3rd Australian Biosecurity Symposium: Final Abstract Book

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Strengthening smallholder resilience to LSD and FMD in Indonesia

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[1]LiveCorp, North Sydney , Australia

Biography:
Katie Hallatt completed a Bachelor of Animal and Veterinary Bioscience at the University of Sydney. Following this, Katie started her journey with LiveCorp five years ago, the research and development corporation for the livestock export industry. To date, Katie manages trade & market access at LiveCorp, and has been a key player in the industry's response to exotic disease outbreaks in Indonesia in 2022, taking lead on the Indonesian vaccination program.

Abstract:
Indonesia is Australia's largest live cattle export market and has experienced significant economic impact from the detection of lumpy skin disease (LSD) and foot and mouth disease (FMD) in early 2022. The disease outbreaks had a significant impact on Indonesia's food security, accessibility, and affordability. Many feedlots, including those holding Australian-bred cattle, have the resources to increase biosecurity efforts. However, this is not necessarily the case for the smallholder farmers.

A $1.2 million grant from the Australian Government was provided to LiveCorp, the research and development corporation for the livestock export industry. The grant allowed the management and facilitation of a vaccination program for feedlots holding Australian cattle and supported vaccination of livestock in smallholdings around those feedlots to create a buffer zone. In partnership with the Indonesian Society of Animal Science (ISAS/ISPI), a project was developed with the goal of building smallholder capacity and capability in strengthening smallholder resilience against the threat of LSD and FMD. Vaccinating smallholders' livestock in Indonesia helps to create a buffer zone around feedlots holding Australian-bred cattle, reducing their risk of infection, as well as supporting food security for local families.

In the initial phase, a comprehensive scoping study was conducted to identify gaps in the knowledge and biosecurity practices among smallholders concerning LSD, as well as to address vaccination hesitancy stemming from concerns about adverse reactions to previous vaccines and the dissemination of misinformation. The second phase included the development and dissemination of targeted information about LSD, vaccination events in villages, and training for local agencies who can then work with their communities to build knowledge that will help to protect livestock and the livelihoods of smallholders.

The program developed intangible goodwill between Indonesia and Australia. The most prominent outcome from the program was the significant reduction in the reluctance of smallholders who attended the campaigns to vaccinate and requesting for their cattle to be vaccinated. The project developed communication strategies for training and awareness campaigns for smallholder farmers in feedlot provinces and assisted in the facilitation of vaccination events. This initiative has played a crucial role in closing the gaps within non-vaccinated cattle populations, thereby assisting in the reduction of the spread of FMD and LSD.

LiveCorp thank the Australian Government for its ongoing efforts to assist Indonesia and bolster Australia's biosecurity preparedness and looks forward to working with industry in both countries in a continuous effort preserve best practice management for emergency animal diseases.

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Supporting smallholder pig producers in Viet Nam with biosecurity preparedness for African swine fever

Dr Jennifer Manyweathers[1,2], Lynne Hayes[1,2], Dr Gang Xie[1], Dr Jen Bond[1,2], Jen Kelly[3], Professor Marta Hernandez-Jover[1,2]
[1]Charles Sturt University, Wagga Wagga, Australia, [2]Gulbali Institute, Wagga Wagga, Australia, [3]CSIRO, Australia

Biography:
Dr Jennifer Manyweathers graduated as a vet from Sydney University, working for several years in rural mixed practice. This was followed by three years at Tsukuba University, Japan, lecturing in science communication. Completing her PhD in risk perception of horse owners and veterinarians concerning Hendra virus, she worked as a postdoctoral research fellow developing a farmer-led partnership system for improved surveillance for Foot and Mouth Disease.

Jennifer is currently Senior Lecturer in Ruminant Health and Epidemiology at Charles Sturt University, interested the social and psychological factors play in stakeholder decision-making in the animal health arena, and how this impacts veterinary education.

Abstract:
African swine fever (ASF) is a contagious viral disease that has a significant impact on the pork industry. Current measures worldwide are restricted to stamping out procedures, with no effective vaccines or treatment protocols. First detected in Viet Nam pig herds in 2019, ASF has since reduced the national herd by 20%, due to disease and depopulation. African swine fever has been reported in 63 provinces and has impacted on supply and price of pork, with social and economic consequences for all pig producers across Viet Nam.

The need for an improved understanding of biosecurity challenges and opportunities at a household level / smallholder level was identified as part of the national response, with support from CSIRO Resilient Agriculture and Food component under Aus4Innovation (A4I). Partnering with the National Institute for Animal Sciences (NIAS) under the Ministry of Agriculture and Rural Development in Viet Nam, the Charles Sturt University research team, aimed to test data collection approaches that would inform decision makers about on-ground biosecurity problems and the vulnerability of small holder pig producers to outbreaks of disease in their pigs.

Using a collaborative approach, a questionnaire was designed and piloted, and then translated and distributed in three provinces by NIAS officers. Data collected were then translated into English. Charles Sturt researchers provided descriptive analysis and developed a Bayesian network (BN) model that statistically summarised the data in a holistic way. The resulting BN model is a statistical representation of the vulnerability framework of likelihood of exposure and capacity to respond to an ASF outbreak.

Findings suggest that vulnerability to an outbreak of diseases in pigs is likely to be higher in farms that run an open system. One province, Hoa Binh, was found likely to be more vulnerable to a disease incursion, according to the assumptions within the model. The model also showed a high sensitivity to the percentage of income that producers depend on pigs for. Producers who rely on their pigs for more than 50% of their income, are likely to be less vulnerable to a disease incursion than those that have other income sources.

The pilot has shown that data can be collected to better inform decision making and capacity building for pig producers in Viet Nam. Many challenges and opportunities have been identified that can be acted upon to strengthen pig biosecurity for smallholders.

This project is possible through the work of and support from the National Institute of Animal Science team and was funded by the Aus4Innovation (A4I) program. A4I partnership between MoST, Australian DFAT and CSIRO to help Viet Nam strengthen its Innovation System.

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Targeting travellers to reshape biosecurity in northern Australia

Tanya Armstrong[1]
[1]Biosecurity Queensland, Department Of Agriculture And Fisheries, Brisbane, Australia

Biography:
Tanya Armstrong is a communication professional with more than 20 years' experience. Throughout her career she has worked in various communication, media and engagement roles within Queensland and New South Wales Governments delivering successful strategies for national and statewide public awareness and education programs and incident responses.

Tanya is currently the Principal Communication Officer (Corporate Communications) for Biosecurity Queensland. In this role Tanya leads the effective delivery of communication strategies across the business that raise public awareness and build stakeholder relationships to support good biosecurity outcomes.
Tanya has led the communication function for various biosecurity incidents such as varroa mite on Asian honey bee, freshwater gold clam, and guava root-knot nematode. She has also developed communication strategies to promote national and Queensland programs including the National Electric Ants Eradication Program and the Queensland Feral Pest Initiative.

Abstract:
Protecting the Cape York Peninsula and Torres Strait is a priority for ensuring the biosecurity in the north of Australia. This region presents unique challenges due to its proximity to neighbouring countries, high domestic and international travel, adverse weather conditions, tropical climate and vast, remote areas and coastline.

Biosecurity threats change and evolve over time, and we need to continually review and adapt our biosecurity strategies to protect Australia.

Through Biosecurity Queensland's Repositioning Northern Biosecurity Strategy, there was a recognised need to move away from a model of roadside voluntary inspections, to a broader, mobile and targeted biosecurity strategy that addresses the changing and evolving threats and pathways.

Around 136,000 people visited Queensland's Northern Peninsula Area in 2022, and this number is steadily growing. As such, the travelling public is an important risk pathway for the movement of biosecurity carriers such as plants, fruits, vegetables, and soil to and from the region.

Highly transient audiences such as travellers are challenging to reach via traditional media. It was determined that a targeted digital communication campaign would be the most valuable approach due to the sophisticated targeting and tracking capability of these tools.

This session outlines the success of this campaign approach in targeting groups such as grey nomads, 'the Tip' 4wd enthusiasts, backpackers and agri-tourism travellers. The session will also share learnings and recommendations for future communication and engagement with these audiences.

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The Bug Hunt: Improving citizen science-based biosecurity reporting through a trial using invasive insects of biosecurity concern

Natalie Frost[1], Lyall Grieve[1], **Jack Gough[1]**
[1]Invasive Species Council, Australia

Abstract:
Early detection of new invasive species is critical to the early intervention and successful eradication of environmentally harmful pests. Insects are the most diverse class of animals and their abundance and diversity, as well as their small size, rapid reproduction and multiple life stages make them a challenging group of animals for biosecurity authorities. They can cause significant environmental and social impacts. Improved surveillance tools and an increased surveillance effort has the potential to limit the impacts of new arrivals into the future. Citizen science already plays an important role in biosecurity detections and have led to incidental detections of non-native species.

With the right incentives and supporting systems there is potential for community-generated detections of insects and others species of concern to assist with national biosecurity surveillance efforts. Given the diversity, size and enthusiasm of existing citizen science efforts across Australia, this project seeks to engage with existing citizen science programs to enhance their biosecurity-reporting capacity.

The Bug Hunt aims to use the surveillance of invasive insects of biosecurity concern using citizen science as a case study to determine more broadly how environmental biosecurity reporting and awareness of newly established and emerging pest species in Australia can be improved and increasingly adopted through existing citizen science initiatives. This project aims to lay an important foundation for ongoing or future targeted/active community surveillance and increase the practice of general biosecurity surveillance, in turn increasing knowledge and capacity available to respond to time-sensitive biosecurity incursions.

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Advancing Biosecurity Preparedness in Australia through Extended Reality Training: Insights from Charles Sturt University eXtended Reality Centre

Mr Andrew Hagan[1,2], Professor David Mackay[2,3], Dr Agasthya Thotagmuwa[2,3]
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Biography:
Andrew Hagan is an experienced academic and practitioner with a career spanning 25 years. He is the co-founder and director of the eXtended Reality Centre (XRC) at Charles Sturt University (CSU). The XRC focuses on applied research in creative immersive technologies that enhance the human experience beyond the physical world. He established Australia's first undergraduate degree in Animation & Visual Effects and has innovated education to prepare creative minds for future careers. Currently, he is working on real-time technologies that can be applied across all industries to develop smarter, faster, cheaper, and safer ways of living.

David Mackay was a founding academic staff member of Charles Sturt University's Biosecurity Training Centre (BTC), a strategic partnership with the Department of Agriculture, Fisheries and Forestry (DAFF), and is the current Academic Director. He teaches multiple courses run by the BTC with a focus on international and national biosecurity frameworks and regulatory activities. He has also developed and run biosecurity programs in Timor-Leste and Indonesia. David has over 25 years of experience in public policy, management, and education within government, private, not-for-profit, and university sectors. He has contributed to or led several reviews on behalf of the Inspector-General of Biosecurity, including the effectiveness of the department's operational model, the robustness of khapra beetle measures, and the efficacy and adequacy of detection technologies, and has consulted on regulatory compliance in biosecurity and illegal logging.

Abstract:
In the contemporary context, biosecurity threats present a significant risk to worldwide health, agriculture, and ecosystems. The Australian biosecurity system, widely recognised as a global leader in this field, faces ongoing challenges due to the growing volume of international trade and travel. These factors greatly heighten the potential for introducing exotic pests and diseases, which can cause serious harm to Australia's unique biodiversity, ecosystems and agricultural industries. Early detection plays a crucial role in effectively mitigating these threats, as evidenced by numerous major biosecurity incursion events in the past. To ensure readiness and rapid response, the biosecurity professionals need upskilling. This abstract explores the potential of Extended Reality (XR) technology in enhancing training for biosecurity professionals, particularly focusing on the Australian context, and draws upon the work of Charles Sturt eXtended Reality Centre (CSU XRC) in developing the award-winning 'Xylella Keep it Out' animation for the Department of Agriculture, Fisheries and Forestry (DAFF).

