATION TO MITIGATE POTENTIAL RISK OF NON-TARGET IMPACTS?

THEME E

Kiran is supervised by Max Suckling, Greg Holwell (UoA) and Gonzalo Avila and linked to the B3 project in Theme E "Socially Acceptable Eradication Tools Underpinned by Modelling for Eradication" led by Lloyd Stringer. Kiran's research explores the synergism of two pest management technologies a) the Sterile Insect Technique and b) Biological Control, in particular, the use of sterile parasitoids for eradication of invasive stink bugs. This approach could reduce detrimental impacts on non-target organisms from biological control, as they will not be able to reproduce. Using the green vegetable bug and *Trissolcus basalis* as surrogates for BMSB and the Samurai wasp, the results look promising.

KARLA LOPEZ, LINCOLN UNIVERSITY

VISUAL ECOLOGY OF HERBIVOROUS PESTS

THEME E

Karla's PhD is linked to Theme E – Surveillance and Eradication, examining the colour vision in thrips through behavioural, molecular and physiological research, this is with the ultimate aim of improving traps for use in monitoring and mass trapping. Studying at Lincoln University, with aspects carried out at Wageningen, Bristol and Lund Universities, she is using western flower thrips as a model that includes a number of invasive economic pests. Karla's scholarship, initiated through a Royal Society of NZ Catalyst Fund, is funded by the PBRC and Wageningen University of Research, and she is supervised by Karen Armstrong with Travis Glare, David Teulon and European collaborators Rob van Tol and Mike Bok on the supervisory team.

HESTER WILLIAMS, UNIVERSITY OF AUCKLAND (GRADUATED JUNE 2020)

SOCIAL ACCEPTABILITY OF ALTERNATIVE ERADICATION TOOLS

THEME E

Hester was originally part of the MBIE "Urban Eradication" programme and then adopted by B3. She was supervised by Darren Ward, Mandy Barron and Ecki Brockerhoff with Andrew Liebhold (USDA).

Hester's studies focused on exploring non-pesticide eradication techniques for invasive insect species. By using a weed biocontrol agent as a proxy invasive insect species, she identified key factors influencing establishment and eradication. These studies helped explain the role of Allee effects during early establishment of new insect pest invasions and how they could be used in eradication attempts.

PROJECTS COMPLETED IN JUNE 2020

Four projects wrapped up at the end of June 2020. For more information please contact the project leader.

B17.4: Sentinel plants to forecast & future proof NZ plant systems against pests & diseases

Project Leader: Mark.McNeill@agresearch.co.nz (yr 1 & 2), David.Teulon@plantandfood.co.nz (yr 3)

This project has advanced our understanding of the sentinel plant concept for biosecurity risk assessment. An important article summarising the science underpinning the sentinel plant concept was published in a major invasive species journal and several model systems (myrtle rust, *Xylella*, BMSB) were explored for the use of sentinel plants in practice. Strong relationships were developed and maintained through Botanic Garden Conservation International and the International Plant Sentinel Network including NZ support for the sentinel garden approach in Australia through Plant Health Australia. New Zealand indigenous plants are found in botanic gardens throughout the world.

B17.5: Integrated biosecurity risk assessment models for imports

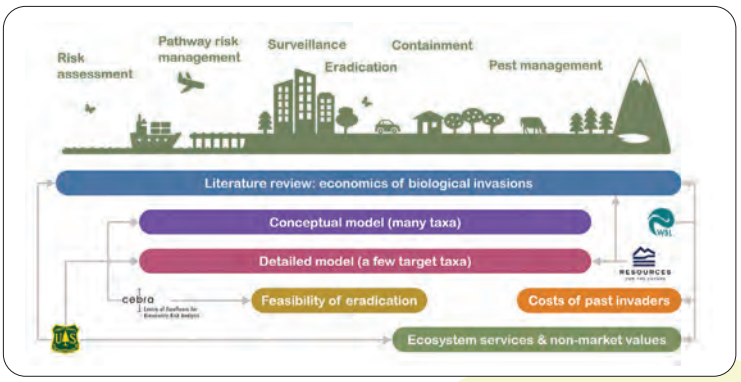
Project Leader: Lisa.Jamieson@plantandfood.co.nz

The Integrated Biosecurity Risk Assessment Model (IBRAM) developed from this project has been designed to deliver a more nuanced and timely assessment of risk, allowing for more efficient intervention on pathways and allocation of surveillance resources In a spatial and temporal context. A web-based tool has been developed that allows for effective input of data, running the model, and display of the outputs. Several case studies have been used to test and validate the model including Queensland fruit fly, BMSB, Asian gypsy moth and the pepper weevil. MPI has been using the model to assess the risks for a number of pest species, including red imported fire ant and serpentine leaf miner.

