

B3 Annual Report

DAJ Teulon

2018-19



**Adding Value to New Zealand's Biosecurity
System Through Research**



B3

Science Solutions for
Better Border Biosecurity
AOTEAROA NEW ZEALAND

B3's aspiration

New Zealand has a world-leading science-based plant border biosecurity system, ensuring the welfare of our environment, retaining and building the value in our important plant systems, underpinning investor confidence for continued sector growth and innovation, and maintaining market access for plant-based exports.

B3's mission

Science-based border biosecurity solutions underpinning the vitality of New Zealand's natural and productive plant landscapes (forestry, horticulture, arable, pastoral) and other plant-based industries, through a research-industry-government collaboration delivering world-leading science and technology development, enabling stakeholders to implement results for *Better Border Biosecurity*.

B3 will contribute to the strategic directions of Biosecurity 2025

A Biosecurity Team of All New Zealanders
A Toolbox for Tomorrow
Free-flowing Information Highways
Effective Leadership and Governance
Tomorrow's Skills and Assets

B3's research themes

Risk Assessment – Intentional Introductions
Risk Assessment – Unintentional Introductions
Pathway Risk Management
Diagnostics
Surveillance, Eradication and Response

B3's parties

The Ministry for Primary Industries (MPI)
The Department of Conservation (DOC)
The Environmental Protection Authority (EPA) (observer status)
The New Zealand Forest Owners' Association (FOA) (representing the forestry sector)
Horticulture New Zealand (Hort NZ) (representing the horticulture/cropping sectors)
Beef+Lamb (observer status) (representing the pastoral sector)
The New Zealand Institute for Plant & Food Research Limited (PFR)
AgResearch (AGR)
Scion
Manaaki Whenua Landcare Research (MWLR)
Bio-Protection Research Centre (BPRC)

B3 is fully aligned to the Biological Heritage National Science Challenge (BHNSC)

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B3 is a strong supporter of the Ko Tātou – This is Us initiative, with a number of activities relevant to its aim of developing a Biosecurity Team of 4.7 m (see pages 11-13)

About Better Border Biosecurity

Background. 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 biosecurity research. It has evolved from largely isolated and sector-based initiatives within the productive sector Crown Research Institute's (CRI) (pre 2003), through to the Foundation for Research Science and Technology (FRST)-funded 'Improved Biosecurity' programme (2003–05). A step change followed with the Ministry for Science and Innovation (MSI)-contracted Outcome Based Investment (OBI) B3 programme (2005–11), to the current collaboration resourced primarily through CRI funding (MBIE Strategic Science Investment Fund). B3 CRI partners aligned their B3 investment to New Zealand's Biological Heritage National Science Challenge (BHNSC) in 2014.

Scope. The breadth of research carried out within B3 encompasses threats to the pastoral, horticultural, arable and forestry productive sectors and to natural ecosystems, especially cross-sectoral issues where plant pests, diseases and weeds do not respect the productive and natural system boundaries. Weeds were confirmed to be within the scope of B3 in 2014–15.

Parties. All parties work towards a commonly developed and agreed Strategic Plan and a 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), led by an independent Chair and consisting of senior managers from the members listed above, plus the Director, meets quarterly to provide a governance role for B3 and to provide 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 Manaaki Whenua Landcare Research representative), who are also representatives for the research providers. They provide operational leadership to the Project Leaders who make up the B3 science programme. The Theme Leaders are strongly influenced by Theme Representatives from the stakeholders, who provide input at the twice-yearly Science Partnership Forum (SPF) as well as at a range of formal and informal meetings throughout the year. The recent appointment of an MPI Science Programme Engagement Lead is augmenting engagement with MPI. A central tenet of B3 is that the government operational agencies, MPI and DOC, and now the members of the Government Industry Agreement (GIA), create the value from B3's science and technology through their co-investment in the form of research uptake and application at the border. A corollary of this design is the need for frequent and effective communication among the various parties. Researchers are managed by their own organisations, with some advice from the B3 leadership, which has no direct line-control.

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 2016) outlines the aspiration, mission, strategic priorities and scope for the research conducted within B3. The Collaboration Agreement outlines how the 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). These are made available to the CRIs for their internal reporting requirements.

From the Director

Major biosecurity challenges to vital sectors of our economy in 2018-19 – *animal (Mycoplasma bovis), seafood (Bonamia ostreae), our valued native plant species (Austropuccinia psidii), as well as to our fruit exporting industries (several fruit fly and BMSB detections)* – have brought into sharp focus once again, the importance to New Zealand of having a world-class biosecurity system.

This Annual Report is a selection of the research and uptake of our Better Border Biosecurity (B3) research collaboration, and our work to develop science solutions that prevent invasive species, which have the potential to negatively impact our plant systems, from establishing in New Zealand.

Highlights include some of the major areas of focus within B3 that have targeted 'big' current biosecurity issues such as the brown marmorated stink bug (BMSB), *Xylella fastidiosa*, and fruit fly species. These are all listed in the recently compiled MPI priority pest and disease list of species not found in New Zealand but that would pose a serious threat if they established (pages 6-8).

A major accomplishment in this context was B3 support for research on, and the successful application (with stakeholders) for, a pre-emptive introduction into New Zealand of the Samurai wasp (with controls) for BMSB. This was considered a world first approach for biological control risk assessment and uptake.

Formal and informal collaborations and partnerships with government, industry and the wider community are critical to B3 to ensure there is research uptake and impact. These key partnerships are illustrated on pages 9-10. And, this year, I want to draw particular attention to Tauranga Moana Biosecurity Capital's hosting of one of our B3 Science Partnership Forums which was a perfect opportunity to share information with our valuable and engaged community partners.

B3 research teams across New Zealand continued to target research outcomes in the context of Biosecurity 2025 (Team of 4.7 million, Toolbox for Tomorrow, Smart Free Flowing Information, Effective Leadership and Governance, Tomorrow's Skills and Assets) (pages 11-22). It is also encouraging to see so many of our emerging scientists and students involved with B3 and this gives us confidence in the future of plant border biosecurity science for New Zealand.

B3 is responsive to the current biosecurity climate, with several projects concluding and new projects being initiated (pages 23-28). Strategic 'STOP/GOs' ensure that long term projects remain on track to deliver relevant outcomes. Scientific output by B3 remains high and is evident through research publications, reports, and presentations at national and international conferences (pages 29-35).

In 2018-19, we said goodbye to three B3 stalwarts. Barney Stephenson (MPI) has been an essential supporter of the B3 concept within MPI. Ecki Brockerhoff (Scion) has been a key member of B3's science team and leadership group since the early days of B3 and one of B3's most productive science publishers. Margaret Hean (PFR based) was the B3 Programme Co-ordinator since 2010 and an important contributor to the Science Partnership Forums and B3 Conferences. We thank all of them for their support and wish them well in their new endeavours.

Finally, several new ideas were instigated in 2018-19 aimed at increasing the impact of B3. These include the B3 Co-Investment Committee, the development of a new B3 communication position, a new approach to the operationalisation of B3 science, and the early stages of a B3 new strategy. Along with the newly funded projects and the International Year of Plant Health (2020), 2019-20 looks to be a very exciting and productive year for B3 and its partners.



Dr David AJ Teulon

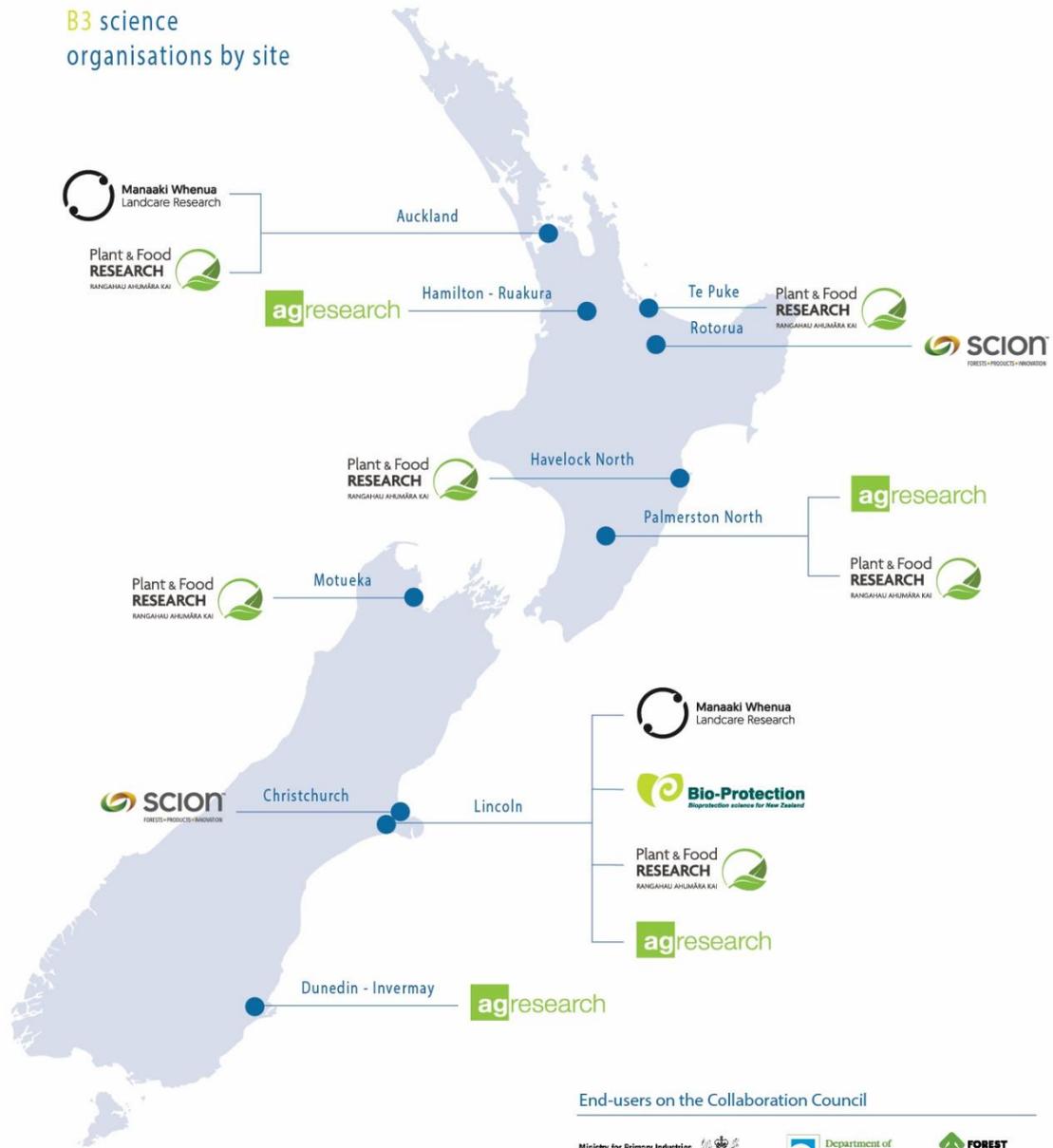
Director, Better Border Biosecurity

December 2019



B3 researchers are spread throughout New Zealand

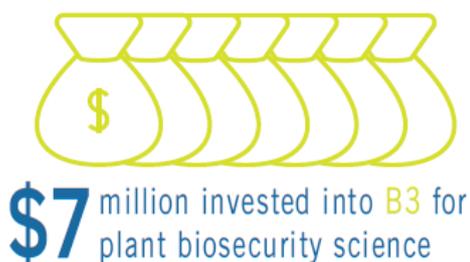
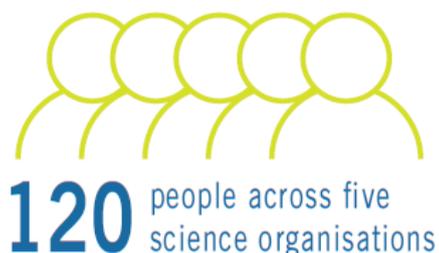
B3 science organisations by site



End-users on the Collaboration Council



B3 by numbers



Research on priority pests and pathogens

Organism Ranking System

Biosecurity NZ (BNZ, MPI) has developed a priority list (Organism Ranking System) of 49 plant pests and diseases, not found in NZ, which would pose serious threats if they established. The purpose of this list is to help NZ target resources to ensure it is anticipating potential threats, actively managing that risk, and is ready to respond if any of these pests or pathogens arrive. B3 has provided feedback to BNZ on the make-up of the priority pests and diseases list. B3's focus is on generic research that establishes principals for the prevention of establishment of all invasive organisms and not just targeting specific species. However, in many cases, this will mean working on a particular invasive species. Highlighted here are several high priority organisms, found in the BNZ list, that are receiving particular attention in the B3 research programme and where B3 is actively working with other parties to reduce the likelihood of these organisms entering New Zealand.