Xylella is the top plant priority pest for several significant reasons. Xylella is a soil-borne bacterium absorbed through the root system and transmitted through a plant's water-transporting vessels (xylem). As the bacteria build-up, they clog the vessels, leading to desiccation and plant death. Xylella can remain viable for many years undetected in soil under a wide range of climatic and environmental conditions. The transmission of Xylella between infected and healthy plants mainly occurs through insect vectors that feed on xylem nutrients using specialised mouth structures. Xylella affects over 600 plant species, including major agricultural cultivars, leading to significant economic losses. The majority of the known Xylella vectors are exotic to Australia. Therefore, it is important to prevent these pests from entering Australia. An effective way to achieve this goal is by developing the necessary awareness and skills to detect these pests. Traditional training methods are not very scalable, as they require specialised staff and in-person sessions that can be costly. XR technology offers significant advantages over traditional training methods in biosecurity preparedness. Through immersive simulations and interactive scenarios, trainees can engage with realistic environments, improving their decision-making skills and situational awareness. Additionally, XR training allows for scalable and cost-effective education, overcoming geographical barriers and resource constraints. By simulating various scenarios and

environments, XR technology addresses the evolving challenges faced by biosecurity professionals, including emerging threats and regulatory changes.

The flexibility of XR platforms allows for customisable training modules tailored to specific contexts and target audiences, ensuring relevance and effectiveness. The integration of expertise from fields such as agriculture, ecology, computer science, and education is crucial in developing comprehensive and scientifically accurate simulations. In conclusion, this abstract highlights the potential of XR technology in revolutionising biosecurity training efforts in Australia. Insights derived from the work of the CSU XRC provide valuable guidance for future initiatives aiming to leverage XR to address priority plant pests and diseases. By harnessing the immersive power of XR, biosecurity professionals can enhance their skills, knowledge, and readiness to safeguard agricultural systems and protect the environment.

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Jump dispersal: linking biosecurity knowledge from research, industry and government via a web portal

Dr Les Kneebone[1]
[1]Centre Of Excellence For Biosecurity Risk Analysis, Coburg, Australia

Biography:
Les Kneebone is a digital librarian and information architect working at the Centre of Excellence for Biosecurity & Risk Analysis. Les has worked in a number of digital library projects where collections of policy research, grey literature and education resources are managed. Les is an active thesaurus compiler and avid participant within the research vocabularies community.

Abstract:
The traceability of biosecurity knowledge is a significant endeavour: the origin of insights into the biosecurity system are found in a broad range of activities conducted in industry, government and research domains. The system as a whole generates enough intelligence to have meaningful impact on our ability to anticipate, prevent, prepare for and respond to biosecurity threats. But the systems' collective knowledge is not itself managed within a discrete collection - instead it is a mix of commercial bibliographic databases, open access repositories, project websites and citation collections. They are hosted and managed by commercial publishers, research institutions, industry bodies, general libraries and project websites. Extracting intelligence from the rhizomic 'collection' to answer key biosecurity collections is therefore not very straightforward: problems abound for finding, accessing and selecting biosecurity research and information.

What if we funnelled the many sources of biosecurity knowledge into a single, searchable interface? To do so is not without challenges - two of which are a particular focus of the Biosecurity Risk Research Portal (Portal): a. how to harmonise disparate metadata formats and structures that are characteristic of diverse publishing practices; and b. how to translate, or provide linguistic support for differing terminology used across sectors and jurisdictions? We present work underway to create metadata pipelines from across the biosecurity system that align all sources with a metadata standard, and index research knowledge with standardised vocabularies. The pipelines fuel a biosecurity database where biosecurity research is stored and curated using common knowledge organisation systems. The database is then available as the basis for search interfaces and to drive analytic applications.

We unpack these metadata pipelines and present some of the technology and data architecture behind the Portal. We conclude by presenting the road ahead, with a focus on connecting more research sources, and planned work to improve concept extraction and recommendation systems.

References
Kneebone, Les; Robinson, Andrew (2022). A Biosecurity Risk Research Portal to Inform Decision-Making. Centre of Excellence for Biosecurity Research, The University of Melbourne. Registration. https://doi.org/10.26188/21498714.v4

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On target: Using behaviour change priorities to drive targeted biosecurity messaging

Ms Kirsten Phillips[1]
[1]Department Of Agriculture And Fisheries, Biosecurity Queensland, BRISBANE CITY, Australia

Biography:
Kirsten Phillips has worked as a communication and engagement professional for more than 25 years with 15 specifically in the biosecurity sector. As the Director, Partnerships and Engagement for Biosecurity Queensland, Kirsten is responsible for strategy and coordination of online engagement and engagement capability development.

As a long-term member of the National Biosecurity Communication and Engagement Network (NBCEN), Kirsten is passionate about collaboration and coordination across the biosecurity communication sector nationally. Kirsten also has extensive experience in public information delivery leading the communication and engagement response for multiple incidents including Panama disease, Hendra virus, and white spot disease.

Abstract:
Increasing biosecurity awareness and achieving behaviour change at a grassroots level is challenging. Targeted messaging is critical to success.

Building on research in defining six key biosecurity behaviour change priorities, Biosecurity Queensland has put into practice a content filter used to refine and target biosecurity messaging particularly in the social media sphere. This refined approached to content has increased engagement, improved profiling of biosecurity partners and driven stakeholders to seek additional resources.

The content filter is a simple step by step process that guides content creators in preparing engaging content, framing a call to action, and recognising partners. These behaviour change priorities are also driving Biosecurity Queensland's current and future stakeholder engagement agenda.

This includes the delivery of initiatives such as the Queensland on-farm biosecurity summit, the on-farm biosecurity training module and the domestic airport signage project.

This session will provide insights into how behaviour change priorities are driving targeted messaging for Biosecurity Queensland communication channels.

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Can citizen science fill data gaps and engage communities in biosecurity? A review of ALA's myrtle rust citizen science campaign

Dr Erin Roger[1], Mrs Rebecca Paxton[1,2]
[1]Atlas Of Living Australia- Csiro, Eveleigh, Australia, [2]The University of Adelaide, Adelaide, Australia

Biography:
Dr Erin Roger is a Sector Lead for the Atlas of Living Australia (based in CSIRO) and works to enhance ALA's approach and engagement with both the citizen science and biosecurity sectors. Erin has a PhD in Terrestrial Ecology, is a 2022 Churchill Fellow and graduate of the Australian Institute of Company Directors. Erin is also invested in non-profit leadership, and was Chair of the Australian Citizen Science Association for five years, where she oversaw its incorporation and development.

Abstract:
The Atlas of Living Australia (ALA) is Australia's largest biodiversity open data aggregator. Home to more than 132 million species occurrence records of native and introduced species, the ALA is often the first platform where invasive species incursions are publicly recorded. However, we know that invasive species are vastly underrepresented in the ALA and currently comprise only about 2% of the total number of occurrence records. Myrtle rust is caused by an invasive fungus, Austropuccinia psidii, that infects plants in the Myrtaceae family, including more than 1,500 species of Australian native trees and shrubs such as tea trees, bottlebrushes, paperbarks, and lily-pillies. Introduced in NSW 2010, myrtle rust is now relatively widespread in eastern Australia. To combat the threat of myrtle rust, current and more representative data is required to inform researchers, policymakers, landholders and decision-makers about how myrtle rust spreads, how far it has spread and how it impacts different plant communities. In March 2024, the ALA commenced a myrtle rust campaign with the aims of raising awareness about myrtle rust and encouraging increased data collection. Prior to our myrtle rust campaign, the spatial picture of myrtle rust in the ALA was patchy and incomplete, with only about 500 occurrence records. We partnered with government agencies and NGO's, to develop social and online content to raise awareness and promote reporting of the disease. Members of the public were called upon to report possible myrtle rust infections through two popular biodiversity recording applications, iNaturalist and NatureMapr. Here we present the results of our myrtle rust campaign, including communication tactics, engagement and reach statistics. We also report on the increased number of data points and discuss opportunities and challenges for similar campaigns in the future.

References
https://www.ala.org.au/blogs-news/combating-myrtle-rust-with-citizen-science/

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Enhancing northern Australia's emergency animal disease preparedness through government and industry collaboration

Louise Morgan[1], Dr Rebecca Ambrose[1]
[1]Department of Agriculture and Fisheries, Cairns, Australia

Biography:
Dr Rebecca Ambrose is a veterinarian with a PhD in veterinary virology. She has worked with the Department of Agriculture and Fisheries for 18 years, predominantly in a research capacity investigating pathogens, predominantly viruses, of veterinary importance in the agriculture and fisheries industries. She is now working within Biosecurity Queensland's Emergency Animal Disease Preparedness Team.

Abstract:
Northern Australia presents a unique and challenging landscape when it comes to biosecurity and is considered a significant risk pathway for emergency animal disease (EAD) incursions. A number of factors contribute to Northern Australia's increased exposure to EADs including:

- climate change
- the presence of transboundary EADs in neighbouring countries
- the expansive and remote distribution of livestock and wild animal populations
- shifts in agricultural production and land use
- limited and remote distribution of community members
- pressure on workforce capacity servicing associated industries
- travel and trade.

These challenges are shared across the three northern jurisdictions; however, state and territory borders create invisible boundaries that can promote working in isolation. To counteract this issue, an innovative network has been established to work across geographical boundaries, pooling resources and intelligence to focus efforts on EAD prevention and response preparedness.

The Northern Australia Coordination Network (NACN) is an initiative bringing together Northern Territory, Queensland, Western Australia and Commonwealth governments in partnership with key industries and local communities to enhance biosecurity and EAD preparedness across the north to mitigate the risk of EAD incursions.

The network of skilled and experienced government and industry personnel is increasing effective collaboration and coordination around priority disease risks such as foot-and-mouth disease and lumpy skin disease. This facilitates optimal use of resources and enhances capability for prevention, early detection and preparedness efforts. The development of trusted and strong working relationships in 'peace time' is integral to biosecurity emergency response frameworks and enables efficient and effective responses to EADs.

NACN's core activities include training and awareness; surveillance and early detection; and property biosecurity planning. These activities supplement existing national strategies to strengthen Australia's preparedness for potential EAD incursions.

NACN's goal is to create long standing relationships that continue to build our industry and community resilience across the north.

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Rabbits, Rewilding questions to answer first

Mr Tim Bloomfield[1], Mrs Heidi Kleinert[1], Mr Neil Devanny[1], Mr Tom Miller[1], Mr Brad Spear[1]
[1]Victorian Rabbit Action Network, Attwood, Australia

Biography:
Tim Bloomfield has been working with Victorian Rabbit Action Network for ten years. He is also the Director of his own NRM consulting group - Environment First.

He has 47 years of experience in pest and land management across roles in state governments, councils and private businesses in Victoria and interstate. He has helped develop and manage environmental strategies, and action plans, for governments, and community groups on rabbits, foxes, feral pigs and other wicked problems.

Abstract:
Rewilding projects are sweeping across Australia to help restore our fragile ecosystems. Many of us are planning conservation strategies to rebalance the environment and introduce keystone species that once were. But are we rushing into conservation projects without thinking about the past, present and future impacts of pest species?

The Victorian Rabbit Action Network (VRAN) has witnessed a trend in conservation programs moving towards the rewilding philosophy. The programs are usually the recipients of large government and philanthropic investments. Program objectives often include the reproduction and reintroduction of lost flora and fauna species, with the aim to let nature take care of nature. But few have successfully undertaken the steps of removing invasive pest species before the reintroduction of native keystone species.

The European Rabbit (Oryctolagus cuniculus), has successfully survived in Australia for more than one hundred and sixty years, dominating our landscapes. Declared Australia's number one pest species and recognised as having the greatest impact on threatened flora and fauna species, the rabbit is the most widely distributed and abundant mammal species in Australia. It can survive variable environmental conditions, recover quickly from human and predator impacts, and undermine environmental gains compromising large investments of money and effort.

Not removing an invasive species such as the rabbit which can cohabit and/or dominate a keystone species, is a failure in planning and implementing of a rewilding program. Their presence alongside a keystone species can make it even more difficult to manage rabbits when using best-practice control measures such as baiting and warren modification.

Many of us have not seen an environment without rabbits, but we'd like to. This presentation will introduce VRAN's guiding principles of why you should plan to de-wild before you re-wild.

Ms Kellyanne Harris[1]
[1]Department of Energy, Environment and Climate Action, Bendigo, Australia

Biography:
Kellyanne Hariss has worked for Agriculture Victoria for 24 years. Currently working as Animal Disease Industry Engagement and Business Resilience Program Manager at DEECA.

Kellyanne worked extensively in the red meat industry as an extension officer throughout Victoria and nationally (with the Beef CRC). Kellyanne managed LandLearn and the DPI Young Scientists Programs, sat on committees for the Young Farmers Scholarship Program and was the Departmental representative on the 2011 inquiry into agricultural education and training in Victoria & the 2012 inquiry into the Capacity of the Farming Sector to Attract and Retain Young Farmers and Respond to an Ageing Workforce.