C17.36: Optimising biosecurity investment and effort across all invasion phases

Project Leader: Melissa.Welsh@scionresearch.com

Working with our CEBRA collaborators, this project has enabled better appreciation of the benefits and costs of border biosecurity interventions at different stages of the biosecurity system and the biosecurity system as a whole. It has also enhanced the ability of biosecurity managers to understand trade-offs and make informed decisions about optimal interventions and investment across prevention, surveillance, and incursion response and pest management. Results from this project have been presented at several conferences and seminars in New Zealand, Australia and further abroad, and workshopped with end users at MPI. A tool for visualising initial population spread and detection is currently being used by MPI as training tool.



C19.7: *Phytophthora* Interceptions in New Zealand Borders

Project Leader: Rebecca.McDougal@scionresearch.com

This small project sought to better understand the methods for detection of exotic plant pathogens at the border, in particular *Phytophthora* species potentially introduced through plant imports. Both standard quantitative PCR (qPCR) and novel digital PCR (dPCR) performed well, each being able to detect the lowest levels of isolates tested. As dPCR has the capacity to be more robust than qPCR for the detection of specific pathogens in certain circumstances, this project supports further research into its application at the New Zealand border.

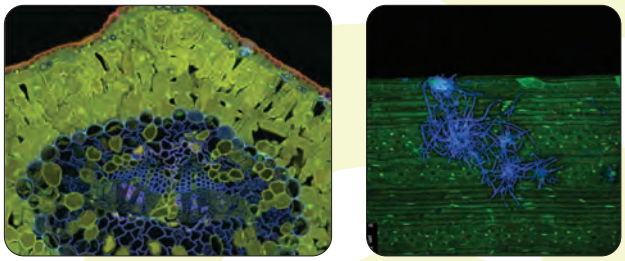


Photo: Lloyd Donaldson Scion

PROJECTS INITIATED IN JULY 2020

B3 Director David Teulon says co-innovation was critical to the development of these new projects and this meant working closely with key stakeholders to ensure the research targets high priority biosecurity needs for New Zealand, and outcomes are implemented by government and industry.

B 20.3

***Xylella fastidiosa (Xf)* and its vectors in NZ:** *Xf* is a serious invasive pathogen currently spreading through the world and is of serious concern for many NZ productive sectors as well as the natural estate. The potential for NZ native insects to transmit *Xf* needs to be understood. This project will work closely with the Xylella Action Group and is exploring connections with Euphresco.

Email: Jessica.Vereijssen@plantandfood.co.nz
CRIs: PFR, MWLR
Term: 5 years

B 20.12

Global change and NZ biosecurity risks and economics of future climates and trade patterns: The short, medium and long term impacts of climate change on plant border biosecurity are not well understood. This project will bring together all interested parties (science, government, industry) in the first year to develop a programme of research targeting the main issues. The project is strongly linked to Australia's Centre of Excellence for Biosecurity Risk Analysis (CEBRA).

Email: Nicolas.Meurisse@scionresearch.com
CRIs: Scion, AGR, PFR.
Term: 5 years

C 20.4

Prospects for the future of the fumigation research: comparative review. Treatments within the trade pathway are a major part of the biosecurity toolkit and are severely impacted with the imminent loss of methyl bromide. This short project, which will include literature review and a stakeholder workshop, aims to set the scene for a larger and more experimental project to be submitted at a later date. It is strongly aligned with a recently MPI funded project.

Email: Kambiz.Esfandi@plantandfood.co.nz
CRIs: PFR.
Term: 1 year

E 20.5

Remote sensing for biosecurity threats in nurseries: Early detection of asymptomatic pathogens within plant nurseries can make the difference between eradication and establishment. This project will investigate the relatively novel use of hyperspectral imaging for surveillance of invasive pathogens in nurseries initially targeting the destructive plant pathogen *Phytophthora*. It is exploring links to Euphresco.

Email: Rebecca.McDougal@scionresearch.com
CRIs: Scion.
Term: 3 years

E 20.8

Aerodynamic design principles for effective insect traps: Early detection and delimitation of invasive species is essential for successful biosecurity outcomes. This project will investigate some of the fundamental principles needed to develop more effective insect traps for BMSB, a key biosecurity risk threat for which there are limited trapping options. This project will working closely with the BMSB Council.

Email: Rachael.Horner@plantandfood.co.nz
CRIs: PFR, Scion.
Term: 3 years

E 20.9

Effectiveness of UAVs for spot spraying large urban trees during incursion responses: The use of pesticides is likely to continue in the near future as a key tactic for eradication of invasive species, but under the strictest of conditions to minimise environmental and social impacts. This project will investigate the use of UAVs to provide much more precise application opportunities than current alternatives and in difficult to access places such as urban trees.