Link: www.mpi.govt.nz/protection-and-response/finding-and-reporting-pests-and-diseases/priority-pests-plant-aquatic/



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

This stink bug, originally from Asia, has caused considerable damage to a range of crops in the many areas that it has invaded. B3 activities have included:

- Research on SIT (Sterile Insect Technique), biotremology and other eradication tactics for BMSB at Fondazione Edmund Mach (Italy)
- Developing food-webs to assess the potential broader impact of the Samurai wasp on non-target organisms
- Developing novel surveillance tools based on insect odour receptors
- Assessing the impact of BMSB on NZ native plant species (sentinels) in North America and Italy
- Illustrating the potential impact of BMSB to plants of value to Māori
- Trials of the stable isotope technique within active responses to determine the local/non-local origins of BMSB detections
- PhD projects examining pre-emptive biocontrol, SIT for parasitoids, and novel surveillance tools
- Supporting the Samurai Wasp Working Group in the EPA application and hearing
- Co-sponsoring NZ visits of Dr Anne Nielsen (USA) and Dr Claudio Ioriatti (Italy), both BMSB experts
- Modelling the release of the Samurai wasp (BMSB Council funded)
- Researching BMSB population dynamics and management in China (KVH/Zespri funded)
- Completing a literature review on the BMSB impact on kiwifruit in China (KVH/Zespri funded)
- Updating the BMSB Council on B3 programme and projects
- Supporting Zespri/KVH in planning their BMSB research investments

Bacterial leaf scorch - *Xylella fastidiosa* (Xf)

A xylem-limited bacterium native to the Americas, which has a devastating impact on many crops and is a threat to NZ's native plant systems. It is currently spreading rapidly throughout the world and was a focus of our B3 Conference 2018. B3 activities included:

- Reassessing the impact of Xf on NZ native (sentinel) plants in California and assessing the options for similar research in Europe
- Developing an in-field Xf pathogen biosensor for early detection
- Promoting the development of an Xf cross-industry research programme culminating in the SFF Tere project
- Undertaking a literature review on the potential Xf impacts on valued NZ plants and listing potential NZ vectors (SFF Tere funded)
- Co-planning workshops in conjunction with Plant Biosecurity Research Initiative (PBRI) and MPI
- Membership of the Xylella Action Group



Pohutokawa in Sth California with severe dieback.
Image: R Groenteman

Fruit fly species – *Bactrocera dorsalis*, *Bactrocera tryoni*, *Ceratitis capitata*

New Zealand is one of the few countries in the world that is fruit fly free, and this provides the country with significant advantages in exporting horticultural commodities. With ever-increasing travel and trade as a ceaseless source for these pests and the consequential pressure on the border, smarter solutions to are needed manage this risk, and deal with such pests when they arrive. B3 provides a hub of biosecurity research activity, including more than ten projects relevant to fruit fly border protection including:

- Risk modelling to identify where and how fruit flies are most likely to arrive, and how climate might influence which regions of NZ could support their establishment
- Developing pre-border treatments in countries recognised as being at high risk

- Novel detection methods for checking international transit containers
- New technologies that will confirm whether the appropriate treatments have occurred overseas
- Lures for trapping females – a single pregnant female is of more concern than a single male
- Biogeochemical methods to assist response decision making by determining whether trapped flies are new arrivals or have been breeding here undetected

Myrtle rust - *Austropuccinia psidii*

MPI transitioned myrtle rust to long-term management in April 2018 so that myrtle rust is no longer on the MPI priority pest and disease list and now falls outside of B3 scope. Nevertheless, there are still serious concerns about alternative myrtle rust strains reaching NZ and B3 has continued to support the myrtle rust response where it can in several ways including:

- Utilising the myrtle rust incursion and response as a model system to explore improved engagement with Maori in biosecurity incursions
- Testing the sentinel plant concept with an ex-post examination of myrtle rust infection on NZ native plants overseas
- Providing maps of NZ myrtle rust distribution (updated monthly) to the biosecurity community including iwi
- Supporting a PhD student testing South African myrtle rust strains on NZ native plants
- Sponsoring an Australian speaker to attend the Myrtle Rust Symposium in Wellington in late 2018

Other priority pests and pathogens

B3 researchers work on several other pests and pathogens (or their surrogates). These include Asian long horned beetle, Ceraocystis wilt, Russian wheat aphid, spotted wing drosophila, pine pitch canker, spotted lanternfly, gypsy moth, sudden oak death, *Pseudomonas syringae* pv. *actinidiae*, and red imported fire ant.



The spotted lanternfly, originally from Asia, has a very broad host plant range. It has recently invaded parts of North America where it is proving to be as problematic as BMSB. Image: E Smyers, PSU

Collaborations and partnerships

B3 is a mature partnership of research institutions, government departments and plant sector industries with a focus on science solutions for better border biosecurity. To better achieve its aspiration and mission, B3 has entered into several formal relationships with additional parties.

Biological Heritage National Science Challenge (BHNSC) (bioheritage.nz)

National SCIENCE Challenges

NEW ZEALAND'S
BIOLOGICAL
HERITAGE

Ngā Koiora
Tuku Iho

B3 has been fully aligned to this NSC since 2014 with the BHNSC Intermediate Outcomes incorporated into the most recent B3 Strategy. In 2018-19, B3 and BHNSC worked together to achieve their common goals in several ways:

- Synergistic projects including research on an integrated platform for biosecurity through eDNA sequencing, Māori responses to biosecurity incursions and the susceptibility of taonga plants to myrtle rust
- Significant involvement and contributions from B3 researchers in the BHNSC Tranche II scoping exercises
- Joint presentations of B3 and BHNSC activities at appropriate events such as Tauranga Moana Biosecurity Capital meetings and hui
- BHNSC representation at B3 Theme Leader Group meetings and Science Partnership Forums
- Joint planning meeting of the Boards of B3, BHNSC and BPRC (June 2019. Wellington).

Plant Biosecurity Research Initiative (PBRI), Australia (www.pbri.com.au)

PBRI supports cross-sectoral investment for plant biosecurity research development and extension in Australia. In October 2018, the Chairs of B3 (James Buwalda) and PBRI (Greg Fraser) signed an MOU to further trans-Tasman collaboration in plant biosecurity between the two organisations. Directors David Teulon and Jo Luck had regular discussions throughout 2018-19 to ensure potential synergies between the two entities were maximised including in the following activities:

- Joint planning for a trans-Tasman *Xylella* and BMSB workshop in December 2018
- Joint planning for the PBRI Symposium in August 2019 including a range of NZ speakers
- Initiation of planned collaboration in two major research programmes:
 - iMapPESTS – Improving plant pest management through cross-industry deployment of smart sensors, diagnostics, and forecasting
 - Boosting national diagnostic capacity for plant production industries

Plant Biosecurity Research Initiative



PBRI Chair Greg Fraser

International Plant Sentinel Network (IPSN) (www.plantsentinel.org)

IPSN, currently hosted by Botanic Gardens Conservation International (BGCI), and co-ordinated through Euphresco, links botanic gardens and arboreta, National Plant Protection Organisations (NPPOs), and plant health scientists. It provides an early warning system of new and emerging pest and pathogen risks. B3, along with four NZ botanic gardens, is part of IPSN with B3 providing a representative for the IPSN International Advisory Group. In 2018-19, B3 members participated (one

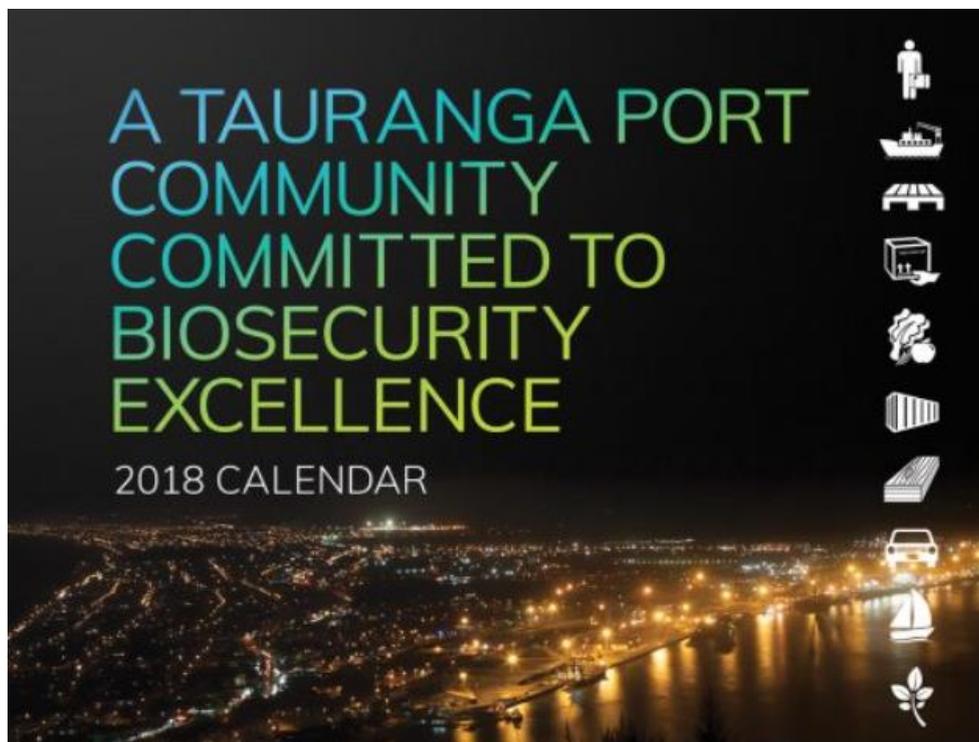
as a keynote) at an annual IPSN meeting in Switzerland, and supported Plant Health Australia's development of a plant sentinel system in Australia. BGCI assisted B3 in locating international gardens with NZ native plants as part of the B3 Sentinel Plant project.

Keynote: McNeill et al. Evaluating the expatriate plants concept: looking overseas to predict invasive threats to New Zealand natural and agricultural ecosystems. Sentinel plantings for detecting alien, potentially damaging tree pests: state of the art 2018. 9-12 October 2018. Sursee, Switzerland.