Abstract:
Introduction
Agriculture Victoria used a storytelling approach by profiling case studies of real small landholders sharing their stories and experiences with other small landholders to influence behavioural change to improve biosecurity awareness.

We developed videos of four small landholders: alpaca, heritage pig and cattle, goat, and highland cattle owners to share their story. Each video had a different biosecurity key message and a clear call to action to promote a biosecurity resource designed to support small landholder.

We used a combination of paid media, including print, digital, social, radio and Google search engine marketing (SEM).

The key message for this advertising campaign was: “When you take steps to protect your animals from emergency animal diseases, you also protect your neighbour’s animals, commercial farms, and Victoria’s agriculture industry.” This message applied across the board.

Then through individual case studies, this message became personalised and adapted to relate to the individuals. For example, when the case study video used alpacas, the message was adapted to say ‘when you take steps to protect your alpacas’... increasing the relevance of the creative to the target audience.

Furthermore, while the advertising campaign was in market, complementary communication were ramped up to add furthe traction to the reach. This included:

Targeted media drop to the Herald Sun
Media release from the Minister for Agriculture
Social media content across Agriculture Victoria and partner agency channels
Stakeholder kits for partners to share with their audiences
15,646 postcards delivered to small landholders across 18 Victorian councils

Aim
Develop and deliver a paid media awareness campaign targeted at Victorian small landholders to increase livestock biosecurity awareness and increase EAD awareness

Results and conclusions
This campaign has successfully connected Agriculture Victoria with Victorian small landholders, who have previously not been engaged. During campaign preparation, staff connected with many peri-urban local government areas and artisanal industries, which strengthened key relationships through the campaign. Small

landholders at workshops and field days have been supportive of this campaign. Social media comments monitor showed strong support for the campaign.

The campaign was supported by complimentary engagement activities such as the Backyard Biosecurity Sculpture Project, kids activity packs and EAD animations.

The campaign was nominated for the PRIA Golden Target Awards.

Results include:

- The web page reached 200 daily hits during campaign period from 1 June to 30 June 2023 with 5,209 views.
- The number of views of the four individual campaign videos has reached 62,071 views.
- 147 subscribers to the Backyard Biosecurity newsletter series. 1,154 emails have been sent with a 60% average open rate.
- 69 press ads were inserted to papers across Victoria.
- 48 radio spots were delivered in Mandarin and Vietnamese.
- Google SEM: 1,169 clicks and 10,267 impressions.
- Meta: 1,924,402 impressions.
- YouTube: 270,756 impressions.
- Display campaign delivered 3,622,485 impressions and 3,499 clicks.
- Broadcast on demand (BVOD) delivered 159,955 impressions. These had strong completion rate at 96.55% showing the video message resonating with the audience.

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Sustainability of Australian livestock producer on-farm biosecurity following the 2022 foot-and-mouth disease outbreak in Indonesia

Miss Josephine Graham[1], Lynne Hayes[1,2], Jake Fountain[1,2], Dr Jennifer Manyweathers[1,2], Professor Marta Hernandez-Jover[1,2]
[1]Charles Sturt University, Wagga Wagga, Australia, [2]Gulbali Institute, Wagga Wagga, Australia

Biography:
Dr Marta Hernández-Jover is a Professor in Veterinary Epidemiology and Public Health. Her main interests and current research focus on biosecurity, disease surveillance and epidemiology and social science methods applied to infectious animal diseases and public health. She completed her PhD on livestock traceability in 2006 in Spain. Marta teaches epidemiology, public health and food safety to veterinary students. Prof Hernandez-Jover is a member of the Epidemiology and Public Health Chapters of the Australian and New Zealand College of Veterinary Scientists since 2015 and was president of the Epidemiology Chapter in 2018.

Abstract:
Australia holds an advantageous animal disease-free position within the global economy, with foot and mouth disease (FMD) representing the most significant infectious threat to the Australian livestock industries. As a result of the FMD outbreak reported in Indonesia in May 2022, Australia adjusted border biosecurity protocols to reflect the changed FMD risk. Australian government and agricultural industry bodies allocated resources to increase the FMD and biosecurity awareness of the public and livestock industries. The current study aimed to qualitatively assess the impact of the extension provided in response to the 2022 Indonesian FMD outbreak on the current biosecurity practices and perceptions of sheep producers in New South Wales, Australia.

Semi-structured interviews were conducted with 18 sheep producers during August-September 2023. Overall, biosecurity was perceived to be important to the ongoing enterprise productivity and integral to risk management; however, biosecurity understanding and practices related mainly to bioexclusion rather than biocontainment. Seven producers reported engaging with the extension campaigns developed by the government and industry bodies, and indicated that direct extension involvement increased their awareness of FMD. Lack of time, lack of event awareness, perceived irrelevance of extension content and geographical and technology limitations, were the main reasons for the lack of engagement. Furthermore, some participants suggested that the risk communication strategies used were not sufficiently effective in inducing compliance and reducing uncertainty, with the lack of direct communication between government authorities and producers being poorly received.

Despite the limited extension engagement, half of the participants reported management changes following the 2022 Indonesian FMD outbreak, with the most common changes being in relation to visitor biosecurity, such as enforcement of visitor protocols, restricted access of high-risk personnel and the purchase of biosecurity signs. Most of these changes required minimal financial investment and ongoing effort. The three main reasons for reporting no change in biosecurity were the perception that: 1. The risk had not changed; 2. Current practice was sufficient; and 3. Change was impractical and would not produce beneficial returns. Participant FMD concern following the extension campaigns were varied, with only some producers reporting increased concern. However, most participants reported a reduced level of FMD concern following the decrease in media attention and frequency of government and industry body outreach.

The approach to agricultural extension by government and industry during the Indonesian FMD outbreak used mass media and interpersonal strategies, and despite increasing awareness of FMD, it had limited impact on initiating change which effectively mitigates the high-risk pathways of FMD introduction and spread. Further research into the impacts of extension and risk communication strategies in relation to emergency animal diseases and biosecurity among livestock producers is needed. Understanding the contribution of producer and extension factors which can influence change to biosecurity practices and perceptions, would support the development of more effective strategies in the future.

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Children are the future: fostering the next generation of biosecurity champions

Ms Gayle Holmik[1]
[1]Department of Agriculture, Fisheries and Forestry,

Biography:
Over her career, Gayle Holmik has worked across government in a number of portfolios and the private sector to deliver elite sporting events (including Sydney 2000 Olympics), communications teams, board appointments, senior official forums as well as off-shore engagement.
In her current role, is delivering targeted biosecurity education and awareness activities. This includes communication campaigns, research, junior education program, business network, national forums and awards.

Abstract:
Biosecurity is more important than ever, emphasising the need for proactive interventions in our awareness and engagement programs.
This presentation delves into the intersection between children and biosecurity, offering insights into the challenges and opportunities in teaching children about the subject. Through the Junior Biosecurity Officer program, education plays a pivotal role in empowering children as active agents of biosecurity.
Engaging children provides an opportunity to instil good biosecurity behaviours from a young age. It also encourages them to share their learnings with their parents or guardians, family and friends.
Various policies, programs and strategies to improve biosecurity have been developed in the last 5 years but there hasn't been much focus on children and young people, especially on border biosecurity. The JBO program aims to complement educational programs with a regional focus such as Victoria's Urban Plant Health Network and New South Wales's Biosecurity Warrior program.
The Department of Agriculture, Fisheries and Forestry's Junior Biosecurity Officer program aims to increase awareness among children (and, by extension, their parents/carers, family friends and educators) of biosecurity, its threats, impact, and importance. The program explores a range of topics including plants, animals, risk pathways, hitchhiker pests and post-entry quarantine.
Through targeted, innovative and engaging education initiatives, children can learn essential knowledge and skills about biosecurity. Using age-appropriate and culturally sensitive methods, leveraging digital platforms, interactive materials, and community outreach programs. The program includes child-friendly, relatable elements such as Frankie the detector dog – a gender-neutral mascot.
It focuses on the story piece, teaching primary school children about basic biosecurity concepts and has three main components – an airport trial, online educational resources and a school trial.
Resources include lesson plans and activities, mapped to the Australian curriculum, for teachers to deliver in classrooms developed in partnership with the Primary Industries Education Foundation Australia (PIEFA) along with merchandise, online activities and more.
The program connects into a broader education piece and aims to complement similar work both in northern Australia and in the states and territories. The Biosecurity Education and Engagement team has worked with stakeholders such as NAQS, NSW DPI's Biosecurity Warrior Program, PIEFA, Australian Curriculum Assessment and Reporting Authority, Department of Education, ACT Government and Australian Science Teachers Association.
Fostering partnerships between industry, government, educators, and community leaders has helped address challenges and bridge gaps.
Biosecurity is a shared responsibility. It's never been more important to galvanise biosecurity ambassadors. The Junior Biosecurity Program engages children early and encourages them to be a part of future solutions. Capturing the hearts and minds of children is not easy, particularly when the subject matter can be confusing. The Junior Biosecurity Officer program advocates for a child-centric approach to biosecurity education, recognising children as both ambassadors and agents of change in mitigating biosecurity risks.
Through a combination of education initiatives and policy advocacy, it is possible to forge a path towards a safer, more secure future for Australia, resilient in the face of increasing biosecurity challenges.

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A buzzworthy cause: Bee Pest Blitz

Ms Kathryn Pagler, Dr Lucy Tran-Nguyen[1]
[1]Plant Health Australia Limited, DEAKIN, Australia

Biography:
Kathryn Pagler is PHA's Bee Biosecurity Project Officer, working on the National Bee Biosecurity Program and the National Bee Pest Surveillance Program. Previously Kathryn completed an Honours of Applied Science from the University of Canberra, during which she studied the nature of European honey bee gut microbes and their relationship with bee diseases. She has also completed a Bachelor of Biomedical Science, majoring in molecular and cellular biology, with a major research component on the effects of immunoglobulin A on chronic obstructive pulmonary disease. Kathryn has also worked as an administration officer at RehabCo, a workplace rehabilitation company.

Abstract:
Over the past 2 years, the Bee Pest Blitz has proven to be a cost effective and successful way to engage and encourage Australian beekeepers to inspect their hives for high priority pests such as varroa and tropilaelaps mites.
The Bee Pest Blitz is a call-to-action national campaign for beekeepers to conduct surveillance in a coordinated month-long campaign. The campaign is supported by nationally agreed messaging that will focus on a particular pest and/or technique each year.
The Bee Pest Blitz has improved awareness of bee biosecurity risks and promoted early detection and reporting of high priority bee pests, and consistent record keeping and reporting of results, including by:

- a highly visual nationally coordinated annual campaign promoting best practice, and nationally consistent surveillance techniques for beekeepers
- improved consistency, coordination, and promotion of national messaging for techniques used for bee pest surveillance
- improved early detection and awareness of bee pests.

As a result, the Bee Pest Blitz has enhanced the outcomes of the National Bee Pest Surveillance Program and National Bee Biosecurity Program. Plant Health Australia has developed a suite of resources to support the month-long call-to-action campaign including factsheets, posters, flyers, magnets and a new training video that provides guidance to beekeepers on performing an alcohol wash for detecting the presence and monitoring the level of external mites.
The training video is an important tool in promoting a new nationally consistent alcohol wash method endorsed last year by the National Bee Biosecurity Steering Committee and was developed in partnership with the Australian Honey Bee Industry Council and the New South Wales Government.
The alcohol wash method highlights the importance of washing the sample three times to achieve over 90 per cent mite recovery. It also provides greater clarity on sampling techniques and includes a filtering step to effectively separate the mites from the bees and the solution.
Metrics from the 2023 campaign showed a high level of participation from bee keepers, with 3,668 reports throughout April. Results from the 2024 campaign will be presented, as well as an analysis of whether this approach provides a long-term solution for engaging beekeepers (and other industry participants more generally) and maintaining their interest in biosecurity.
By participating in the Bee Pest Blitz month, Australian beekeepers fulfilled their bee biosecurity obligations and one of the two inspection requirements under the Australian Honey Bee Industry Code of Practice.
Bee Pest Blitz was funded by the Department of Agriculture, Fisheries and Forestry, led by Plant Health Australia and supported by the Australian Honey Bee Industry Council and all state and territory government agriculture agencies.

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What is the ARC Training Centre in Plant Biosecurity?