Email: Justin.Nairn@scionresearch.com
CRIs: Scion.
Term: 1 year

PEER REVIEWED PUBLICATIONS (2019-20)

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Giovani B, Blümel S, Lopian R, Teulon D, Bloem S, Galeano Martínez C, Beltrán Montoya C, Ramon Urias Morales C, Dharmapuri S, Timote V, Horn N, Chouibani M, Mezui M'Ella JG, Herrera V, Castinel A, Goletsos C, Moeller C, Naumann I, Stancanelli G, Bronzwaer S, Tramontini S, MacDonald P, Matheson L, Anthoine G, De Jonghe K, Schenk M, Steinmöller S, Rodriguez E, Leonor Cruz M, Luck J, Fraser G, Brunel S, Montuori M, Fedchock C, Steel E, Pennington HG, Day R, Rossi JP, Xia J. 2020. Science diplomacy for plant health: moving towards global phytosanitary research coordination to empower countries against regulated and emerging pests. Nature Plants 6:902-905. doi.org/10.1038/s41477-020-0744-x

Holder PW, Van Hale RJ, Frew R, George S, Armstrong KF. 2019. Natal origin of the invasive biosecurity pest, brown marmorated stink bug (*Halyomorpha halys*: Penatomidae), determined by dual-element stable isotope-ratio mass spectrometry. Pest Management Science 76 (4): 1456-1463. DOI:10.1002/ps.5659

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B3 PUBLISHED A RECORD NUMBER OF

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REPRESENTATION FOR 2019-20

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*Philippa Stevens assumed the role of Chair when matters of the Biological Heritage NSC are discussed as James Buwalda is Chair of this entity.

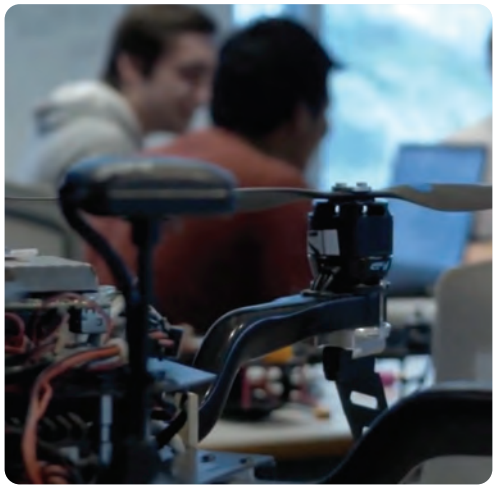
UNIVERSITY OF CANTERBURY ENGINEERING STUDENTS INVESTIGATE NOVEL WAY TO PROTECT OUR BORDERS FROM BIOSECURITY THREATS

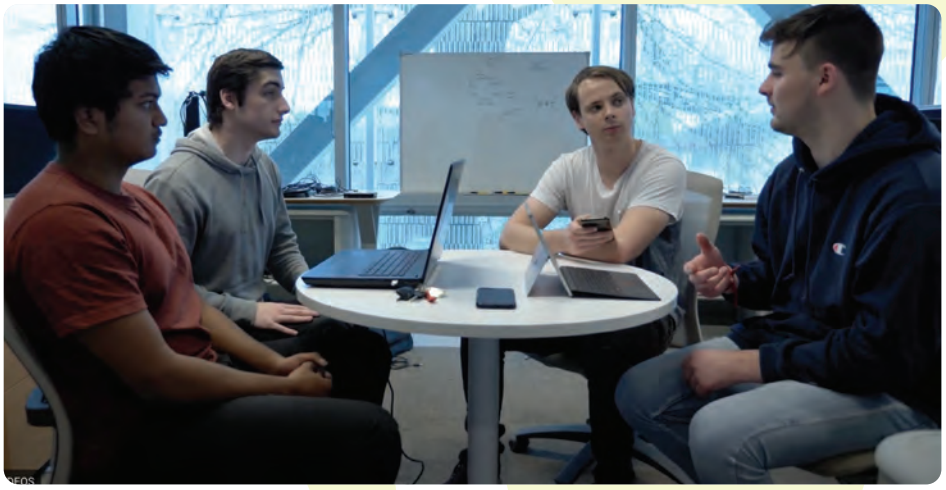
Students Aaron Smith, Manoj Paladugu, Joel Ridden and Michael Shannon from the University of Canterbury worked with B3's AgResearch scientist Mark McNeill and Scion scientists Steve Pawson and Sam Davidson, to develop smart technology capable of rapidly detecting external contamination on shipping containers while not impacting on port operations. Video here: **https://youtu.be/4kFq1zMlZok**

On average, 11,170 full and 7,500 empty sea containers arrive at the Port of Tauranga a month in 2020 with 10% and 16%, respectively, inspected for contamination by MPI or designated quarantine operators. Best efforts are made to ensure biosecurity risks are mitigated offshore, however there is an ever-present risk that hitchhiker pests or soil that contains weed seeds and/or pathogens could be present on containers and undetected when they are processed through our seaports.

Their final year project created a successful proof of concept using an AI Imaging System to show the feasibility of container scanning and identification of biological contaminants, as well as developing an efficient information system able to manage millions of container data entries.

This project is part of a collaboration with Port of Tauranga (E17.28 Biosecurity excellence in port communities) to develop better targeting of pathway interventions, surveillance and eradication practices in and around port environments. The students' project is hoped to be developed further beyond 2020, with a new initiative involving B3 scientists and University of Canterbury.





Mā te whakaatu, ka mōhio
Through resonance comes cognisance

Mā te mōhio, ka mārama
Through cognisance comes understanding

Mā te mārama, ka mātau
Through understanding comes knowledge

Mā te mātau ka ora
Through knowledge comes life

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