Tauranga Moana Biosecurity Capital (TMBC) (www.tmbiosecurity.co.nz)

The TMBC initiative was formally launched by Minister Damien O'Connor in October 2018. TMBC brings together a "coalition of the willing," including iwi, community groups, industry, businesses, agencies, educators, scientists, and others such as B3, all striving to achieve biosecurity excellence. B3 works closely with TMBC, and especially with TMBC members House of Science and Port of Tauranga Biosecurity Excellence in a number of ways including:

- The B3 Biosecurity Excellence in Port Communities project undertaking research in the areas of social science (see pg 11), trapping technologies, and biosecurity risk profiling
- Attending and presenting at a range of TMBC meetings and hui including the formal opening
- The B3 Science Partnership Forum in May 2019, with about 70 attendees, was hosted by TMBC



Other collaborations

Most B3 projects involve collaborators from outside the formal B3 partnership. These collaborators make critical contributions to research and uptake. They include:

In New Zealand: Auckland Botanic Gardens, Government Industry Agreement for Readiness and Response (GIA), Seed Industry Research Centre (SIRC), Te Tira Whakamātaki, University of Auckland, University of Canterbury, University of Otago, Victoria University of Wellington

Overseas: Bayesian Intelligence (Melbourne), CABI China, Centre of Excellence for Biosecurity Risk Analysis (CEBRA) (Melbourne), CSIRO, Fondazione Edmund Mach (Italy), New South Wales Department of Primary Industries, Oregon State University, Penn State University, Queensland University of Technology, Resources for the Future, Samoa Ministry of Agriculture and Fisheries, Scientific Research Organization of Samoa, US Forest Service, US Department of Agriculture (California, Delaware, Hawaii, Oregon, West Virginia).

Biosecurity 2025

As directed by the B3 Strategy, B3 contributes to the Strategic Directions of Biosecurity 2025

Strategic Direction #1. A Biosecurity Team of 4.7 M

Biosecurity trail empowers visitors to protect NZ flora

A new walking trail was opened at the Auckland Botanic Gardens (ABG) in April 2019 and is giving locals and visitors a chance to learn about NZ's flora as well as the role they play in protecting it. The Biosecurity Trail is a collaboration between B3 and ABG and branded under the Ko Tātou This Is Us initiative. Visitors embark on a 1.8 km-long walk around the garden with brief information about pests and pathogens that threaten NZ's native flora and primary industries at each of the 12 checkpoints along the path. Visitors can also scan the Quick Reference code at each checkpoint and be directed to an additional video and/or website information on the pest or the pathogen and how to prevent its spread. "We believe that the insights our visitors will gain on this trail will be a significant way of engaging them with this important topic" says Julia Watson from ABG.



Image credit: PFR

Contact: Manoharie.Sandanayaka@plantandfood.co.nz

Link: discover.stqry.com/v/auckland-botanic-gardens/e/3ba87e74-eacd-4d08-b0ec-a4224a5a7753



Measuring biosecurity excellence in port communities



Port of Tauranga (PoT) is NZ's largest and fastest-growing port, processing a large volume of goods, from diverse origins. These goods may contain biosecurity risks, and with over 1,000 workers on the port, working for several different companies, there is dispersed social and geographic responsibility for managing these risks. A range of surveys and interviews were conducted with four key groups (port staff, transitional facility staff, local community surrounding the port and school children) to

provide a baseline measurement of biosecurity awareness, perceptions and behaviours and to measure the effectiveness of targeted interventions. This work has indicated that all four stakeholder groups appreciate the importance of biosecurity, and are generally familiar with the concept. All groups appear open to receiving more information or training and are willing to support biosecurity outcomes.

Contact: Penny.Payne@agresearch.co.nz

Nurturing curious minds about invasive pathogens

Since February 2019, students from Aorere College's (Papatoetoe, South Auckland) Year 10 Mātauranga Māori class have been supported by regular lessons from PFR scientists as part of an "Unlocking Curious Minds" MBIE project on Understanding Rusts – Fungal Invaders of Aotearoa. The project seeks to expose students to biosecurity concepts and the dynamic nature of plant disease epidemics, taking them beyond theory and into scientific practice. The project includes visits to the Biosecurity Trail at ABG.



Quote: "We found out that myrtle rust had originated from Brazil, and it's progression to NZ was by the wind. They told us about how easily the spores can spread and how effective it is. Over time we found out that not all plants are or can be infected by this fungal disease. We have learnt quite a lot about what to do if we have a sighting of myrtle rust or even how to act when being around it" - Olivia, Aroha, Jazhtice and Ryshani.

Contact: Lucia.Ramos@plantandfood.co.nz

House of Science (HoS) turns 5 year olds into biosecurity scientists

'A Biosecurity Team of 4.7 Million' aims to make all NZers aware of the importance of biosecurity and to get them involved in pest and pathogen management. But very few are targeting the approximately 760,000 school students who will lead the communities of the future and provide the vital components for lasting biosecurity success. House of Science is filling this vital gap. Two of the 34 kits in the HoS library have a direct biosecurity focus targeting primary and intermediate school children. 'Invasion Busters' (Ngā Kaiārai Kaiurutomo) was developed in partnership with AGR and 'Plants, Pests & Produce' was designed with the help of Scion. There are more than 17 copies of these biosecurity kits available to over 250 NZ primary and intermediate schools in HoS's 11 regional centres. Over 8,000 students have learned about biosecurity as a result of these teaching resources. By 2025 these resources can reach over 150,000 students, helping to build an informed and capable workforce and a solid foundation for an effective biosecurity team of 4.7 million.

Contact: John.Kean@agresearch.co.nz

Video: www.youtube.com/watch?v=CZZNfWvUYRQ



Targeting Issues of Relevance to Māori

Māori responses to biosecurity incursions: the myrtle rust case study



A series of hui held between May and October 2017, along with follow up hui at the end of 2018, highlighted the need to engage Māori from the outset rather than at different stages throughout an incursion. The hui collected valuable information that informed a number of biosecurity and science outcomes. These included a published paper on the amalgamation of Mātauranga Māori with western biosecurity concepts, and the development of plans to improve future engagement based on learnings from the recent myrtle rust incursion. The project also completed a literature review of Māori engagement and existing response plans and a summary report of cultural impact assessment of myrtle rust biosecurity tools.

Contact: Alby.Marsh@plantandfood.co.nz

E whakarite ana he tūāpapa e mārāma ai i ngā kino o te ngārara pīhau parauri ki ngā tipu e whai hua ki te Māori

Māori are partners in NZ's biosecurity community and an understanding of the potential impact of any invasive alien species, such as BMSB, to their interests is essential. A review of published literature indicates that many fruit and some vegetable species are likely to be affected by BMSB in commercial and non-commercial Māori horticulture but the impact of BMSB on indigenous/native and other taonga plant species in mara kai and the native estate is difficult to evaluate. A kaupapa Māori approach examining unpublished mātauranga would considerably broaden this understanding. Hone Ropata spoke at the May 2019 B3 SPF and Aleise Puketapu (right) spoke at the August 2019 PBRI Symposium.



Contact: Aleise.Puketapu@plantandfood.co.nz

Publication: Teulon et al. 2019. Establishing a base for understanding the threat of the BMSB to plants of value to Māori. NZ Plant Protection 72: 44-58. *Abstract in Te Reo.*

Documenting the written views of Māori to the introduction of biological control agents

Iwi often provide submissions to the Environmental Protection Authority (EPA) to support, or not, applications for the introduction of new biological agents into NZ. As part of a larger project examining the perceived uncertainties raised in all applications and submissions, the views from iwi submissions were collated and summarised. This resource can provide Māori researchers with useful information for understanding iwi values and attitudes to biological control introductions.

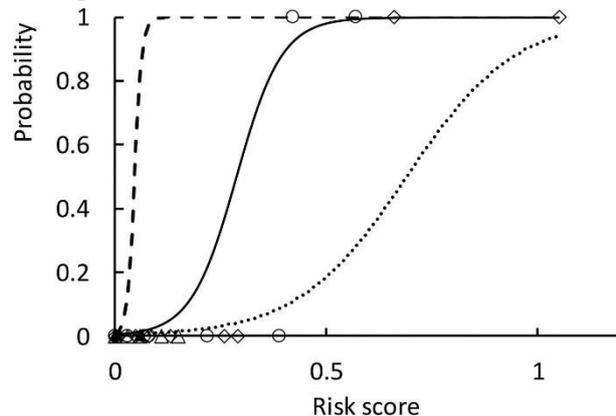


Report: Barratt BIP. 2019. Maori responses and submissions to applications for biological control agent introductions under HSNO. AgResearch; Better Border Biosecurity, Mosgiel, 16 p. (draft).

Strategic Direction #2. A Toolbox for Tomorrow

A new risk assessment tool for biological control agents

A simple risk threshold approach, previously developed for weed biocontrol agents, appears to be useful for determining the potential impact of pest biological control agents on non-target species. In this instance it was tested on a group of aphid parasitoids (*Aphidius* spp.). The relative risk score (host utilisation) of parasitoids in the field correlated to the relative risk score of parasitoids in laboratory specificity tests. The approach is being examined for another model system (weevils and their parasitoids). So far, it appears that this approach will be a useful tool for assessing the potential impact of pest biological control agents as part of the EPA assessment process for their release in NZ.



Contact: PaynterQ@landcareresearch.co.nz

Publication: Paynter & Teulon 2019. Laboratory tests to estimate the non-target impacts of four *Aphidius* spp. parasitoids in the field. *Biological Control* 133: 41-49.

New tools for BMSB: lessons from Italy

A Trimble Award, supporting Prof Max Suckling to visit Fondazione Edmund Mach in Italy where BMSB is in outbreak mode, is enabling the development of a number of new tools for use in the event of an incursion of BMSB in NZ

- 'Kamikaze Wasp' technique. BMSB biocontrol agents (parasitoid wasps) are sterilised and potentially used for eradication in conjunction with sterilised BMSB adults (i.e. SIT). This approach may reduce potential non-target impacts of the wasps on native stinkbugs
- 'Live traps'. A new cheap and simple trap that allows for the capture of live BMSB adults which may be used in SIT
- 'The Nazgûl' (right) is a prototype lure-and-kill system for BMSB nymphs and adults made from a pheromone-baited insecticide-treated mesh. Like all B3 research, any application of these tools will need to be evaluated with reference to current practices and ease of implementation.



Contact: Max.Suckling@plantandfood.co.nz

Link: www.agscience.org.nz/max-suckling-updates-the-nziahs-on-trimble-awards-role-in-war-on-stink-bugs/

Mitigating biosecurity threats from the Pacific

Travel and trade with our northern Pacific neighbours creates a significant pathway for entry to NZ of several devastating fruit fly species and other pests. In the context of international commitments to reduce the use of methyl bromide, B3 is collaborating with researchers in Samoa and Hawaii to develop alternative disinfestation treatments for breadfruit and taro. The need for fumigation of these imports is successfully being reduced through an improved understanding of heat and hot water

treatments in combination with pressure washing cleaning systems. Future options for using x-ray technology are also being examined. These treatment systems also have applications for other tropical countries.

Contact: Allan.Woolf@plantandfood.co.nz

Publications: Tunupopo et al. 2019. Development of heat treatments for Samoan fruit flies (*Bactrocera* spp., Diptera: Tephritidae). NZ Plant Protection 72: 59. Molimau-Samasoni et al. 2019. A comparison of postharvest quality of breadfruit (*Artocarpus altilis*) after disinfecting hot air and hot water treatments. NZ Plant Protection 72: 67.



Stable isotopes hone in on where pests come from

When deciding how to deal with a 'new to NZ' pest insect it is important to know where the insect was born. At the outset of this B3 project, stable isotope analysis was seen as area of high risk for applied biosecurity applications. However, recent advances, including reducing the time and sample size for analyses, have made the technology more fit-for-purpose. The new protocols were able to support responses for the Auckland Airport and Mt Manganui BMSB incursions, as well as the Queensland fruit fly (QFF) in Northcote. "The project leaders have established themselves as world leaders in this novel application".