Professor Peter Solomon[1]
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Biography:
Professor Peter Solomon is currently a Professor in the Research School of Biology at The Australian National University, leading the Wheat Biosecurity Laboratory (www.wheatbiosecurity.com), which focuses on understanding the molecular mechanisms underpinning fungal diseases in cereal crops. In addition to the research program, Peter also serves as the Director of the ARC Training Centre in Plant Biosecurity (https://plantbiosecuritycentre.edu.au), aiming to train future leaders and innovators in plant biosecurity to protect Australia's agricultural, horticultural, and environmental sectors.

Abstract:
Biosecurity is a critical part of Australia's efforts to prevent, respond to, and recover from pests and diseases that threaten the economy and environment. The protection though of our valued flora is not guaranteed, and outbreaks could have devastating consequences for the agricultural and forestry industries whilst compromising our native environments. A robust, effective, and responsive plant biosecurity system is critical to protect our natural and productive ecosystems.

However, analyses of the sector have shown that employing a "business as usual" approach for our future biosecurity requirements will be ineffective in the long-term [1]. Modelling has demonstrated that even a tripling in investment in the sector is not enough to prevent increased biosecurity threats over the short-to-medium term. Consequently, plant biosecurity requires a transformational change to keep ahead of the increased risks and ensure its effectiveness in protecting Australia's multibillion-dollar agriculture, horticulture, forestry, environmental industries, tourism, and quality of life.

The ARC Training Centre in Plant Biosecurity aims to deliver a solution for Australia's increasing biosecurity risk through generational change in its workforce coupled with breakthrough technologies. It will launch an innovative training program for future leaders who will build relationships with end users and engage meaningfully with communities for effective implementation strategies. It will deliver a cohort of highly skilled graduates that will innovate novel diagnostic technologies, enable data-driven decision platforms and address barriers to biosecurity adoption. In this presentation I will discuss the training program and research embedded within the Training Centre and outline the exciting opportunities now available for students and postdocs.

References
[1] Craik, W., et al., Priorities for Australia's biosecurity system: An independent review of the capacity of the national biosecurity system and
its underpinning Intergovernmental Agreement. 2017, Department of Agriculture and Water Resources: Canberra.

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Hitchhiker pest awareness campaign

Monica Talbot
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Biography:
Monica is an Assistant Director in the Stakeholder Engagement Section of the Biosecurity Plant and Services Division within the Department of Agriculture, Fisheries and Forestry. She has experience delivering engagement and communication activities across a range of plant biosecurity issues and diverse stakeholder groups. Holding a degree in natural resource economics, Monica joined the department as a graduate in 2016 and has since gained extensive experience, including operational work with offshore biosecurity treatment assurance programs.

Abstract:
Australia is currently free of some of the world's most serious hitchhiker pests that threaten our industries, economy, environment, and way of life. Hitchhiker pests are those that can "hitch a ride" to Australia within or on shipping containers, imported goods and other forms of transportation. They are not native to Australia but have a specific biology or behaviour that enables them to use or associate with inanimate goods or containers, survive an extended journey, and actively disperse to Australia's environment.

Australia has a strong biosecurity system that works to prevent pests from entering and establishing here. However, a number of countries, including Australia, have observed an increase in the global movement of sea containers infested with hitchhiker pests. This increase can be attributed to climate change, intensification of agriculture, increased movement of people and products, and supply chain complexities.

The Hitchhiker Pest Program (the program) was established to respond to this problem and reduce the risk of hitchhiker pests. The program is adopting a systematic approach to comprehensively manage this risk through 3 focus areas including expanded use of offshore controls, targeted onshore risk intervention and surveillance, and partnerships with industry, government, and researchers.

As part of this program, we are launching a hitchhiker pest awareness campaign. Our presentation to Australian Biosecurity Symposium will focus on this campaign. The presentation will outline the campaign's:

• Aim to raise awareness of hitchhiker pests in and on sea containers and imported goods, as well as how to report suspected detections.
• Target audience, including port workers, importers, shipping, freight, logistics, transport companies and empty container parks.
• Communication channels and products, including sponsored digital advertising and the distribution of promotional 'call to action' material to key stakeholders.
• Evaluation approach, including direct feedback, digital analytics, dynamic QR code tracking and surveys.

Importantly, the presentation will explain the significance of the campaign (and the program more broadly) to biosecurity. This will include an overview of the changing risk profile of hitchhiker pests and the importance of biosecurity being everybody's business.

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National Biosecurity Training Hub: A collaborative, centralised approach to biosecurity engagement

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[1]Plant Health Australia , Canberra, Australia , [2]Plant Health Australia , Canberra, Australia

Biography:
An experienced marketing and communications professional, Amanda is the General Manager, Corporate Services at Plant Health Australia (PHA).

Prior to PHA, Amanda worked in the Northern Territory (NT) Public Sector at the Northern Territory Department of the Chief Minister, Department of Treasury and Finance and Department of Industry, Tourism and Trade. During her time in the NT, she worked with the National Citrus Canker Eradication Program team, worked on the African Swine Fever pre-response public information campaign and delivered two NT budget campaigns.

Since joining PHA, Amanda has delivered key national projects such as the National Biosecurity Training Hub and National Biosecurity Week and has been part of the Australian Biosecurity Symposium Management Committee for the 2022 and 2024 events.

Abstract:
Accessible education and training in biosecurity continues to be raised as a high priority by stakeholders nationally.

Through collaboration and sharing of key stakeholder feedback, partners across Plant Health Australia (PHA), Animal Health Australia (AHA), Agriculture Victoria, New South Wales Department of Primary Industries, and the Queensland Department of Agriculture and Fisheries collectively identified the need for a national, centralised platform for biosecurity training.

Launched in December 2023, the National Biosecurity Training Hub (the hub) is the result of this collaboration. The hub provides stakeholders with an easy to navigate library of biosecurity training to support biosecurity prevention, preparedness, response and recovery, and encourages an increased level of general awareness on biosecurity matters across jurisdictions and industries.

As well as providing enhanced access to and visibility of biosecurity training, the hub encourages greater national coordination and collaboration on training development and delivery, including sharing of expertise and resources and reducing duplication of effort.

This session will explore the development of the hub as a collaborative project; how the online platform works, the role of all stakeholders in ongoing contributions to the hug including promotion.

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A collaborative approach to review and enhance livestock export registered establishment biosecurity plan templates

Mrs Maria Thompson[1], Ms Katie Hallatt
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Biography:
Katie Hallatt completed a Bachelor of Animal and Veterinary Bioscience at the University of Sydney. Following this, Katie started her journey with LiveCorp five years ago, the research and development corporation for the livestock export industry. To date, Katie manages trade & market access at LiveCorp, and has been a key player in the industry's response to exotic disease outbreaks in Indonesia in 2022, taking lead on the Indonesian vaccination program. Katie also collaborated on a project to update the livestock export biosecurity plan templates for registered establishments.

Abstract:
Tailored and effectively implemented biosecurity plans for livestock export registered establishments ensure proactive measures are in place to prevent, detect, and respond to potential biosecurity risks within each establishment. There is a risk that personnel developing these plans will simply “tick and flick”, rather than developing and implementing the plan. Through collaboration with registered establishment operators and employing a co-innovation approach, templates were reviewed, improved and are now relevant and practical for end users, ensuring that they customise the plans to suit their individual situations.
All livestock prior to departing from Australia via sea must be held and prepared at registered establishments, playing a critical role in maintaining Australia’s biosecurity and to ensure market access and trade is maintained.
Recognising the increased importance of biosecurity and awareness of the potential risks posed by emergency animal diseases to Australia, coupled with the release of Australian Standards for the Export of Livestock (ASEL) 3.2 and ASEL 3.3, it was deemed essential to revisit and enhance the RE Biosecurity Plan template developed in 2020.
This revision aimed to ensure that the template contained the most relevant and up-to-date information, empowering registered establishment operators to develop and implement effective biosecurity plans tailored to their respective establishments. The template is provided in an accessible Word document format.

The development of the template involved close collaboration with three registered establishment operators, state and territory authorities and Animal Health Australia. This collective effort ensured that the revised template aligned with specific requirements and remained highly relevant, promoting widespread adoption. One-on-one consultations were conducted with registered establishment operators and their staff implementing the biosecurity procedures, offering valuable support and fostering accountability in the implementation of their biosecurity plans.

LiveCorp has distributed the template to 22 registered establishments. Initial feedback from operators has been positive, particularly around the inclusion of components specific to live export and ASEL, making the process much easier. LiveCorp will continue to work with operators of registered establishments to ensure the ongoing implementation of the biosecurity plans.

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Lessons from a First Nations biosecurity training exercise in the Torres Strait

Ms Emma Atkins[1]
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Biography:
Emma Atkins lives and works in Cape York, managing the Far Northern Biosecurity Initiative on behalf of Biosecurity Queensland. Her small team works closely with Torres Strait and Cape York stakeholders to manage invasives from the north (PNG) and mainland Australia. Throughout her career, Emma has successfully developed and delivered capability and capacity uplift programs on behalf of local and state government.

Abstract:
The Torres Strait and the Northern Peninsula Area (NPA) is recognised as a high-risk area for biosecurity incursions which may threaten Australia from countries to our north. Exotic agricultural pests and diseases may enter the region through natural dispersal, traditional trade or through the movement of risk items such as plant material, animals, people and machinery. Implementing an effective and rapid operational biosecurity response in the region is challenging for mainland-based government response agencies because of logistical, cultural, and geographic factors which are not typically experienced during mainland responses.

Imagine needing to urgently conduct biosecurity plant pest surveillance on a small island community, where English is the third language, and access was tide and weather dependant, where there are no accommodation or catering options available. How do you communicate your needs, how do you get approval to enter the island, let alone people's gardens which contain their food, medicinal and cultural resources? How do you gain local people's trust when historical biosecurity efforts destroyed these resources, how do you change the narrative on biosecurity? Working with our local stakeholders to provide them with biosecurity response training was identified as a high priority by the regional biosecurity working group. This training was a first for both Queensland's Department of Agriculture and Fisheries (QDAF) and the Commonwealth Department of Agriculture, Fisheries and Forestry (DAFF) and has helped build capability in preparing for a potential incursion, and support local people to protect their way of life.

Whilst QDAF have a "Just in Time" training package available, it had not been designed to be delivered to predominantly First Nations stakeholders where English is a second or third language or in a local setting. The department recognises the importance of engaging local people in a response, which is key to the success of any biosecurity effort and subsequently successfully applied for funding through DAFF for a grant to redesign the package and deliver to local biosecurity stakeholders. It also included the development of a cultural induction package, aimed at staff who do not have awareness of the cultural differences that could impact on successful engagement and delivery of the project, and ultimately a biosecurity response should one occur.

The bespoke training package was delivered over 3 days, and included a mock biosecurity incident exercise. It was held on Thursday Island, with travel and accommodation fully funded for all participants. The 30 attendees included environmental health workers, rangers, senior managers, and traditional owners, representing six organisations.

Whilst the attendees were trained in biosecurity response systems, QDAF's delivery teams gained considerable insights on how to improve the training, and also how a response will need to be significantly modified given the remoteness of the region, the cultural differences, differences in communication methods, seasons, and community sentiment. The training was considered a success, with alliances and networks strengthened, understanding gained and a recognition of the work that is required further in this field.

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Giving it some thought-the role of the Appreciation before and during biosecurity emergency response

Mr Andrew Bishop[1]
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Biography:
Andrew Bishop is the Director of Agriscience Consultancies Tasmania, a company he and his wife Hilda, established in 2023. Andrew has 36 years of experience working in government in Tasmania and Victoria. Before retiring from the State service Andrew was Tasmania's Chief Plant Protection Officer with the Department of Natural Resources and Environment Tasmania. Andrew was responsible for representation (state and national) and decision-making with the development and maintenance of the Tasmanian plant biosecurity system including plant biosecurity emergency responses. He has participated in multiple biosecurity responses in various roles and is a trained planning manager and incident controller.

Abstract:
Effective planning increases the chance of success of any emergency response. An activity that appears to be only occasionally used in biosecurity responses is the development of an Appreciation of the situation. I make the case that this process should be central during and after responses rather than a side thought. It requires capacity and capability development/training in the technique as part of national biosecurity response training.

Appreciation origins:
The Appreciation process originates in the military for use in situations of war. Known as the Joint Military Appreciation Process (JMAP), it is a key planning and decision-making tool used by the Australian Defence Force. It is useful in response situations that extend over longer periods and see changes in personnel and responders several times due to the extended period. It guides incident teams to deliver and complete mission objectives based on rational considerations.

A Joint Biosecurity Response Appreciation Process:
When fighting a war and undertaking a biosecurity emergency response, the identified needs and what an Appreciation can deliver are similar. It is one of the tools that can bring order, structure, and levels of confidence to the analysis phases ahead of developing the response plan. It is not unknown to biosecurity and over the years the process has been employed in Tasmanian biosecurity responses at varying levels depending on the personnel and personalities responsible for undertaking the responses. My argument is that it is of sufficient value to be given prominence in how the Planning function operates in response and should receive similar recognition as does its military counterpart. Formalising this important step as the Joint Biosecurity Response Appreciation Process (JBRAP) would ensure its standard deployment in responses. It provides an opportunity to get a step or two ahead of an unfolding biosecurity emergency.

A JBRAP- the what and the how:
Undertaking the Appreciation should be the very first activity undertaken by planners in a newly established response. There is also value in considering pre-response preparations of Appreciation documents and having them close to hand should the incursion eventuate. An example of successfully deploying this approach was the development of a 'peace-time' Appreciation for a myrtle rust incursion into Tasmania. That work resulted in a comprehensive guide that was immediately used by the Chief Plant Protection Officer and Incident Controller when the first incursion occurred in February 2014. Described simply, the components of a JBRAP are:

- Aim and Objectives
- Background
- Current Situation
- Factors to Consider
- Current Courses of Action Open
- Preferred Course of Action Consideration

- Analysis-based recommendations

Appreciating the future:
Eighteen years ago, when the Emergency Plant Pest Response Deed (EPPRD) was first developed, multiple, ongoing plant biosecurity responses were unknown whereas now they are commonplace. There has not been a consistently high level of commitment to resourcing national biosecurity response training programs over the last few decades. Trained and competent emergency response personnel capable of undertaking a JBRAP are just one example of an ongoing training need in biosecurity response in Australia.

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Using a Theory of Change to design a Frontline Field Epidemiology Training Program in New South Wales, 2024

Dr Laura Macfarlane-Berry[1], Rachel Hammersley-Mather[2,3], Dr Rebecca Forsythe[1], Dr Emily Doyle[1]
[1]New South Wales Department Of Primary Industries, Orange, Australia, [2]University of Newcastle, Newcastle, Australia, [3]Hunter New England Health, Wallsend, Australia

Biography:
Dr Laura Macfarlane-Berry is veterinarian and epidemiologist who has over 15 years experience in animal and public health in Australia, Asia and the Pacific. Currently working as a Senior Veterinary Policy and Project Officer at the New South Wales Department of Primary Industries.

Abstract:
Introduction: Over the past decade, New South Wales (NSW) has experienced increasing and complex biosecurity threats and several emergency animal disease (EAD) incursions. Evaluations of surveillance performance and epidemiology capacity conducted in 2023 identified gaps in government workforce capacity, including a lack of routine in-service training and formal mentorship opportunities in epidemiology. One approach NSW is using to address these gaps is an animal health Frontline Field Epidemiology Training Program (FETP) pilot. FETPs are in-service experiential programs designed to equip trainees with the competencies required to work rapidly and effectively within their workplace, with Frontline-level programs targeting individuals working at the local level. The program's success relies on alignment to local and state needs and commitment from stakeholders. A Theory of Change (ToC) is an approach where the desired outcomes from an intervention are described in a narrative or diagram together with the causal pathway. ToC can be used in different contexts including program design.

Aim: To describe use of a ToC to develop a vision for change and framework for the NSW Frontline FETP pilot.

Methods: To develop the ToC, a 1.5 day stakeholder workshop was organised in Orange, NSW. Participants worked in government or universities and were selected to represent different organisational levels, technical and species backgrounds, geographic areas, and career stages. Although terrestrial animal health individuals were in the majority, representatives from public, plant and aquatic health were also in attendance.

Results: The ToC workshop included a mix of small group activities and facilitated discussions. The 28 participants were divided into groups of five or six and worked within these groups for the duration of the workshop. Groups were allocated to ensure a mixture of expertise and experience. Following introductory presentations, participants were asked to identify issues which could cause the program to fail as well as potential consequences if the program could not proceed. Participants then worked together to develop long-term outcomes, intermediate outcomes, and interventions/activities, and identify assumptions underpinning the theory. A ceiling of accountability was collectively decided, delineating between outcomes the program is responsible for achieving compared to those it will contribute to. Evaluations were conducted at the close of each day, revealing participant enthusiasm with the ToC and anticipation and support for the program implementation. The ToC was refined by the program team following the workshop.

Conclusion: The ToC workshop was a useful approach to develop a collective understanding of how a NSW Frontline FETP can address local and state animal health priorities. The workshop resulted in a collective vision for change for the program and framework from which the program can be evaluated. The lessons from this experience can serve as a guide for implementation of other biosecurity interventions.

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Enhancing industry response readiness: A training pathway

Ms Kirsten Phillips[1]
[1]Department Of Agriculture And Fisheries, Biosecurity Queensland, BRISBANE CITY, Australia

Biography:
Kirsten Phillips has worked as a communication and engagement professional for more than 25 years with 15 specifically in the biosecurity sector. As the Director, Partnerships and Engagement for Biosecurity Queensland, Kirsten is responsible for strategy and coordination of online engagement and engagement capability development.

As a long-term member of the National Biosecurity Communication and Engagement Network (NBCEN), Kirsten is passionate about collaboration and coordination across the biosecurity communication sector nationally. Kirsten also has extensive experience in public information delivery leading the communication and engagement response for multiple incidents including Panama disease, Hendra virus, and white spot disease.

Abstract:
Industry peak bodies play a critical role in biosecurity emergency prevention and preparedness initiatives. Upskilling the workforces of agricultural peak industry bodies and key individuals is paramount for safeguarding Queensland's environment and way of life, food security and multi-billion-dollar agricultural sector.

Biosecurity Queensland has launched a new education pathway to upskill staff, elected members and emerging leaders of industry peak bodies in nationally agreed response arrangements and incident management structures. Working with Plant Health Australia (PHA) and Animal Health Australia (AHA), Biosecurity Queensland is working to help industry peak bodies to build their capability and capacity to operate in a response environment and support an incident management team both from within and outside the response.

This session explores Queensland's approach to empowering and upskilling industry stakeholders through a training pathway that brings together:
1. The new national biosecurity training hub
2. Queensland's new industry biosecurity response readiness training (IBRRT)
3. Industry Liaison Officer training

In its first 6 months, this training pathway has already seen over 80 industry representatives upskill their knowledge and skills in responding to a biosecurity incident.

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Enhancing veterinary capability and the NSW livestock passive disease surveillance system

Dr Nicole Schembri[1], Ms Rachel Gordon[1], Miss Alliza Bartley[1], Professor Marta Hernandez-Jover[2], Lynne Hayes[2], Dr Jennifer Manyweathers[2], Dr Eliz Braddon[1], Dr Emily Doyle[1]
[1]NSW Department of Primary Industries, Orange, Australia, [2]Charles Sturt University, Wagga Wagga, Australia

Biography:
Dr Nicole Schembri has a special interest in understanding the human influences of applied animal biosecurity and emergency animal disease (EAD) prevention and preparedness, having a completed a PhD in the field of social veterinary epidemiology. She has worked in the agricultural industry, servicing NSW producers and communities for over 15 years in roles at the University of Sydney, NSW Local Land Services and more recently at NSW DPI. Her current focus is on EAD preparedness and prevention, capacity building and behaviour change through engagement.

Abstract:
The New South Wales (NSW) animal health surveillance system provides evidence to support disease freedom claims and stakeholder confidence in the emergency animal disease (EAD) 'free' status of NSW and Australia. Passive surveillance is primarily used to support early and rapid EAD detection to facilitate control and minimise the impact of an EAD. Veterinarians play a key role in this system. This study investigated private and government veterinarian capabilities and capacity to contribute to the passive surveillance system in NSW.

This study used an online cross-sectional survey of private (PV) and government District Veterinarians (DV) treating livestock in NSW. A series of educational and training opportunities and support resources were conducted over a 12-month period to boost veterinary engagement in EAD responses (and by extension, passive disease surveillance). A second survey was repeated 18 months later (April 2024) to evaluate the effectiveness of our interventions and provide understand how veterinarian EAD awareness, their attitudes, and drivers of practice in relation to passive EAD surveillance may have changed over time and resulting from our interventions. Descriptive statistics and regression analyses were conducted analyse the survey data and to help inform future veterinary engagement in this area of interest.

A total of 97 veterinarians participated in the first survey (N=60% PV and N=40% DV). Results suggest that PVs have little to moderate knowledge of 3 of the 5 key EAD threats, namely avian influenza, African swine fever and African horse sickness and a lower perceived likelihood of these being introduced to Australia within the next 5 years, compared to DVs. Around 97% of DVs and 65% of PVs had taken and submitted samples for a suspect EAD in production animals. PVs identified lacking confidence in exclusion by differential diagnosis, sample submission and carrying out a field investigation for a significant animal disease. Key challenges to conducting EAD investigations included available workforce, distance, and time to travel and renumeration, timely education and resources. While the DV sample size is representative of the population, the PV sample size is small, potentially representing those who are already engaged with or have an interest in EADs. Preliminary results highlight an opportunity for further government-private veterinary engagement, utilising and strengthening existing pathways to simplify the passive surveillance system.

A number of educational and engagement activities, or interventions, that were identified as being 'useful' learning opportunities in the first survey were developed, piloted and implemented over a 12-month period, including:
- a series of in-person and practical workshops,
- specific EAD resources (e.g., field guides and post-mortem kits) and
- regular communications at veterinary conferences and via an EAD newsletter

Findings and learnings from the follow up survey will be presented.

Increased veterinary EAD awareness and capability is required ongoing to maintain engagement and continually enhance our passive disease surveillance capabilities under ever-increasing EAD risk. Educational

and engagement interventions sought to build confidence and capacity to ensure passive field surveillance. Ongoing investment and support to ensure our ability to detect and respond to potential EADs remains strong.

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Harnessing First Nations Wisdom: Enhancing Environmental Biosecurity in Contemporary Australian Landscapes

Mr David Barras[1], Corey Williams-Daly[1]
[1]Department Of Agriculture, Fisheries and Forestry, Canberra, Australia

Biography:
David is the Assistant Director of the First Nations Program and Engagement team within the Environmental Biosecurity Office in the Australian Government Department of Agriculture, Fisheries and Forestry. David is an Aboriginal man, with ancestral ties to the Malgana and Yinggarda people of North-west Western Australia. With over 18 years' experience within the Australian Public Service, he has worked primarily on the First Nations agenda, specialising in service delivery, community engagement, project management and policy development. David is currently completing a Masters in Business Administration though Edith Cowan University.

Abstract:
First Nations perspectives offer unique insights into the intricate ecosystems of Australia, forged through more than 80,000 years of deep connection and custodianship of the land. Traditional practices deeply rooted in Indigenous cultures offer innovative approaches to environmental stewardship, finely attuned to the Australian landscape's unique challenges and opportunities. Practices such as firestick farming, selective hunting, and water management techniques demonstrate First Nation peoples' sophisticated strategies for maintaining ecological balance and resilience over generations. Integrating these practices into biosecurity initiatives not only enhances ecosystem health and biodiversity but also fosters cultural revitalisation and empowerment within First Nations communities.

Cultural values inherent within Indigenous societies underscore the intrinsic connection between land, identity, and well-being, guiding ethical considerations and community engagement in biosecurity endeavours. Concepts such as "Caring for Country," kinship with all living beings, and respect for ancestral knowledge inform Indigenous ethical frameworks, emphasising the importance of reciprocity and respect. By centring these cultural values, biosecurity activities can foster meaningful partnerships with First Nations peoples, grounded in mutual respect, trust, and shared responsibility.

The Environmental Biosecurity Office is at the forefront of an innovative and collaborative engagement model, that centres and champions the knowledge and values of First Nations people in the way future Environmental Biosecurity Initiatives are implemented across the Department of Agriculture, Fisheries and Forestry.

Collaboration with First Nations communities ensures the contextual relevance and effectiveness of biosecurity interventions, fostering co-design and co-management approaches that prioritise local knowledge and priorities. Meaningful engagement with Indigenous stakeholders not only enhances the success of biosecurity measures but also strengthens social cohesion, cultural resilience, and community well-being.