Contact: Karen.Armstrong@lincoln.ac.nz

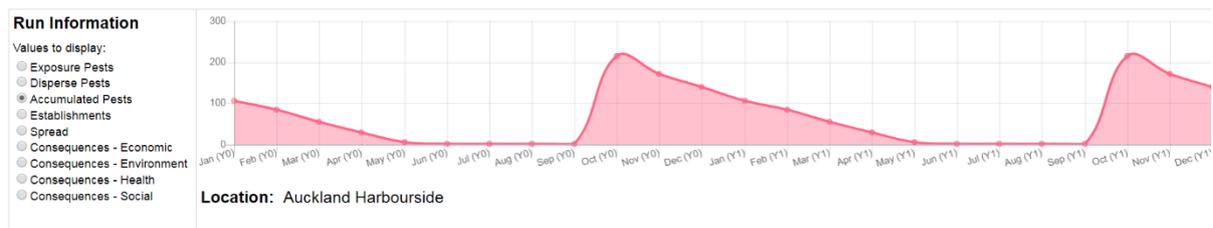
IBRAM – the Integrated Biosecurity Risk Assessment Model for risk assessment

B3 researchers and MPI risk assessors have been working closely together to develop IBRAM, a tool to support decision making for managing biosecurity risk organisms. IBRAM includes a combination of entry, establishment and spread models. It integrates trade, pest, and landscape information to map the biosecurity risk at each point on the invasion pathway, as well as the overall risk for NZ. This enables 'what-if' scenarios to be examined for interventions at each point in the pathway over time, allows relative comparisons with other risk organisms and provides a measure of economic impact. An online tool has been developed and is being used by MPI. IBRAM works well for discrete units (i.e. insects) but challenges remain for non-discrete units (i.e. pathogens).

Contact: Lisa.Jamieson@plantandfood.co.nz

BMSB

Base



Bees as Biosecurity Biomonitoring – a new aligned project

Andrew Cridge, from the Department of Biochemistry at the University of Otago, leads a team including B3 researchers, to make use of honey bees as biosecurity monitors, in the first instance to detect and locate the presence of noxious plant species in NZ. The researchers intend to deliver an efficient and cost-effective end-to-end surveillance, diagnostic, and discovery system by combining the foraging behaviour of bees with cutting edge DNA technology. The goal is to detect and identify plant species by metabarcoding bee-collected pollen, then use remote-data modelling to locate the invasive plant. This landscape-scale approach to monitor for noxious plants will be trialled in both rural and urban areas, including high-risk sites for exotic weed invasions. Andrew presented on this programme at the B3 SPF in October 2018.

Contact: Andrew.Cridge@otago.ac.nz



Strategic Direction #3. Smart Free-flowing Information

Review of butterfly eradication underscores need for smart use of data



The DOC GWB response team

A recent review of the first and only successful eradication of the large white butterfly anywhere (in June 2016 in Nelson) underlines the importance of comprehensive information for a successful biosecurity outcome. Arguably, the initial uncertainty to not undertake an eradication of this insect was based on assumptions made from inadequate data, especially the benefits and costs, and the efficacy of detection and control tools. Conversely, after a decision was made to proceed, the constant reassessment of resource allocations to different aspects of the project, and the resultant efficiencies gained, were only possible through the expert analyses of incoming data from the response team to the Technical Advisory Group that supported the response.

Contact: Craig.Phillips@agresearch.co.nz

Publication: Brown et al. 2019. Feasibility of eradicating the large white butterfly (*Pieris brassicae*) from New Zealand: Data gathering to inform decisions about the feasibility of eradication. IUCN Island Invasives: scaling up to meet the challenge 62: 364–369.

B3 teams up with Seed Industry Research Centre (SIRC) to understand weed incursions

Several high profile weed incursions have necessitated a better understanding of weed incursion pathways, including the role of managed seed importations. This data-intensive B3 project, initially targeting ryegrass and clover seed importations, aims to develop a network model that will estimate contamination and incursion rates. Critical to this approach has been the need to clarify and understand the seed inspection and data collection processes, as well as undertaking time-consuming manual data cleaning. Early findings suggest that weed contaminants are common (although not quarantine weed species), but that the probability for any given species to be detected is very low. SIRC is supporting a PhD student at BPRC who, in addition to the examination of seed imports, will work with seed industry stakeholders to improve our understanding of weed contaminants.

Contact: Chris.Buddenhagen@agresearch.co.nz



SEED INDUSTRY RESEARCH CENTRE

Impacts from the archives: historical B3 research supports current EPA application

The 2019 Scion application to release a new biocontrol agent (*Pauesia nigrovaria*) for the invasive giant willow aphid (*Tuberoachnus salignus*) relied heavily on previous biosystematics and biosafety research carried out on indigenous aphids in B3. Advice was provided to the applicant as to which non-target aphids should be tested and reference was made to historical B3 research on 11 occasions from 5 different publications in the application.

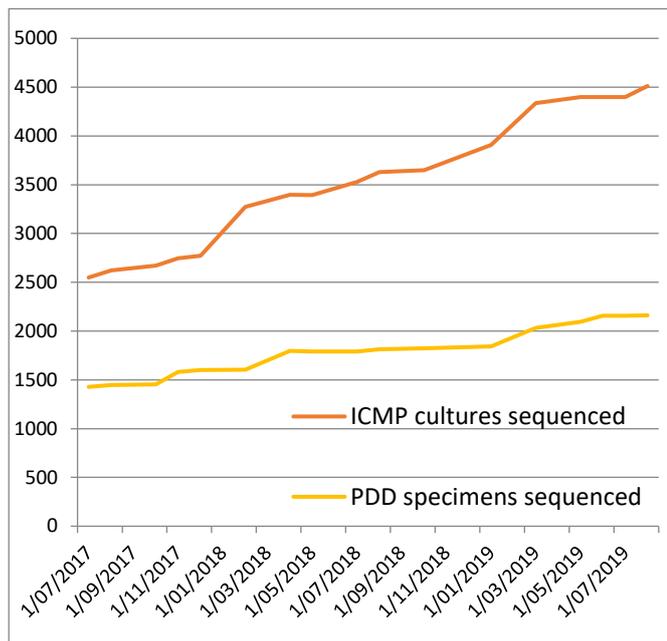
Contact: Toni.Withers@scionresearch.com

Link: www.epa.govt.nz/database-search/hsno-application-register/view/APP203853



A diagnostic data nexus for sustaining biosecurity outcomes

Accurate and rapid diagnostics of invasive organisms is the cornerstone of an effective biosecurity system. Towards this end, the linkage to international databases is essential to establish if these organism have already been identified overseas. B3 researchers in the NZ Fungarium (PDD), the International Collection of Microorganisms from Plants (ICMP) and the NZ Arthropod Collection (NZAC) are developing protocols to pair vouchered named species to high quality DNA sequence data and then to link these to international databases such as GenBank and BOLD. New protocols are making it much easier to upload NZ sequence data (and other data such as GPS coordinates) to GenBank and BOLD enabling the backlog of uploads to be reduced, and to speed identification with greater confidence. Consequently, 2165 new sequences added to GenBank from ICMP / PDD last year.



Contact: WardDA@landcareresearch.co.nz (Darren Ward)

Lack of data stymies biosecurity tourism research and management



Along with many other factors, the strong growth in tourism is putting an immense strain on NZ's biosecurity system. A recent B3 report on the use of tourist movement data to visualise tourist flows throughout NZ illustrates how this data can give a better understanding of the biosecurity risk presented by tourism. The report also showed how this information might be used to improve our response, for example, by informing surveillance programmes. Current tourism flow data are out of date and do not reflect the recent increases and changes in tourist numbers especially those associated with

visitors from Asia. Tourism flow data are not currently collected, but new data sources (such as cell phone tracking records) may in the future provide a more useful, informative and accurate dataset of tourist flow and activity than was not able to be measured in the past

Contact: David.Simmons@lincoln.ac.nz

Report: Wilson et al. 2018. Tourism, biosecurity and pathways into New Zealand: identifying risk and mitigation strategies. Report on visitor hotspot data mapping. Faculty of Environment Society & Design, Lincoln Univ.

International tourists dominate human movement into NZ

- 56% of all passenger arrivals by air (YE Mar 2018)
- 87% of passenger in cruise arrivals (YE June 2018)

Strategic Direction #4. Effective Leadership & Governance

Bringing international expertise to NZ

B3 supported visits to NZ of BMSB experts **Dr Anne Nielsen** (Rutgers University, USA) (right) in October 2018 and **Dr Claudio Ioriatti** (Fondazione Edmund Mach Italy) (below) in May 2019. Both spoke to a wide range of stakeholders throughout the country during their visits and progressed the development of NZ's readiness for this insect.



As part of the project 'Using Molecular Systematics to Enhance Diagnostics and Predict Biosecurity Risk', MPI funded several international beetle specialists (**Mengjie Jin** (Australian National Insect Collection), **Igor Orlov** (Natural History Museum, Denmark, and **Pawel Jalszynski** (University of Wroclaw, Poland)) to visit the New Zealand Arthropod Collection (NZAC) to identify species for DNA sequencing. Rove beetles which can contaminate timber products, and longhorn beetles which are forestry pests, are key biosecurity groups for MPI diagnostic staff. Overseas collaborators are a vital part of NZ biosecurity because of the limited expertise within NZ.



Leadership in national and international science agendas

- **Max Suckling** was appointed to the Paris-based Scientific Advisory Body of the OECD Co-operative Research Programme on Biological Resource Management for Sustainable Agricultural Systems (CRP) for a five-year term. He will co-lead “Managing Risks in a Connected World” with meetings in Paris and conferences on managing risks threatening food security, including invasive species.
- **Barbara Barratt** has been invited to join the international organizing committee for a project to support the development of a risk assessment protocol for exotic generalist arthropod biological control agents. The project is known as Environmental Risk Assessment for Generalist Biological Control Agents (ERA-GABCA).
- **David Teulon** was approached by MBIE and MPI to represent NZ at the International BioEconomy Forum - Plant Health Working Group. He attended the initial meeting in Ottawa in November 2018 and several virtual meetings thereafter. The Working Group is attempting to develop ‘A Network of Networks’ to link researchers within the international Plant Health community.
- **Toni Withers** led the Scion applicant team at the EPA hearing for the release of *Eadya daenerys* – a biological control agent for eucalyptus tortoise beetle. This application included the use of the B3 developed PRONTI tool for selecting non-target test species (see 2017-18 Annual Report)

Recognition of B3 researchers from NZ science community

Andrew Kralicek (right), B3 project leader, won the BNZ Supreme Award, KiwiNet 2018, for his research on harnessing insects’ receptors for commercial sensing. This award recognises an entry which demonstrates overall excellence in all core areas of research commercialisation. Andrew’s technological breakthrough led to the development of a proof of principle prototype showing that insect odorant receptors can be used for the detection of miniscule amounts of volatile compounds. Possible commercial applications range from human health, pest and disease detection, food quality and defence technologies. Andrew is now exploring the use of these technologies to detect BMSB and fruit flies in the plant border biosecurity context.