The integration of First Nations perspectives, traditional practices, and cultural values is indispensable for the effective implementation of environmental biosecurity activities in contemporary Australian landscapes. By embracing Indigenous knowledge systems, practices, and values, practitioners can harness the collective wisdom of Australia's First Peoples, fostering more resilient, inclusive, and sustainable approaches to environmental management. Embracing this is not only a matter of ethical imperative but a strategic necessity in confronting the complex ecological challenges facing Australia in the 21st century.

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The role of partnerships in our reimagined shared biosecurity future

Ms Amanda Yong[1], Ms Sarah Corcoran[1], Ms Karin Steenkamp[1]
[1]Plant Health Australia, Deakin, Australia

Biography:
Appointed as the CEO of PHA in 2020, Sarah's biosecurity experience extends across the Australian Government, and the Queensland and Northern Territory governments where she gained a wealth of expertise in biosecurity, regulation, science, and innovation. Sarah has delivered several significant eradication programs for agricultural and environmental pests. She has overseen biosecurity research and investment in infrastructure across sectors, including disease detection, management, and response. Sarah currently serves on the Advisory Board for the Centre of Excellence for Biosecurity Risk Analysis, the Victorian Invasive Pests Advisory Board and is an observer (and former member) of the National Biosecurity Committee.

Abstract:
The Australian plant biosecurity system, traditionally seen as the responsibility of the Australian Government, state and territory governments and farmers has experienced mounting pressure as global megatrends accelerate and biosecurity challenges become increasingly complex.

The evolving landscape marked by increased trade and travel industry, agricultural expansion and intensification, urbanisation near farmlands, funding constraints, changing legislation and other factors like climate change, necessitates a re-imagination of the plant biosecurity system and a transformative approach to building a shared biosecurity culture that recognises shared benefits and the linkage between plant biosecurity and food security.

Inclusion makes us stronger. Through the work of Plant Health Australia (PHA), significant efforts have already been made to strengthen government and industry partnerships to ensure a collective vision and a united purpose to enhance our biosecurity capability.

However, an inclusive system, based on a shared biosecurity responsibility requires practice change at all levels.

To promote inclusivity and address existing inequities within the current plant biosecurity system, demands a fostering and strengthening of partnerships with indigenous Australians, youth, and cultural and linguistically diverse community groups, both in traditional and non-traditional ways.

A re-invigorated biosecurity culture also requires inclusivity and participation of local, regional, national, and international stakeholders. Although regional, national and international stakeholders have increased their points of collaboration over the past decade, there is an opportunity to include local stakeholders in the conversation. Beyond face-to-face interactions there is also a need to change the way we craft communications to not only reach, but also resonate with all Australians, regardless of race, gender, geographic location, cultural background, language or beliefs.

For over 24 years, PHA has played a critical role in bringing key plant biosecurity stakeholders together to generate solutions that improve biosecurity outcomes. A system repositioning involves the integration and inclusion of diverse networks; drawing on knowledge, practices, and programs, to form a unique partnership. As the trusted coordinator of the plant biosecurity system, PHA is well versed in how partnerships enable new strategic collaborations, and the value of leveraging expertise, unused channels and dispersed audiences to build biosecurity awareness and amplify biosecurity messaging. Other partnership benefits include cost-effective communication, cross-promotion, shared risks, and a greater trust in the biosecurity system.

With an average of 40 plant pest incursions per year, there is a growing need for innovative techniques to prevent and manage emergency pest and disease outbreaks, stakeholder engagement, early detection and response. By creating a deliberate space to share experiences and reflections on current partnerships and

programs, whether in emergency management, fires, floods, health sector, or the community, system participants can improve efficiencies, enhance responses and guide future biosecurity efforts.

An interconnected and resilient plant biosecurity system based on a shared biosecurity culture, requires continuous investment, collaboration facilitated through strong partnerships, and shared resources and knowledge. The key to safeguarding the Australian way of life, protecting our valuable agriculture industry and ensuring food security is inclusivity.

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Unleashing the Power of Women: Shaping the future of Australia's biosecurity landscape

Ms Amanda Yong[1], Ms Karin Steenkamp[1], Dr Gabrielle Vivian-Smith, Brigid Price, Ms Sarah Corcoran[1], Kathleen Plowman, Mr Callum Fletcher, Ms Shakira Johnson

Abstract:
Women are well-known for their ability to juggle multiple roles and responsibilities as employees, parents and active members within their communities. This combination of broad skills, diverse experiences and unique perspectives, naturally equip women to take on leadership roles.

Throughout the world, the contribution of women to agriculture, food production and safeguarding our environment from pests and diseases, has been invaluable. The United Nations estimates almost a third of women's employment globally is in agriculture, including forestry and fishing (excluding self-employed and unpaid family workers).

In 2023, it was estimated that approximately 88,000 Australian women were employed in agriculture, with an increasing number obtaining qualifications in agriculture. Contrary to the number of women employed in Australian agriculture, only 30% of researchers worldwide are women, and only 16% of Australians with science, technology, engineering, and mathematics (STEM) professional qualifications are female.

Australian women play a critical role in biosecurity by minimising plant pests, enhancing our plant health status, supporting market access, safeguarding the livelihoods of producers, supporting the future of plant industries and communities, and preserving Australia's environment and amenity.

According to the International Monetary Fund greater gender equality boosts economic growth and contributes to better development outcomes. Moreover, it boosts economic diversification and reduces income inequality, which supports economic resilience.

The empowerment of women is good for business, and similarly Australia could benefit from promoting female leaders and developing future generations of women biosecurity professionals.

In order to enhance the economic empowerment of women and work towards a more inclusive and sustainable future, it is essential to raise awareness and access to educational, mentoring, and leadership programs for young women in the agriculture and biosecurity sectors.

There is no doubt that a career in biosecurity goes hand in hand with agriculture and can open a world of opportunities and new perspectives for young women. The diversity of biosecurity roles both in-field and in the office, often involves working across the spectrum including business development, research, science and technology practitioners, emergency management and communication and extension.

At PHA, our leadership team is spearheaded by our CEO Sarah Corcoran, who brings her expertise and vision to steer our organisation forward. Alongside her, we have a dedicated group of strong women within the Executive Management Team. Together they are committed to protecting Australia's biosecurity system and safeguarding our food supply.

Women's inclusion in biosecurity is not only based on their gender, but rather their contributions and the diversity they bring to the table. Taking advantage of the insights and leadership styles of key women in Australian biosecurity across industry and government, this panel aims to explore unique perspectives, and leadership lessons that could further unleash the power of women and shape our future biosecurity system.

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Inclusivity in AUSVETPLAN development

Dr Mark Cozens[1]
[1]Animal Health Australia, Lyneham, Australia

Biography:
Dr Mark Cozens is a veterinarian with experience in both the government and private sectors, and has worked overseas on responses to foot-and-mouth disease, chronic wasting disease and anthrax, and in Australia on responses to Newcastle disease, equine influenza, Hendra virus and white spot disease.

Dr Cozens manages the AUSVETPLAN program within Animal Health Australia that provides the nationally agreed approach for the response to cost-shared emergency animal disease incidents in Australia. He works closely with government and industry representatives to enhance emergency response readiness for both government and industry members.

Abstract:
Development and approval of AUSVETPLAN is a collaborative process between Animal Health Australia, its government, industry and associate members and other stakeholders as required.

The diversity of stakeholders engaged in the process can make reaching consensus on AUSVETPLAN manuals challenging, but critical for Australia's emergency animal disease preparedness.

This presentation will delve into how manuals are developed and reviewed. It will focus on how we mix the process of inclusive engagement with confidentially in a respectful and professional environment to provide AUSVETPLAN manuals that are current, accurate, readily available, accessible and endorsed by all key stakeholders.

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Engagement with traceability among the cattle, sheep and goat industries in New South Wales

Professor Marta Hernandez-Jover[1,2], Lynne Hayes[1,2], Dr Jennifer Manyweathers[1,2], Professor Bruce Allworth[1,2], Mrs Trudy Marriott[3]
[1]Charles Sturt University, Wagga Wagga, Australia, [2]Gulbali Institute, Wagga Wagga, Australia, [3]Department of Regional NSW, Orange, Australia

Biography:
Dr Marta Hernández-Jover is a Professor in Veterinary Epidemiology and Public Health. Her main interests and current research focus on biosecurity, disease surveillance and epidemiology and social science methods applied to infectious animal diseases and public health. She completed her PhD on livestock traceability in 2006 in Spain. Marta teaches epidemiology, public health and food safety to veterinary students. Prof Hernandez-Jover is a member of the Epidemiology and Public Health Chapters of the Australian and New Zealand College of Veterinary Scientists since 2015 and was president of the Epidemiology Chapter in 2018.

Abstract:
Effective and efficient traceability is essential to ensure that Australia maintains and improves its position as a safe and high-quality exporter to global red meat markets. This study aimed to understand stakeholder attitudes towards traceability in NSW among the cattle, sheep, and goat industries. Phase 1 of the study was completed in 2022 and focussed on attitudes towards the introduction of electronic identification (eID) of sheep and goats in NSW. Then, Phase 2 focussed on the National Vendor Declaration (NVD) for livestock movements and explored barriers to and enablers for positive change.

An analysis of the baseline level of completion and accuracy of the NVD against National Standards and NSW state specific requirements for livestock traceability was undertaken. Descriptive statistics and logistic regression analyses were conducted to describe the baseline differences between species, venues and NVD format. The second component of Phase 2 included semi structured interviews with key stakeholders across the red meat supply chain. Interview data was qualitatively analysed using thematic analysis. Finally, a workshop was conducted with targeted industry stakeholders to discuss and identify key areas of focus for the development of a change management plan to improve active engagement with traceability.

A total of 463 NVDs were assessed across three abattoirs and two saleyards in NSW (206 cattle, 244 sheep and 13 goat). Approximately 20 to 30% of these were electronic NVDs (eNVD). Overall NVD completeness was low, with an average of 13.6% of cattle and sheep NVDs being deemed to be accurately completed. No significant differences were observed between species, venues or NVD format.

Semi-structured interviews were conducted with 35 stakeholders, providing information on stakeholder practices and perspectives on the purpose of National Livestock Identification System (NLIS), the implementation of eID in sheep and goats, and the use of NVDs, eNVDs and the eNVD app. Results identified a disconnect between NLIS understanding and market access. Stakeholders were concerned about the accuracy of inputs into the NLIS database, difficulties with the use of the NLIS platform and differences in requirements between states. These perspectives were similar to those reported by participants of Phase 1, indicating there have been no discernible changes in stakeholder perspectives since then. A preference for the paper based NVD was the described. Data indicates there is some uptake of eNVDs but minimal uptake of the eNVD app. Eight stakeholders participated in the workshop. The workshop reidentified a knowledge gap in understanding traceability and NLIS and its importance for and impact on the individual producer, responsibility issues, resistance to change, and system difficulties.

The low compliance rate with accurate completion of the NVD may indicate a lack of or limited understanding of how to complete the form as required. However, it is more likely indicative of a lack of connection between NLIS, eID and NVD in some sectors of the red meat industry. Stakeholders may lack understanding of the purpose and importance of the NVD as a contributor to traceability and its role in protecting market access, biosecurity and food safety.

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Making Shared Responsibility for Biosecurity Workable

Professor Vaughan Higgins[1], Professor Melanie Bryant[1], Professor Marta Hernandez-Jover[2], Dr Russell Warman[1]
[1]University Of Tasmania, Hobart, Australia, [2]Charles Sturt University, Wagga Wagga, Australia

Biography:
Vaughan Higgins is a Professor of Sociology in the School of Social Sciences at the University of Tasmania. Informed by analytical approaches such as governmentality, actor network theory, and assemblage thinking, Vaughan's work is aimed at understanding how agri-food policy and programmes are implemented in practice across a range of regional and industry settings.