Left to right: Brian Richardson and Steve Pawson (both Scion), Melanie Mark-Shadbolt (TTW), Nick Waipara (PFR), Andrea Byrom (BHNSC)

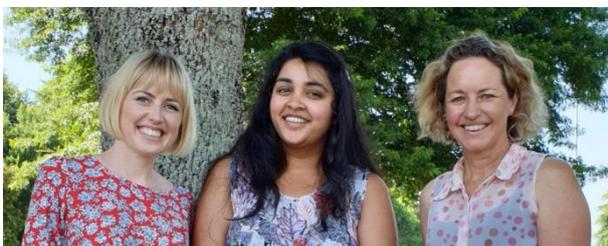
The Scion MBIE programme ‘**Protecting New Zealand's primary sector from plant pests; a toolkit for the urban battlefield**’, led by Tara Strand but including a range of CRIs, universities, and private business, took out the BHNSC Science Award in 2018. B3 co-funded a major proportion of this programme relating to research on more effective methods of eradicating pests once they are found in NZ including significantly advanced targeted pesticide spraying tools, increasing efficacy and reducing amounts of spraying required, and developing a new fragmentation eradication model.

Strategic Direction #5. Tomorrow's Skills & Assets

B3 partners host summer students in 2018-19

Summer studentships are designed to generate enthusiasm and enhance the career development of the next generation of scientists. In 2018-19, B3 had the privilege of hosting a number of summer students in both B3 and aligned biosecurity projects within various B3 partners.

Anoek Grosmann and **Janet Reid**, from the University of Auckland were with MWLR testing newly developed protocols to capture and deliver verifiable sequence data from vouchered specimens. They have worked across several target taxonomic groups (beetles, moths) to fill gaps in the DNA databases of NZ taxa.



Romalee Amolic had a Te Pūnaha Matatini Summer Internship with AGR where she worked to enhance social network analyses of biosecurity information in the NZ tourism industry.

Link: www.tepunahamatatini.ac.nz/2019/05/05/streamlining-the-process-of-social-network-analysis/

Teegan Maxwell from Massey University was hosted by PFR to help develop a Māori-led preparedness plan for the incursion and management of myrtle rust.



Brittany Pearce from University of Auckland and hosted by PFR and was using food webs to predict the non-target impacts of biological control agents.

Poster: Pearce et al. 2019. Understanding the environmental impacts of biocontrol agent introductions to inform future release decisions. 68th Ent Soc of NZ Conference, Hanmer Springs

Genavee Rhodes from UNITEC was hosted by PFR to look at the impact of the introduced aphid parasitoids on non-target species.

Poster: Rhodes et al. 2019. Identifying parasitoid wasps to understand non-target impacts of aphid parasitism. 68th Ent Soc of NZ Conf, Hanmer Springs



Lauren Sargent from University of Otago was hosted by AGR and worked on developing the COMET bioassay to determine whether imported fruit and any fruit fly maggots found in fruit have been irradiated through a post-harvest treatment or not.

Aligned Graduate Students

An increasing number of graduate and post-doctoral students are linked to B3 through financial support, supervision by B3 researchers, or by the plant border biosecurity focus of their research theses.

Recently graduated PhD students

Name	Project	University	Funding	Supervisor(s)	Defence
Lloyd Stringer	Understanding how populations and management tools interact for pest surveillance & eradication	Auckland	B3, PFR	Beggs, Suckling, Kean	12 October 2018
Simren Brar	Genetic diversity & gene expression analysis of <i>Phytophthora pluvialis</i> , a foliar pathogen of conifers	Massey	MBIE, FOA, Scion, B3	Ganley, Bradshaw, McDougal	19 July 2018

PhD students

Name	Project	University	Funding	Supervisor(s)	Status
Carol Bedoya	Acoustic identification of unwanted organisms in import pathways	Canterbury	MBIE/DHS	Nelson, Hayes, Sutin (Stevens Inst. (USA), Brockerhoff	Current
Jamal Cheema	Development of an insect odorant receptor array based biosensor for chemical detection	Auckland	B3	Kralicek, Travase-Sejdic	Current
Maikol Santamaria Galindo	Thrips in deciduous fruit trees in Colombia – A case study (<i>Frankliniella panamensis</i>)	National University of Colombia	NUC, UniMinuto, Colombia	Teulon, Brochero	Current
Kiran Horrocks		Auckland	UoA	Suckling, Avila & Holwell	Current
Karla Lopez	Visual ecology of herbivorous pests	Lincoln	Wageningen UR/LU	Armstrong, Glare, Teulon, Rostás, van Tol	Current
Tom Saunders	Improving methods of non-target testing for biological control agents	Auckland	UoA	Avila, Holwell	Current
Gerardo Roselli	Trapping and SIT for BMSB	Univ. Trento		Ioriatti, Suckling	Current
Hester Williams	Social acceptability of alternative eradication tools	Auckland	MPI, UoA	Brockerhoff, Barron, Ward	Current

Post-doctoral scholars

Name	Project	University	Funding	Supervisor(s)	Started
Rebecca Turner	Using biosecurity data to inform general surveillance	Canterbury	NZBH/Scion	Pawson, Brockerhoff, James, Plank	Feb 2018
Melissa Welsh	Optimising biosecurity investment and effort across all invasion phases	-	B3/Scion	Brockerhoff	April 2018
Mariona Roige	Improving biosecurity risk analysis methods for NZ agriculture	Lincoln	AGMARDT /AGR	Phillips	Jun 2018

A number of Masters students have also been associated with B3 during 2018–19 including Kiran Horrocks (Auckland University) (graduated), Taylor Welsh (University of Canterbury), Morgane Sinlet (Université de La Réunion) (graduated) and Hannah Kotula (University of Canterbury).

Projects completed in June 2019 – realised outcomes

Theme B. Risk Assessment for Unintentional Introductions

B17.6. On-line automated climate matching functionality. Craig.Phillips@agresearch.co.nz

- An updated App has been made available for pest risk analysts that easily and rapidly provides maps showing climatic similarity between subsets of NZ and the rest of the world

B17.15. *Phytophthora* biosecurity and biogeography. Peter.Scott@plantandfood.co.nz

- A collation of almost 12,500 records of *Phytophthora* species (including many invasive plant pathogens) from 136 countries will help MPI, plant productive industries and researchers to determine the impact and entry pathways of these organisms into NZ

B17.39. Pasture pest risk analysis. Craig.Phillips@agresearch.co.nz

- Dairy NZ now has a new method to estimate and determine which not-in-NZ invertebrates pose the most biosecurity risk to pasture production. The method is generic and can be applied to other organisms and other plant sectors

B17.40. Testing plants from NZ against the South African strain of myrtle rust.

Beccy.Ganley@plantandfood.co.nz

- As part of a broader NZ investment for myrtle rust, PhD student Julia Soewarto travelled to South Africa to learn pathogen inoculation techniques for Myrtaceae and to test the susceptibility of pōhutukawa, mānuka, rawiri mānuka and kānuka against a South African myrtle rust strain

Theme C. Pathway Risk Management

C17.7. Imaging technology for biosecurity inspection of imported seed lots.

John.Hampton@lincoln.ac.nz

- The prototype scanning system for automated quarantine inspection of imported seed was not fit-for-purpose and the project was stopped after year 1

C17.10. Development of new and less toxic on-shore treatments for imports. Adriana.Najar-

Rodriguez@plantandfood.co.nz

- The concept for using surrogate species able to be tested in NZ to assess on-shore treatments for hitchhiking pests was not particularly successful. However, preliminary results using ethyl formate to replace heat and other fumigant treatments for BMSB look promising and will be continued off-shore with our USDA collaborators

Theme D. Diagnostics

D 17.20. A platform for biosecurity detections through environmental DNA sequencing

Simon.Bulman@plantandfood.co.nz

- A draft protocol for reporting new-to-New Zealand organisms putatively identified by Next Generation Sequencing (NGS) was co-developed with MPI

Theme E. Surveillance and Eradication

E17.29 Integrating Low Power Wide Area Networks (LPWAN) into the biosecurity system.

Scott.Hardwick@agresearch.co.nz

- The cost of setting up a LPWAN dedicated to biosecurity in NZ is not overly expensive. However, the current lack of fit for purpose sensors would severely limit the usefulness of such a network - an issue that may be resolved soon due to the rapid evolution of sensor technology.

E 17.32 Genetic methods for eradicating recent invaders. Craig.Phillips@agresearch.co.nz

- A review of emerging techniques including those most likely to be useful in NZ eradication responses revealed the situation is bigger and more complicated than originally thought. Many biological and ecological issues will make it very challenging for the implementation of genetic control systems for plant border biosecurity

E17.33 Targeted spraying tools for urban pest eradication. Tara.Strand@scionresearch.com

- Two new protocols for spot spraying in the urban environment were developed using a new ring boom on a tether for helicopter-based spraying and UAV's for targeted pesticide spraying. Community engagement guidelines were developed for the use of these new tools.

E17.37. Māori responses to biosecurity incursions, including Cultural License to Operate; using Myrtle Rust as the case study. Alby.Marsh@plantandfood.co.nz

- A series of hui has highlighted the need to engage Māori from the outset rather than at different stages throughout a biosecurity incursion. The information gained from these hui provided the basis to improve future engagement based on learnings from the recent myrtle rust incursion.



The Tauranga Moana Biosecurity Capital -TMBC - has installed a giant banner of the Brown Marmorated Stink Bug - BMSB - on the Grain Corp Towers as part of a local public awareness campaign.

Projects initiated in July 2019 – targeted outcomes

B19.2. Supporting pest risk assessments in natural ecosystems

Theme B: Risk Assessment – Unintentional Introductions

Project Leader	Barbara.Barratt@agresearch.co.nz
Research Parties	AGR, MWL, PFR
Significant collaborators	
Duration	July 2019 – June 2022 (3 yrs)
Biosecurity 2025 SD	Smart free flowing information
Capability development	MS student

Biosecurity outcome

- A framework that will underpin improved biosecurity risk assessment for invasive organisms in natural ecosystems based on a comparative analysis of the characteristics of invasive organisms established in natural and productive plant systems

Science outcome

- A greater understanding of the characteristics of invasive insect species that leads to establishment in natural ecosystems as well as productive systems

B19.3: Biosecurity over the horizon: identifying invasive agricultural pests in China

Theme B: Risk Assessment – Unintentional Introductions

Project Leader	Colin.Ferguson@agresearch.co.nz
Research Parties	AGR
Significant collaborators	Chinese Agricultural University, Beijing
Duration	July 2019 – June 2024 (5 yrs)
Biosecurity 2025 SD	Smart free flowing information
Capability development	Potential student in China

Biosecurity outcome

- A database insect pests of pasture and indigenous grasslands found in China (incl. impact, potential pathways) will be developed that will enable organisms of biosecurity concern to be identified
- A proof-of-concept 'Sentinel Plants Habitat' risk assessment tool for insect pests will be developed and tested for grassland plant communities rather than single plant species

Science outcome

- Information on the insect pest taxa and communities (incl. biology, impact) found in Chinese pastoral systems will be made accessible to non-Chinese researchers
- The plant 'plant communities' approach for biosecurity risk assessment will be assessed using the Chinese pastoral system as a model. The 'plant communities' based risk approach will be compared and contrasted with current risk assessment approaches such as those targeting a single plant species only

B19.4: Predicting the risks and impacts of *Xylella fastidiosa* using sentinel plant network

Theme B: Risk Assessment – Unintentional Introductions

Project Leader	GroentemanR@landcareresearch.co.nz (Ronnie)
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Research Parties	MWL, (PFR for 1 yr)
Significant collaborators	UC Riverside, UC Berkeley
Duration	July 2019 – June 2022 (3 yrs)
Biosecurity 2025 SD	Smart free flowing information
Capability development	Summer student in USA

Biosecurity outcome

- The risk to some NZ indigenous/native plant species (incl. taonga) from *Xylella fastidiosa* will be better understood (incl. hosts, impact, strains)
- Molecular diagnostics protocols will be tested to improve resolution beyond the pathogen species level
- Methods for sequencing *Xylella* at subspecies and sequence type levels from plant tissue will be validated

Science outcome

- The sentinel/expatriate concept for risk assessment will be tested using NZ indigenous/native plants found within the distribution of *Xylella* in California
- A greater understanding on host/pathogen relationships will be established by establishing the host list for *Xylella* (California strain) for some NZ plants

B19.5: B3 support for the NZ dairy biosecurity risk evaluation framework (DBRiEF)

Theme B: Risk Assessment – Unintentional Introductions

Project Leader	Craig.Phillips@agresearch.co.nz
Research Parties	AGR
Significant collaborators	Dairy NZ
Duration	July 2019 – June 2023 (4 yrs)
Biosecurity 2025 SD	A toolbox for tomorrow
Capability development	AGMARDT postdoc

Biosecurity outcome

- Insect and weed biosecurity risks to plants important for NZ dairying have been identified and prioritised to help design mitigations to prevent their entry and establishment.

Science outcome

- New approaches to pest risk assessment will be developed, contrasted with other approaches, and made available to the international science community through peer reviewed publications

C19.7: *Phytophthora* interceptions in New Zealand borders

Theme C: Pathway Risk Management

Project Leader	Tammy.Waters@scionresearch.com
Research Parties	Scion
Significant collaborators	
Duration	July 2019 – June 2020 (1 yr)
Biosecurity 2025 SD	A toolbox for tomorrow
Capability development	

Biosecurity outcome

- Establishing the prevalence of *Phytophthora* spp. on plant material imports to NZ

- Establishing the utility of digital droplet PCR for oomycete pathogen detection and quantification for border inspections

Science outcome

- Adaptation of existing molecular diagnostic assays for increased detection sensitivity and higher throughput analysis

D19.8: Confidence in stable isotopes to verify a high risk pest incursion as foreign or NZ established

Theme D: Diagnostics

Project Leader	Karen.Armstrong@lincoln.ac.nz
Research Parties	BPRC
Significant collaborators	Queensland UT, Uni of Otago
Duration	July 2019 – June 2022 (3 yrs)
Biosecurity 2025 SD	A toolbox for tomorrow
Capability development	PhD planned, summer student

Biosecurity outcome

- Stable isotope (SI) signatures of origin will aid MPI decisions on the level of response needed for a new high risk, post-border pest detection, by providing supporting evidence of a locally breeding population or fresh overseas arrival
- The first evidence of whether the plant part (fruit, leaf, sap, wood) used for insect growth, and acquisition of its SI signature, influences use of that data

Science outcome

- A novel statistically-based method of landscape isotope (isoscape) data to distinguish the origins of insects will be generated

D19.9. Diagnosis of irradiated insects and fruit

Theme D: Diagnostics

Project Leader	Ela.Sawicka@agresearch.co.nz
Research Parties	AGR, BPRC
Significant collaborators	NSW DPI
Duration	July 2019 – June 2021 (2 yrs)
Biosecurity 2025 SD	A toolbox for tomorrow
Capability development	Summer student

Biosecurity outcome

- A tool to diagnose if insects discovered in imported fresh produce, and/or the associated host material, have been irradiated, or not, will aid MPI decisions to avoid where possible the unnecessary and costly rejection of fresh produce at border, or the need to recall fresh produce post border. This will also help to test for compliance if at-source procedures come under question and contribute to pathway intelligence

Science outcome

- Novel data about DNA irradiation repair times and damage detectability will be developed and reported

E19.11. eDNA detection of invasive insects

Theme E: Surveillance and Eradication

Project Leader	Simon.Bulman@plantandfood.co.nz
Research Parties	PFR
Significant collaborators	Rutgers (USA), Cesar (Aust.), PoT
Duration	July 2019 – June 2022 (3 yrs)
Biosecurity 2025 SD	A toolbox for tomorrow
Capability development	Planned PhD

Biosecurity outcome

- The suitability of eDNA for biosecurity surveillance will be assessed (proof-of-concept) using a pentatomid/BMSB model system. This will include the establishment of baseline information on eDNA detection of BMSB in NZ and comparison of eDNA detection with current technologies, with the ultimate aim of developing a BMSB eDNA trapping network.

Science outcome

- New approaches for eDNA preparation and amplification from terrestrial surfaces will be tested and reported. “Simple” steps such as measuring and quantifying the detection limits for insect eDNA in the terrestrial environment will represent important scientific advances
- The limits of detection for BMSB and surrogate stink bugs eDNA from environmental substrates will be quantified. Working with MPI, PoT and grower groups

E19.12. Improving the attractiveness of cuelure for better detection and eradication of invasive fruit flies

Theme E: Surveillance and Eradication

Project Leader	Ashraf.El-Sayed@plantandfood.co.nz
Research Parties	PFR
Significant collaborators	Linnaeus University (Sweden), Institut Agronomique néo-Calédonien (France)
Duration	July 2019 – June 2022 (3 yrs)
Biosecurity 2025 SD	A toolbox for tomorrow
Capability development	No student involvement planned

Biosecurity outcome

- The development of more effective attractant(s) for various species of fruit flies that respond to cuelure (mainly QFF and melon fly), based on synthesis and testing of new analogues of cuelure to improve surveillance and eradication of these species

Science outcome

- In a first of its type study for fruit flies (FF), the structure (compound)-activity relationship is better understood based on a study of a wide range of synthesised compounds

Outputs

Publications

Peer reviewed publications

- Barratt BIP, Cock MJW, Oberprieler RG. 2018. Weevils as targets for biological control, and the importance of taxonomy and phylogeny for efficacy and biosafety. *Diversity* 10(3): 73, 19pp. doi:10.3390/d10030073
- Bedoya CL, Nelson XJ, Hayes M, Hofstetter RW, Atkinson TH, Eckehard G, Brockerhoff EG. 2019. First report of luminous stimuli eliciting sound production in weevils. *The Science of Nature* 106, 17 doi:10.1007/s00114-019-1619-8
- Bulman SR, McDougal RL, Hill K, Lear G. 2018. Opportunities and limitations for DNA metabarcoding in Australasian plant-pathogen biosecurity. *Australasian Plant Pathology* 47: 467-474. <https://doi.org/10.1007/s13313-018-0579-3>
- Chase KD, Stringer LD, Butler RC, Liebhold AM, Miller DR, Shearer PW, Brockerhoff EG. 2018. Multiple-lure surveillance trapping for *Ips* bark beetles, *Monochamus* longhorn beetles, and *Halyomorpha halys*. *Journal of Economic Entomology* 111: 2255–2263. doi:10.1093/jee/toy190
- Dillon MM, Thakur S, Almeida RND, Wang PW, Weir BS, Guttman DS. 2019. Recombination of ecologically and evolutionarily significant loci maintains genetic cohesion in the *Pseudomonas syringae* species complex. *Genome biology* 20 (1), 3 doi:10.1186/s13059-018-1606-y
- El-Sayed AM, Venkatesham U, Unelius CR, Sporle A, Pérez J, Taylor PW, Suckling DM. 2019. Chemical composition of the rectal gland and volatiles released by female Queensland fruit fly, *Bactrocera tryoni*. *Environmental Entomology* 48 (4): 807–814. doi.org/10.1093/ee/nvz061
- El-Sayed AM, Sporle A, Gemeno C, Jósvei JK, Simmons GS, Suckling DM. 2019. Leafroller-induced phenylacetone nitrile and acetic acid attract adult *Lobesia botrana* in European vineyards. *Zeitschrift für Naturforschung* 74 (5-6): 161–165. doi.org/10.1515/znc-2018-0163
- Kean JM, Stringer LD. 2019. Optimising the seasonal deployment of surveillance traps for detection of incipient pest invasions. *Crop Protection* 123: 36-44. doi.org/10.1016/j.cropro.2019.05.015
- Khadka R, Aydemir N, Carraher C, Hamiaux C, Colbert D, Cheema J, Malmstrom J, Kralicek A, Travas-Sejdic J. 2018. Data on preparation and characterization of an insect odorant receptor based biosensor. *Data in Brief* 21: 2142-2148. <https://doi.org/10.1016/j.bios.2018.10.043>
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Books or book chapters

- Brown K, Phillips C, Broome K, Green C, Toft R, Walker G. 2019. Feasibility of eradicating the large white butterfly (*Pieris brassicae*) from New Zealand: Data gathering to inform decisions about the feasibility of eradication. *IUCN Island Invasives: scaling up to meet the challenge* 62: 364–369. <https://portals.iucn.org/library/node/48358> In: C.R. Veitch, M.N. Clout, A.R. Martin, J.C. Russell, C.J. West (eds.). 2019. *Island invasives: scaling up to meet the challenge*, pp. 364–369. Occasional Paper SSC no. 62. Gland, Switzerland: IUCN.
- Phillips C, Brown K, Broome K, Green C, Walker G 2019. Criteria to help evaluate and guide attempts to eradicate arthropod pests. *IUCN Island invasives: scaling up to meet the challenge* 62: 400–404 <https://portals.iucn.org/library/node/48358>. In: C.R. Veitch, M.N. Clout, A.R. Martin, J.C. Russell, C.J. West (eds.). 2019. *Island invasives: scaling up to meet the challenge*, pp. 400–404. Occasional Paper SSC no. 62. Gland, Switzerland: IUCN.

Other publications (not abstracts)

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- Armstrong KF, Holder PW. 2018. Scientists hone in on where pests come from. *Biosecurity* 2025 newsletter 6: 13-14.
- Kean JM. 2019. Editorial: Robust decision-making with little data. *Surveillance* 46 (2): 3-4. Ministry for Primary Industries: Wellington, New Zealand. <https://www.biosecurity.govt.nz/dmsdocument/35402-surveillance-magazine-vol-46-no-2-june-2019>

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- Todd JH, Barratt BIP. 2018. PRONTI: Improving selection of test species in invertebrate biological control. *Biocontrol News and Information* 39: 1N-4N