Abstract:
Shared responsibility is an increasingly significant policy direction for biosecurity in Australia. However, the sharing of responsibility among a diverse range of stakeholders has been challenging to achieve in practice. Most work to date has focused on the knowledge, practices, and governance mechanisms that could make shared responsibility more effective. In this presentation, we draw upon evidence collected from a three-year Australian Research Council-funded project involving interviews with 89 national, state, and regional biosecurity stakeholders to focus on how those involved in biosecurity policy development and implementation make the sharing of responsibility work currently despite the challenges. Through our data analysis, we argue that shared responsibility is made to work in three principal ways – regulated devolution: educational technologies to instill biosecurity requirements as part of landholders' everyday management practices; devolved regulation: mechanisms for achieving biosecurity compliance that are either developed by industry or are negotiated to align with industry needs; and, devolved cost-sharing: pragmatic approaches to sharing resources, particularly at state and regional scales. Our research has two important implications for Australia's shared responsibility approach to biosecurity. First, it is often assumed that the achievement of shared responsibility is hampered by a lack of conceptual or practical clarity among different stakeholders on roles and responsibilities, or on what shared responsibility means. We show that efforts to improve clarity and uniformity are likely to be counterproductive as stakeholders work with and work across multiple ways of 'doing' shared responsibility. It this diversity and flexibility that enables shared responsibility to be workable in practice. Second, what might at face value be interpreted as conflicting interpretations of or approaches to shared responsibility (e.g., compliance and devolution) intersect in different and sometimes unexpected ways to facilitate the building of relationships and trust that contribute to the sharing of responsibility. These intersections need to be better recognized and supported.

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Victoria's new Biosecurity Strategy

Dr Lauren Hull[1], Dr Paula Giraldo[1], Dr Louise Clery[1], Ms Bridie Walsh[1], Dr Katherine Clift[1], Natalie Myring[1], Michael Reid, Dr Julie Simons[1]
[1]Agriculture Victoria, Attwood, Australia

Abstract:
In 2023, the Victorian Government released a new Biosecurity Strategy. It outlines five goals and twenty actions to manage pests and diseases that impact what matters to Victorians, transforming the vision outlined in Victoria's 2022 Biosecurity Statement into tangible steps.

This session will be a series of related presentations sharing what we have learnt and exploring the road ahead, and also hearing feedback and ideas from others who are on a similar journey.

Victoria's Biosecurity Strategy was co-developed through multiple rounds of listening and testing with a wide range of people who play a role in biosecurity. Nearly 450 people contributed to the Strategy including Traditional Owners, farmers, industry bodies, supply chain businesses, community, emergency management and government.

It was very deliberately written as a whole-of-system strategy, not a Victorian Government strategy. The process recognises that in order to develop a collective strategic approach to biosecurity, we need to ensure that the people who have 'skin in the game' can clearly see their perspectives and concerns in the Strategy.

The underpinning premise of the strategy is that managing biosecurity is a collective action problem – and we need to 'work together' to reduce risks and impacts. It lays out the key actions we ALL need to take to achieve a stronger and more resilient biosecurity system.

This focus must now be sustained as we now move towards implementation of the Strategy. Challenges include maintaining a collective, co-governed approach; listening to all voices, including those that have historically been under-represented; working out the best ways to invest for real change in awareness and action; and establishing methods to monitor and measure our progress.

This session will dive into these challenges. It will feature:

- Victoria's collaborative, co-governed approach to Strategy development and implementation: This presentation will outline the journey to ensure the Biosecurity Strategy represented a range of voices and interests, and how co-governance groups will continue to work together as we implement the Strategy.
- Engagement and communication initiatives to 'make biosecurity everyone's business': This presentation will two initiatives underway to promote biosecurity, its importance, and actions that everyone can take to manage biosecurity risk and protect what we value most.
- Joint exercises to broaden and strengthen our preparedness for emergencies: This presentation will outline learnings and next steps in a program to build stronger partnerships ahead of emergencies.
- Emerging approaches to measuring the impact of collective biosecurity projects and actions: This presentation will outline work underway to manage the complexity of monitoring progress and change when multiple parties 'share responsibility' for managing biosecurity risk.

We see the discussion as the first step in establishing a group of interested participants who are all working on long term strategic change in biosecurity – and to this end, we propose to follow up this discussion with a webinar on biosecurity strategy and implementation, later in 2024.

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The Voice of Country: An Indigenous perspective on biosecurity

Kathleen Herbert[1], Mr Richard Swain
[1]Invasive Species Council, Katoomba, Australia

Biography:
Richard is a Wiradjuri man, Indigenous Ambassador for the Invasive Species Council, an Hon Associate Professor at Fenner School of Environment and Society, ANU College of Science, and an experienced river guide.

As an ambassador Richard helps raise the profile of the role Indigenous people have in caring for country, and protecting it from invasive species. He is the lead of the Voice of Country campaign which aims to engage and empower Indigenous voices in invasive species policy-making.

Richard was a founder of the influential Reclaim Kosci campaign, which fights to overturn legislation and policies that protect destructive feral horses.

Abstract:
Richard Swain is a Wiradjuri man, Hon Associate Professor at the Fenner School of Environment and Society, ANU, the Indigenous Ambassador for the Invasive Species Council, and a river guide in the Snowy Mountains. His work in campaigning and advocacy strives to amplify the voice of Country. Richard is a well respected public leader in conservation and the battle against invasive species. He is often called upon to speak from an Indigenous perspective on the protection of one of Australia's most precious natural areas - the Australian Alps. Richard's truth-telling and conversational presenting style offers a powerful and unique voice to the biosecurity policy conversation.

This oral presentation will focus on ensuring that Australia's land, rivers, wildlife and plants have a voice at the table on biosecurity policy. It will demonstrate, from an Indigenous perspective, the importance of biosecurity in protecting not only agricultural assets but native ecosystems. The presentation will emphasise the importance of having a holistic approach. One which recognises the threat to native species and therefore to the oldest continuous culture on earth.

We cannot care for Country and allow invasive species to take over at the same time. Many native species are culturally significant to First Nations people, for example, totems. A person's totem is their responsibility, and they have a cultural obligation to protect that totem. Country and Indigenous culture are inextricably linked, any threat to Country is a threat to the ability for Indigenous people to practise their culture. For example, the invasive and environmentally damaging buffel grass in Northern Australia has been described as "killing culture" by Indigenous communities. In the "Umuwa Statement" First Nations people of the desert describe a monoculture which prevents access to bushfoods, ability to teach culture and access to sacred places.

Australia has the worst record of mammal extinctions in the world and invasive species threaten to continue this sad trend. We must protect what remains from new threats. Biosecurity is the frontline tool in protecting Country and culture and it is essential that decision makers approach it as such. This is why we must have Indigenous voices in biosecurity policy making who can share knowledge on culturally significant species and practices being impacted.

Through this presentation Richard invites all Australians to step up to the shared responsibility as caretakers of the land. One of these responsibilities is robust biosecurity policies which prioritise the protection of native species alongside agriculture industries.

Biosecurity is Australia's opportunity to ensure that what's left is protected from new threats. However, without Indigenous voices at the table, decision-makers don't have the whole picture of what needs to be preserved in Australia. Precious species, knowledge and culture will be lost and all Australians will be worse off for it.

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Exploring Global Perspectives on Farm Biosecurity and the Future of Agriculture: Insights from Conversations with Producers Across the World

Dr Regan Lynch[1]
[1]R Lynch Veterinary Contracting, Alligator Creek, Australia

Biography:
Dr Regan Lynch is a mixed animal veterinarian and current Nuffield Australia Scholar. Sponsored by Animal Health Australia and Plant Health Australia, her research explores cultural and social attitudes towards biosecurity in the Northern Australian Beef Industry. With her experience working as a veterinarian in this region, she has developed a strong interest in biosecurity within production animal agriculture. Dr Lynch is also a member of the Northern Australian Biosecurity Surveillance (NABS) Net, has undertaken further training regarding Foot and Mouth outbreaks, and is the current Australian Veterinarian's Association Queensland Division President.

Abstract:
This presentation discusses the insights earned from international and domestic travels over a 12-month, where conversations with producers across various agricultural systems shed light on various issues, concerns, and future expectations for their industries. Spanning regions including the USA, Singapore, Northern Australia, Norway, and the Netherlands, this presentation reviews the perspectives garnered through informal discussions rather than formal survey methodologies.

Additionally, including viewpoints from international associates enriches the discourse, providing comparative analyses and highlighting global trends. Through this presentation, attendees will gain valuable insights into the diverse approaches to farm biosecurity and workplace culture, fostering a deeper understanding of agricultural communities worldwide's challenges and opportunities.

This report will be finalised in July 2024 for publication by Nuffield Australia.

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Exploring Biosecurity Attitudes and Cultural Shifts in the Northern Australian Beef Industry: Implications for Disease Management and Industry Resilience

Dr Regan Lynch[1]
[1]Nuffield Australia, Alligator Creek, Australia

Biography:
Dr Regan Lynch is a mixed animal veterinarian and current Nuffield Australia Scholar. Sponsored by Animal Health Australia and Plant Health Australia, her research explores cultural and social attitudes towards biosecurity in the Northern Australian Beef Industry. With her experience working as a veterinarian in this region, she developed a strong interest in biosecurity within production animal agriculture. Dr Lynch is also a member of the Northern Australian Biosecurity Surveillance (NABS) Net, has undertaken further training regarding Foot and Mouth outbreaks, and is the Australian Veterinarian's Association Queensland Division President.

Abstract:
A Nuffield Scholarship investigates the cultural and social attitudes towards biosecurity in the Northern Australian Beef Industry. Through a combination of interviews, surveys, and observational visits both domestically and internationally, this study aims to achieve several objectives.

Firstly, it seeks to assess the current attitudes towards biosecurity among ground-level workers in the industry, shedding light on their perceptions, practices, and awareness regarding biosecurity by defining biosecurity and its implications for their operation's day-to-day tasks and, more widely, how they fit into the bigger picture of Australia's biosecurity solutions.

Secondly, it aims to identify the cultural and social changes within agricultural industries following disease outbreaks of economic or social significance, focusing on their permanency and implications for industry resilience. By looking at disease outbreaks across various agricultural fields and internationally, a complete picture of how producers, communities, and industries respond will provide a better framework for resilience in the future.

Thirdly, it examines the impact of teamwork on the success of biosecurity reporting and identifies areas of concern among ground-level workers, clarifying the factors that facilitate effective communication and collaboration in disease management efforts.

Lastly, it explores the culture of change within the Northern Australian Beef Industry, identifying opportunities to influence this culture positively and foster a proactive approach to biosecurity practices.

At the time of abstract submission, this report has not been finalized.
By addressing these objectives, this study aims to contribute to developing strategies and interventions that enhance biosecurity resilience and sustainability within the Northern Australian Beef Industry and beyond.
This report will be finalized in July 2024 for publication by Nuffield Australia.

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Measuring safety and efficacy of fipronil in the control of Varroa mite during the 2022-23 NSW Varroa Mite Emergency Response

Mr Nathan Cutter[1], Dr Ken Nguyen
[1]NSW Department Of Primary Industries, Orange, Australia

Biography:
Nathan Cutter works as a Technical Specialist in the Biosecurity Branch of NSW Department of Primary Industries. He is principally involved in the fields of invasive species management with a focus on improving biosecurity through regulation and policy development.

Abstract:
Varroa mite (Varroa destructor) is an external parasite of the European honey bee (Apis Mellifera) and is generally regarded as the world's most devastating honey bee pest. Until 2022 Varroa mite was not present in Australia. However, with the incursion of Varroa mite in NSW, Australia, in June 2022, an Emergency Response was established and an Emergency Order (EO) was declared under the NSW Biosecurity Act 2015. Being an obligate parasite, Varroa mite depends entirely on the honey bee host to complete its life cycle, increase its population density, and expand its geographic range. Therefore, to achieve the eradication of Varroa mite from NSW, there was a requirement to remove of all European honey bees (including managed and feral beehives) within Emergency Eradication Zones (EEZs). During the eradication effort, specialised bait stations and fipronil insecticide was principally used in the control of feral honey bee hives within EEZs.

Alongside the Varroa Mite Emergency Response control work, a number of scientific studies were conducted to evaluate the efficacy and safety of the eradication effort including; measuring the efficacy of fipronil in reducing the population densities of feral honey bees, assessing the impact of residual fipronil on managed honey beehives that were re-introduced to former EEZs, and determining the concentration of fipronil within re-introduced hives.

Within the fipronil efficacy study, the population density of honey bee colonies was evaluated using pheromone attraction (drone-ballooning) of drone bees in areas where eradication had taken place. Evidence was collected indicating that fipronil use within the EEZ reduced the density of honey bee drones.