Reports

- Barratt BIP. 2019. Maori responses and submissions to applications for biological control agent introductions under HSNO. AgResearch; Better Border Biosecurity, Mosgiel, 16 p.
- Bulman S, Chng, Braithwaite M, Harvey I. 2019. C19-30: Interceptions of *Alternaria* section *Infectoriae* fungi on grain imports. PFR SPTS No. 17574. Plant and Food Research. A report for The Foundation for Arable Research. March 2019.
- Holder P. 2018. Auckland Airport BMSB July 2018. Status, and statistical summary and interpretation reports for T18_02652. Series of 3 reports emailed to MPI 29/8/18 to 28/11/18.
- Holder P. 2018. Mt Manganui BMSB Dec 2018. Statistical summary and interpretation reports for T18_04300. Set of 2 reports emailed to MPI 7/1/2019 & 8/1/2019.
- Holder P. 2019. Northcote QFF incursion Feb-May 2019. Auckland QFF and plants isotope data. Statistical summary and interpretation for T19_00807, T19_01530, T19_02213, T19_00735, T19_04125b. Series of 5 reports emailed to MPI between 5/4/19 and 26/6/19
- James T, Phillips C. 2019. Proposed method for evaluating the potential economic impacts of weed hazards to pasture production. AgResearch report 9820 to DairyNZ, 8pp.
- James T, Phillips C. 2019. Predicted spread rates and economic impacts of 24 high hazard weeds for NZ dairy pasture production. AgResearch report 9821 to DairyNZ. 32pp.
- James T, Phillips C. 2019. Priority weed threats for forage crops. AgResearch report 9822 to DairyNZ. 16pp.
- James T, Phillips C, Lamoureaux S. 2019. Potential economic impacts of 11 high hazard weeds for NZ dairy fodder crop production. AgResearch report 9823 to DairyNZ. 43pp.
- Murphy D, de Bruyn M, Armstrong K, Holder P, Allen C. 2018. Strontium isotope analysis of fruit fly from the 2018 South Australian biosecurity incursion. Final Project Report to the PBCRC, July 2019.
- Phillips C 2019. Proposed method for evaluating the potential economic impacts of insect hazards to pasture production. AgResearch report 9836 to DairyNZ, 8pp.
- Phillips C, Barker G, Bell N, Aalders L, Braithwaite M, Orre-Gordon S. 2019. Assessment of potential hazards to NZ dairy farming from forage plants pests other than insects and weeds. AgResearch report 9829 to DairyNZ. 51pp.
- Phillips C, James T, Lamoureaux S 2018. Spread model calibration for the New Zealand pasture weeds kikiyu, ragwort and nodding thistle. AgResearch Report 9830 to DairyNZ, 25p.
- Phillips, CB, Orre-Gordon S, Richards N. 2018. Insect hazards to chicory, lucerne and maize. AgResearch report 9177 to DairyNZ. 41pp.
- Phillips C, Orre-Gordon S, Richards N. 2018. Estimated spread rates in New Zealand dairy areas of insects hazardous to ryegrass and clover. AgResearch report 9177 to DairyNZ. 21pp.
- Phillips C, Richards N, Garnett E, Ferguson C, Hardwick S, Mansfield S, McNeill M, Popay A. 2019. Potential economic impacts of insect hazards to pasture production. AgResearch report 9828 to DairyNZ. 53p.
- Phillips, CB, Richards N, Garnett E, Orre-Gordon S. 2019. Insect hazards to forage brassicas, forage cereals, fodder beet and plantain. AgResearch report 9831 to DairyNZ. 64p.

- Pugh AR, Withers TM, Peters E, Allen GR. 2018. The compatibility of the egg parasitoid guild of *Paropsis charybdis* (Col.: Chrysomelidae) in New Zealand with the predicted phenology of *Eadya daenerys* (Hymenoptera: Braconidae) a proposed new larval biocontrol agent. Rotorua, New Zealand: Internal Report Number 61186. Scion.
- Soewarto J, Sutherland R; Ganley B; du Plessis E, Barnes I, Wingfield M, Granados G. 2019. Topic 1.3 — Assessment of other myrtle rust biotypes. PFR SPTS No. 18040-1.3.
- Stringer LD, Bellamy D, Rathé A. 2019. Spotted wing drosophila literature review: Incursion history, detection and control tools. Report to Plant Health Australia. SPTS 17780.
- Suckling DM. 2018. Travel report for a Trimble Award 2018 bug hunters and biotremologists. A Plant & Food Research report. SPTS No. 16938.
- Suckling DM 2018. SITplus: Improved population management system for Queensland fruit fly HG13034. Final report. SPTS No. 17235.
- Suckling DM 2019. AGMARDT Conference support Report. Summary of Professor Claudio Ioriatti's visit 20-31 May 2019 with Agmardt Conference Support. 5 pp.
- Teulon DAJ, Nielsen M-C. 2019. CATALYST Seedling Activity Report (Fundamental to Applied Research on Insect Sensing (FARIS)). 17-PAF-027-CSG. February 2019.
- Wardhaugh C, Pugh AR, Scott M, Withers TM. 2018. Investigation into New Zealand endemic leaf beetles (Chrysomelinae and Galerucinae) and attempts to locate species in Kahurangi National Park for host testing against *Eadya daenerys*, a potential biocontrol agent. Rotorua, New Zealand: Internal report Number 23807. Scion.
- Wilson J, Doscher C, Simmons D. 2018. Tourism, biosecurity and pathways into New Zealand: identifying risk and mitigation strategies. Report on visitor hotspot data mapping. Faculty of Environment Society and Design, Lincoln University. November 2018, 22 pp.
- Xu G, Teulon DAJ. 2018. BMSB — Chinese papers on the impact of BMSB to kiwifruit (BS1824). Confidential Report for Zespri Group Ltd. PFR SPTS No. 17025. September 2018
- Xu G, Teulon DAJ. 2018. Chinese papers on the impact of BMSB to kiwifruit. Confidential Report for Zespri Group Ltd. PFR SPTS No. 17063. October 2018.
- Xu G, Teulon DAJ. 2018. BMSB – Chinese papers on the impact of BMSB to kiwifruit. Confidential Report for Zespri Group Ltd. PFR SPTS No. 17148. November 2018
- Xu G, Teulon DAJ. 2019. BS19017 Spotted lanternfly – Chinese papers on the impact of spotted lanternfly to kiwifruit. Confidential Report for Zespri Group Ltd. PFR SPTS No. 17591. March 2019.
- Xu G, Teulon DAJ. 2019. BS1790 and BS1824 BMSB – Collation of reports of the Chinese papers on the impact of BMSB to kiwifruit. Confidential Report for Zespri Group Ltd. PFR SPTS No. 17435.

Presentations

Keynote and plenary presentations

- Brockerhoff EG, Liebhold AM, Kimberley M. 2018. Alien forest insect invasion trends and outlook - Is the glass half-empty? European Congress of Entomology. 2-6 July 2018, Naples, Italy.
- McNeill MR, Barratt B, Marroni V, Sarah Mansfield S, Lee Aalders L, Boyd-Wilson K, Bell N, Teulon D. 2018. Evaluating the expatriate plants concept: looking overseas to predict invasive threats to New Zealand natural and agricultural ecosystems. Sentinel plantings for detecting alien, potentially damaging tree pests: state of the art 2018. 9-12 October 2018. Sursee, Switzerland. COST Action FP1401 Global warming.
- Sandanayaka M. 2019. Electrical Penetration Graph technology as a tool to determine host range of invasive Hemipterans. Invited Keynote Speaker at Establishment of a readiness program to evaluate the potential threat posed by invasive sap-feeding insects to managed and natural ecosystems. 3-4 June 2019, Pennsylvania State University, USA.
- Suckling DM 2019. Invasive Pests – a target for sustainability through chemical ecology. Entomology Congress of the German Entomological Society, March 11-14, 2019, Halle, Germany.

Invited presentations (significant international/national meetings/seminars)

- Armstrong K, Holder P, Murphy D, Frew R, Van Hale R. 2019. Is this pest established or not? Non-traditional diagnostics inform incursion responses about immediate risk. Australian Biosecurity Symposium, Crowne Plaza, Gold Coast, QLD. 12-13 June 2019.
- Boyd-Wilson KS, Marroni MV, Campbell RE, McNeill MR, Teulon DAJ. 2018. The use of sentinel plants for risk assessment of biosecurity threats to New Zealand: Myrtle rust as a model ecosystem. Sentinel plantings for detecting alien, potentially damaging tree pests: state of the art 2018. 9-12 October 2018. Sursee, Switzerland. COST Action FP1401 Global warming.
- Christofaro M, Anfora G, Ioriatti C, Roselli G, Suckling DM. 2019. *Drosophila suzukii* and *Halyomorpha halys*: synergism between SIT and biological control for insect pest management in Italy. Entomology Congress of the German Entomological Society. March 11-14 2019. Halle, Germany
- Khadka K, Aydemir N, Carraher C, Kralicek A, Travas-Sejdic J. 2018. An ultrasensitive bio-electronic nose which uses insect olfactory receptors in liposomes for the electrochemical detection of odorants. 28th Anniversary World Congress on Biosensors, 12-15 June 2018, Miami, Florida, USA
- Mas F, Kralicek A, Reynolds O, Alavi M, Horner R, Harper A, Manning L-A M, Osborne T, Suckling DM. 2018. Odorant-based detection of invasive species in fresh fruit. International Society of Chemical Ecology (ISCE 2018), Budapest, Hungary. 12–18 August 2018
- Phillips C. 2018. Eradication of great white butterfly *Pieris brassicae* from New Zealand. Research seminar. Lincoln University. 15 August 2018.
- Roige M, Clark D, Vicente J, McGeoch M. 2019. Existing indicators of biological invasion: systematic review. Theory and Workflows for Alien and Invasive Species Tracking (Stwist). 3-7 June 2019 at German Centre for Integrative Biodiversity Research (iDiv), Leipzig.
- Roige M, Phillips C 2019. Quantitative tools for risk analysis for Biosecurity New Zealand: an example of climate matching online tool. Invited talk to CABI Switzerland weekly seminar series. 14 June 2019, Delemont, Switzerland.
- Scott P 2019. *Phytophthora* species as emerging threats internationally. Lincoln University Research Seminar, 19 June 2019, Lincoln University, New Zealand.
- Suckling DM. 2019. Invasive Pests – a major challenge in the era of accelerating globalization. PheroFIP 19 - Joint meeting of the IOBC-WPRS Working Groups "Pheromones and other semiochemicals in IP" and "Integrated Protection of Fruit Crops". Lisbon, Portugal. 20-25 January 2019.
- Teulon DAJ, Barratt BIP. 2018. Research to support New Zealand's plant border biosecurity. In 'First International Conference on Biological Control: Approached and applications.' Le Meridien Hotel, Bangalore, India p. 4. 27-29 September 2018, ICAR-NBIR Bangalore.
- Teulon DAJ, McNeil M. 2018. Sentinel/Expatriate Plants Research Activity in New Zealand. Establishing a program of plant pest surveillance in Australian botanic gardens and arboreta. 29 October 2018. Royal Botanic Gardens Melbourne
- Teulon DAJ. 2018. Plant Health. New Zealand. International BioEconomy Forum, Plant Health WG. 28 November 2018, Ottawa

Key industry/end-user presentations

- Duggan C, Kean JM. 2018. Engaging tomorrow's biosecurity champions. MPI Biosecurity Forum. 12-13 November 2018. Auckland
- Kean JM, Duggan C. 2018. Engaging tomorrow's biosecurity champions. Tauranga Moana Biosecurity Capital Symposium. 16 October 2018. Tauranga.
- Kean JM. 2018. Gamification for social change. MPI Biosecurity Forum. 12-13 November 2018. Auckland.
- Kean JM, Dominiak B, Manoukis N. 2018. Independent Review of NZ's National Fruit Fly Surveillance Programme. Kiwifruit Vine Health industry symposium, 18 October 2018. Te Puke.
- Kean JM, Stephenson BP, Robinson AP. 2019. Surveillance modelling to inform response decisions. Plant Health Quadrilateral Group (QUADS) meeting. 4 March 2019. Wellington, New Zealand

- Stringer LD, Walker J, Avila G, Astorga I. 2018. Mantener el acceso al mercado en un futuro incierto (Maintaining market access in an uncertain future). Fruittrade & Convención 2018. Casapiedra, Santiago, Chile. 3-4 October 2018.
- Stringer LD, Mas F, El-Sayed AM, Suckling DM. 2018. SITplus: Improved population management system for Queensland fruit fly. SITplus Technical Committee and Horticulture Innovation Australia. 13 December 2018. Devonport Tasmania, Australia.
- Suckling DM. 2018. Advance, retreat, resettle – and colonise: NZ’s invasion risks #BMSB. Kiwifruit Vine Health industry symposium. 18 October 2018. Te Puke.
- Suckling DM. 2018. Integrated Surveillance and Suppression of BMSB. Kiwifruit Vine Health industry symposium. 18 October 2018. Te Puke.
- Teulon DAJ. 2018. Plant border biosecurity. Port of Tauranga Biosecurity Week (16 October 2018). Tauranga.
- Teulon DAJ, Xu. 2018. Biosecurity risks from stink bugs to New Zealand kiwifruit identified in Chinese language literature. Zespri/KVH Kiwifruit Biosecurity Grower Update. 18 October. Te Puke.
- Teulon DAJ, Xu B. 2019. Chinese translations of Spotted Lantern Fly. KVH Biosecurity Steering Group. 8 April 2019, Mount Maunganui.
- Teulon DAJ. 2019. Better Border Biosecurity. Biosecurity Intelligence Team, MPI. 21 May 2019. Wellington
- Teulon DAJ. 2019. Better Border Biosecurity Update. Joint meeting of the BMSB and FF Councils. 23 May 2019.

Public hearings

- Avila G, Charles J, Hunt S, MacDonald F. 2018. Pre-emptive assessment of potential non-target impacts of *Trissolcus japonicus*: a proposed biocontrol agent for *Halyomorpha halys* in New Zealand. Presentation to the public hearing for the *Trissolcus japonicus* release application under HSNO, 17 July 2018, Wellington, New Zealand.

Videos/webcasts (involving B3 science)

- Aotearoa Science Agency. 2018. 'Invasion Busters' enlists kids in Biosecurity War. 19 September 2018. <https://www.youtube.com/watch?v=FoHQmKt2tUI>
- Duggan A. 2018. Invasion Busters board game setup. 23 August 2018. <https://www.youtube.com/watch?v=CZZNfWvUYRQ>
- Fondazione Edmund Mach. 2018. Collaborazioni tra la Fondazione Edmund Mach e la Nuova Zelanda per combattere la cimice asiatica. 21 August 2018. <https://www.youtube.com/watch?v=R0X-8gSiXC0>
- Holder PW. 2018. Determining Provenance of Insects with Isotope Analysis for Biosecurity Purposes. Real World Forensic Applications: On-demand Webcast. ThermoFisher Scientific Spectroscopy. <https://event.on24.com/eventRegistration/EventLobbyServlet?target=reg20.jsp&partnerref=UBMEMAIL&eventid=1777451&sessionid=1&key=EEFA39715F68BD71DCE6EFD5C8881779®Tag=&sourcepage=register>
- KiwiNet 2018. KiwiNet Awards Finalist - Dr Andrew Kralicek – Plant & Food Research. <https://www.youtube.com/watch?v=BJ6MaUW2Kso&t=10s>
- PlantandFood 2018. Kicking up a stink - podcast. 26 September 2018. https://www.youtube.com/watch?v=14JvFqVI_YA
- PlantandFood 2019. Optimising Biocontrol Research For Brown Marmorated Stink Bug. 11 February 2019. <https://www.youtube.com/watch?v=dW2sCFA4nEc>
- Suckling DM. 2018. What is Biotremology? 31 August 2018 <https://www.youtube.com/watch?v=qwi0oWxK1Zs&t=5s>
- Suckling DM. 2018. BMSB Rearing at Fondazione Edmund Mach, TN, Italy. 11 December 2018. https://www.youtube.com/watch?v=qNIJtbKpqPQ&feature=player_embedded

Other outputs

Databases

Anonymous 2019. Global Phytophthora distribution tool.
<https://datasensenz.shinyapps.io/PhytoMap/>

Workshops/symposium/fora (national or international) (significant B3 contribution)

B3 Science Partnership Forum. 11 October 2018. Christchurch.

B3 Pathology Workshop. 6 December 2019. Auckland

B3 Science Partnership Forum. Hosted by Tauranga Moana Biosecurity Capital & Port of Tauranga Biosecurity Excellence. 30 May 2019. Tauranga.

PBRI Trans-Tasman Xylella and BMSB Workshop (video connection for many NZ participants). 4 December 2018. Sydney, Australia.

MPI Biosecurity NZ Forum. Gamification for social change. 13 November 2019. Auckland.

Aligned funding for plant border biosecurity research

Project	Funder	CRI (collaborator)	PI (or equivalent)	Amount
Theme A				
PhD scholarship (Tom Saunders)	UoA	PFR	Avila G	\$27,000
Protocols to import Samurai wasp into containment	MPI	PFR	Avila	\$5,588
EPA BMSB hearing	MPI	PFR	Avila G	\$3,176
Theme B				
Pasture pest risk analysis	DairyNZ	AGR	Phillips C	\$170,000
Chinese language pubs on BMSB impact to kiwifruit	KVH/Zespri	PFR	Teulon D	\$9,720
Chinese language pubs on SLF impact to kiwifruit	KVH/Zespri	PFR	Teulon D	\$8,855
<i>Xylella</i> literature review	MPI SFF Tere	PFR	Bulman S	\$40,365
Theme C				
Tissue culture review	MPI	PFR	Amponsah N	\$30,545
Communication in bark beetles & detection of unwanted species	RSNZ Catalyst	Scion	Brockhoff	\$40,000
PEQ services	Various	PFR	Horner M	\$4,230
Scoping the value & performance of interventions across the NZ biosecurity system	MPI	Scion/CEBRA	Brockhoff	\$40,000
Myrtle rust risk assessment	BHNSC	Scion	Scott P	\$15,000
<i>Phytophthora ramorum</i> risk assessment	FOA	Scion	Bulman L	\$20,000
Theme D				
NGS for border biosecurity	BHNSC	PFR	Bulman S	\$34,676
Ceratocystis detection	Zespri/KVH	PFR	Templeton M	\$43,410
Genetic characterisation of <i>Verticillium</i>	Zespri/KVH	MWLR (PFR)	Weir B	\$35,000
NZ visits of systematists	MPI	MWLR	Ward D	\$20,000
UoO Summer Scholar: stable isotope analytical improvement	UoO	BPRC	Holder P	\$5,000
Analytical sensitivity limits for stable isotopes in high risk plant pests	APBSF	BPRC	Murphy D (QUT)	A\$29,967
Theme E (surveillance)				
Fruit fly surveillance - SITPlus Phase 1	Horticulture Australia	PFR	Stringer L	\$39,468
Fruit fly surveillance - SITPlus Phase 2	Horticulture Australia	PFR	Stringer L	\$8,460
Fruit fly attractants	ANU (Korea)	PFR	Park K	\$73,092
Integration of primary host finding stimuli for phytophagous insects; re-evaluating the role of colour	RSNZ Catalyst	PFR	Teulon D, Nielsen M	\$29,500
FF surveillance	(IAC) Institute Agronomique	PFR	Mas F	\$11,591

Project	Funder	CRI (collaborator)	PI (or equivalent)	Amount
	Néo-Calédonien			
Gypsy moth lure testing	AsureQuality	PFR	Suckling M	\$2,700
Suction trap data for iMapPESTS	Horticulture Australia	PFR	Dohmen-Vereijssen J	\$11,124
Forest surveillance model	FOA	Scion	Bulman L	\$40,000
Myrtle rust surveillance	MPI	Scion	Pearce G	\$17,220
Pheromone modelling	USDA-Forest Service	Scion	Strand T	\$80,000
Gypsy moth surveillance	MPI	Scion	Sopow S	\$35,000
Using biosecurity data to inform general surveillance	BHNSC, Te Pūnaha Matatini	Scion	Pawson S	\$369,500
Theme E (eradication)				
Visit of Prof. Ioratti, Italy	AGMARDT	PFR	Suckling M	\$5,000
Visit to Fondazione Edmund Mach, Italy/BMSB research.	Trimble	PFR	Suckling M	\$4,449
Feasibility of SIT for QFF	GIA	PFF	Stringer L	\$30,050
Keynote address support	DaaD	PFR	Suckling M	\$3,258
Keynote address support	Fundación Para El Desarrollo Frutícola	PFR	Suckling M	\$3,000
Population modelling for SIT and SWD	IAEA	PFR	Stringer L	\$4,090
Eradication tools for SWD	Horticulture Australia	PFR (CESAR)	Stringer L	\$31,700
Unmanned Aerial Vehicle/SIT	IAEA	PFR	Suckling M	\$33,913
Travel grant for K. Horrocks	Zespri/KVH	PFR	Suckling M	\$15,000
Eradication of crane flies in Antarctica	Korean Polar Research Institute	PFR	Chung K	\$34,328
FF incursion response	MPI	PFR	Bullians	\$27,665
Pest impact calculator	FOA	Scion	Bulman L	\$40,000
BMSB chemical approval	MPI	Scion	Bulman L	\$16,363
Spray modelling	USDA-Forest Service	Scion	Strand T	\$45,000
Spray modelling	Various	Scion	Strand T	\$14,400
Theme E (response)				
Optimised biocontrol for BMSB for kiwifruit	Zespri/KVH	PFR (CABI)	Avila G	\$92,125
Physical control of BMSB with autumn overwintering traps	Zespri/KVH	PFR (CABI)	Avila G	\$16,314
Cross Theme				
Maori tourism and biosecurity	MBIE	PFR	Marsh A	\$50,000
End-user support for port biosecurity excellence	PoT, KVH, MPI, FOA, NZ Avocado, BPRC	AGR	Kean J	\$14,000
Creepy crawlies meet primary production	MBIE Curious Minds, BHNSC, NZ Avocado	Scion, House of Science	Pawson S	\$35,000
Understanding rusts – fungal invaders of Aotearoa	MBIE Curious Minds	PFR	Ramos L	\$12,127

Key people in the B3 Collaboration

Representation for 2018-19

Collaboration Council	Theme Leadership Group	End-user/Theme Representatives
Chair James Buwalda*	Director David Teulon	Aurélie Castinel MPI Chris Green (DOC)
Philippa Stevens (PFR) Tony Conner (AGR) Lindsay Bulman (Scion) Peter Millard (LCR) Travis Glare (BPRC) Veronica Herrera (MPI) Amber Bill (DOC) David Rhodes (FOA) Leanne Stewart (Hort NZ)	Programme Co-ordinator Margaret Hean	Russell Dale (FOA) Clark Ehlers (EPA)
Suzanne Keeling (Beef+Lamb) (Observer) Stephen Cobb / Clark Ehlers (EPA) (Observer)	Theme A Barbara Barratt (AGR) Toni Withers (Scion)	Theme A Chris Green/Rod Hitchmough (DOC) Clark Ehlers (EPA)
	Theme B John Kean (AGR) Beccy Ganley / Nicolas Meurisse / Simon Bulman (Scion)	Theme B Jo Berry (MPI) Helen Harman (MPI)
	Theme C Ecki Brockerhoff / Beccy Ganley / Nicolas Meurisse (Scion) Andrew Kralicek (PFR)	Theme C Shane Olsen (MPI) Chris Denny (MPI) Sina Waghorn (MPI)
	Theme D Karen Armstrong (BPRC) Bevan Weir (LCR)	Theme D Rob Taylor (MPI) Prasad Doddala (MPI) Catia Delmiglio (MPI)
	Theme E Jessica Dohmen-Vereijssen (PFR) Nick Waipara (PFR)	Theme E George Gill (MPI) Rory MacLellan (MPI) Paul Stevens (MPI)
	Manaaki Whenua representative Darren Ward	
Science Advisory Group: Richard Newcomb (PFR), Alison Popay (AGR), Lindsay Bulman (Scion), Geoff Ridley (MWLR), Travis Glare (BPRC), Veronica Herrera (for John Roche (MPI)), Chris Green (DOC), Russell Dale (FOA), Anna Rathe (Hort NZ)		

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

Max Suckling remains on the Theme Leaders Group in an *ex officio* capacity



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