In the field fipronil safety studies, sixteen test bee hives were introduced to areas with varying levels of fipronil application history and those hives monitored for hive health and fipronil residues. Bee abundance across all hives increased from the time of introduction with no visible signs of immediate bee mortality or indications of disease at the time of introduction. We observed no difference in bee abundance between hives introduced to areas with and without fipronil use. Similarly, the amount of nectar foraged did not differ between hives in fipronil spiked and non-spiked areas, with a significant increase in nectar foraging in the first two weeks from introduction. We found no difference in honey stores among hives in both non-spiked and spiked areas, with a general increase in honey stores across all areas of the study. There was no difference in the amount of brood between hives introduced to non-spiked and spiked areas, with consistent brood amount throughout the study despite various negative impacts from environmental stresses.

Using a modified QuECHeRS method for determination by HPLC, we also found no detectable concentrations of fipronil within the test hives during the field fipronil safety study. We conclude that managed hives that are re-introduced to former EEZs showed no impacts from any residual fipronil in the environment. Further research is warranted to determine the impacts of Varroa mite and associated disease to managed hives that are introduced to varroa infested areas.

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Varroa Mite Response: The Importance of Public Information

Dr Shannon Mulholland[1], Ms Ellie McNamara[1]
[1]NSW Department of Primary Industries, Orange, Australia

Biography:
Ellie McNamara has extensive experience in public engagement and media and is currently the public information manager for the varroa mite program team. With previous experience communicating with industry during drought and biosecurity responses, Ellie brings expertise in designing communication strategies, presenting research on stakeholder groups and leading evidence-based approaches to communicating often complex technical information to the NSW community and agricultural industries. She has a background in journalism having worked for ABC radio and has consulted on various government advisory groups at both the state and national levels.

Abstract:
Varroa mite was first detected in the Port of Newcastle in June 2022, launching the Varroa mite Emergency Response.

The response quickly became the largest multi-agency biosecurity response in Australia's history, and sought to carefully manage biosecurity risk, protect the agricultural industry, and maintain business continuity.

The Public Information section of this response generally comprised of a PI manager, PI officer, two community engagement officers, a media officer, two resilience officers and call centre staff. The two resilience staff members were unique to this response, an innovation not used in emergency response before, one which proved to be very effective.

The Public Information team ran to a standard structure in many respects – relying on beekeeper contact information from registration data to direct email at the very least weekly, often more when needed, social media, traditional media and community events both face to face and online.

For the period of the eradication period of the response, PI undertook:

- Total call centre calls – 14947
- Resilience calls – 4283
- 300+ direct beekeeper emails
- 600+ media inquiries
- 250+ social media posts
- 100+ face to face public meetings, drop-in centres, and webinars.

PI also took care of daily talking points, web site content, Ministerial responsibilities, and campaign development.

The Response Resilience Officers played a vital role in beekeeper support, for both emotional wellbeing, and importantly in assisting beekeepers to undertake their reimbursement forms. The volume of calls doesn't even begin to capture the face-to-face interactions the officers undertook at community events, and the evolution to host drop in centres in areas with new detections was directly linked to this role, and proved to be very effective.

Drop in centres, either with a community meeting, are common in many emergency responses around natural disasters, and the learning of this response was that this face to face capacity should roll out from the beginning and be exponentially expanded in reaction to spread. The feedback encountered was that these opportunities for face-to-face reaction very quickly gave great confidence and understanding of the response activities, something that seemed more difficult to convey in written communication. That potentially relates to cultural elements in this cohort around age and digital access.

For commercial beekeepers, the webinar series run in conjunction with the Australian Honey Bee Industry Council in particular was highly successful – with over 600 attendees at each, and significant feedback pointing to feelings of reassurance and understanding.

One wicked problem faced in the response was several highly visible and connected social media groups and individuals who likened the response to the Covid response and who spread significant misinformation.

Our standard approach of reaching out to meet face to face with these individuals seemed to only inflame the scenario, and proactive attempts to myth bust their misinformation seemed mostly ineffective on social media. Briefings and good relations with traditional media partners mostly resulted in positive media coverage, but it also had little impact on some of the social media detractors.

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Enhancing biosecurity through inclusive stakeholder engagement: Lessons from White Spot Disease responses

Ms Melissa Walker[1], Ms Alex Murray
[1]Nsw Department Of Primary Industries, Taylors Beach, Australia

Biography:
Melissa Walker was Policy and Program Manager White Spot at the NSW Department of Primary Industries for 12 months following the aquatic disease response transitioning to a management program in July 2023. Melissa has over 15 years experience in Aquatic Biosecurity in NSW, a further 10 years in fisheries management and aquaculture, a background education and training in aquatic science, risk management, and public administration. Her experience leading the Aquatic Biosecurity Program in NSW was used to support the delivery of the White Spot Program and the development of future management recommendations for NSW.

Abstract:
The recent outbreaks of White Spot Disease (WSD) in prawn farms across New South Wales have underscored the critical need for robust and regular engagement of affected industry stakeholders alongside the implementation of swift biosecurity response actions. This paper examines the emergency response to these outbreaks as a case study in inclusive biosecurity responses, highlighting the integration of lessons learned from other biosecurity responses across aquatic industry sectors such as abalone and oysters. Through a detailed analysis of two after-action reviews and stakeholder engagement outcomes, we identify key strategies for enhancing emergency response effectiveness and success of Program Initiative outcomes through inclusive stakeholder collaboration. Our findings suggest that tangible outcomes in biosecurity response and stakeholder engagement can be significantly improved through inclusive practices that prioritise transparent communication, shared learning, and collaborative action planning, “inclusive stakeholder engagement”, during an emergency response. This paper proposes a framework for actively implementing lessons learned from previous outbreaks to better prepare for future biosecurity threats, focusing on emergency response coordination and the pivotal role of stakeholders in disease management and recovery processes.

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Piloting a new companion animal biosecurity surveillance model in remote Indigenous communities

Dr Bonny Cumming[1], Miss Nikita Puruntatameri[1]
[1]Animal Management in Rural and Remote Indigenous Communities, Darwin, Australia, [2]Tiwi Rangers, Winnellie, Australia

Biography:
Dr Bonny Cumming is a veterinarian and Program Manager (Strategic Delivery) for AMRRIC – a national not-for-profit organisation that coordinates veterinary and education programs in rural and remote Aboriginal and Torres Strait Islander communities. Throughout her career, Bonny has held various clinical and non-clinical roles within the veterinary sector. Her current role with AMRRIC is diverse and includes establishing and managing strategic partnerships and projects, monitoring and evaluation, managing the development of the AMRRIC App. Bonny has a keen interest in One Health principles; combining community development, veterinary services and environmental conservation to improve animal, human and ecosystem health.

Nikita Puruntatameri is a Munupi woman from the Tiwi Islands in the Northern Territory. She has been working as a Tiwi Ranger since 2022 and was the first female to work as a marine ranger on the Tiwi Islands. Nikita has a particular interest in biosecurity and has been leading the Tiwi Rangers' biosecurity activities, including undertaking animal health surveillance on the Tiwi Islands in partnership with AMRRIC.

Abstract:
Vast distances, seasonal access challenges, and constrained resources limit the availability of veterinary and animal health capacity within remote Indigenous communities, challenging the early detection of animal biosecurity concerns. Despite this, companion animals in remote communities are valued family members, protectors against physical and spiritual intruders, important hunting aids and often hold cultural significance. The health and management of companion animals is closely tied to the health and wellbeing of Community and Country. The outbreak of Ehrlichia canis, which devastated dog populations (and their owners) in many remote communities across Northern Australia, and the threat of incursions of exotic diseases such as Rabies, emphasize the urgent need for improved companion animal biosecurity surveillance.

Since 2021, with support from the Northern Australia Quarantine Strategy (NAQS) and funding from the Australian Government Indigenous Biosecurity Business Grants Program, AMRRIC, in collaboration with Aboriginal and Torres Strait Islander partner organisations in six remote regions across the Top End, have been piloting a new model of grass-roots companion animal surveillance. The model leverages NAQS' existing fee-for-service arrangements with Indigenous Rangers groups where applicable, but also invites other relevant animal health/management stakeholders (e.g. Animal Management Workers and/or Environmental Health Workers) to participate in capacity-building training while undertaking annual community-wide companion animal censuses within their region. Recognition of Indigenous Cultural and Intellectual Property has been prioritised in data sharing agreements and to avoid 'no survey without service', and instead provide tangible and immediate benefits that improve animal and public health outcomes in each location, local staff from partner community organisations are trained to administer project-funded, broad-spectrum animal anti-parasitic treatments alongside door-to-door animal health data capture activities. AMRRIC's veterinary and/or veterinary nurse staff are concurrently able to provide animal-welfare focused first aid treatments and general animal health advice. Where desired, AMRRIC and partner organisation staff also deliver biosecurity-focused educational activities to school and community groups, thus building general community knowledge around the importance of biosecurity and reporting unusual animal events, signs and behaviours. The project benefits existing visiting veterinary service arrangements, collating a 'desexing and other requests' list which can be used to prioritise patients during the next vet visit. In providing analysis of the animal health and population data, AMRRIC are also able to provide pro bono, tailored recommendations for local partner organisations to

improve their animal management practices. Now in it's final year, this 3 year pilot has to-date, generated over 70 employment and training opportunities for staff from partner Aboriginal and Torres Strait Islander Organisations in 15 remote Indigenous communities across Australia's northern coastline, while providing broad-spectrum anti-parasitic treatments to over 5000 animals.

In this presentation, Bonny from AMRRIC will outline the key lessons learned to-date while Nikita from the Tiwi Rangers will share her experience of being a participant of the project, strengthening her knowledge in animal health surveillance and helping to support the health of her communities.

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Unique partnership between Government and the South Australian pig industry to deliver mutual biosecurity benefits

Ms Chelsea Dossett[1], Dr Kirsty Richards[2,3], Cleopas Bamhare[1], Dr Emma Rooke[1], Dr Andrew Pointon[3], Dr Charley Macnamara[1]
[1]Department of Primary Industries and Regions South Australia, Glenside, Australia, [2]SunPork Group, Brisbane, Australia, [3]Pork SA, West Lakes, Australia

Biography:
Chelsea Dossett is a Biosecurity Officer with the Department of Primary Industries and Regions South Australia (PIRSA) as part of a co-funded initiative between PIRSA and Pork SA to strengthen on-farm biosecurity and emergency animal disease (EAD) preparedness. With farm-level preparedness a key focus, Chelsea has developed systems to assess and verify farm biosecurity and increase adoption of enhanced biosecurity practices to ensure the pig industry is well placed to support supply chain continuity and meet regulatory requirements in an EAD outbreak.

Abstract:
Working collaboratively with stakeholders on preparedness activities improves engagement, capability, and the outcomes of an emergency animal disease (EAD) response for both government and livestock industry stakeholders. Since 2021, the Department of Primary Industries and Regions South Australia (PIRSA) and Pork SA have collaborated in a transformational biosecurity project to advance preparedness of the pig industry to respond to an EAD outbreak.

The Pig Biosecurity Project is a unique initiative to strengthen EAD preparedness across the pig supply chain by delivering infrastructure, capabilities and tools to facilitate biosecurity practice-change, including support for uptake of enhanced on-farm biosecurity. When implemented before an EAD outbreak, enhanced biosecurity:

- reduces the likelihood of disease transmission
- assists state and national risk-based decision-making
- supports supply chain continuity to mitigate disruption and adverse animal welfare impacts associated with interruption to routine pig movements.

Unique components of the initiative include:

- joint supply chain planning to deliver industry-wide benefits
- dedicated resourcing and joint investment by government, producer body and major companies to deliver supply chain outcomes
- fortnightly executive level engagement between industry and government
- expansion and upgrades to safeguard high value genetics at SABOR artificial breeding centre, and the construction of transport and driver decontamination facilities at South Australia's (SA) two export-accredited pork abattoirs to minimise secondary disease transmission back to farms from abattoirs.

The Project commenced in response to the changing risk profile of African swine fever by its spread through Asia. It is part of a wider initiative targeting industry-level vulnerabilities identified by PIRSA and Pork SA, that have guided joint investment in biosecurity programs and infrastructure to mitigate transmission and adverse impacts of an EAD outbreak.

The on-farm component of the Project is funded by PIRSA and Pork SA through the South Australian Pig Industry Fund. This collaboration supports a dedicated Pig Biosecurity Officer within PIRSA Biosecurity to liaise with industry stakeholders and deliver targeted on-farm biosecurity outcomes. Strategic direction is guided by a steering committee chaired by the SA Chief Veterinary Officer (CVO) and includes senior industry and government representatives who meet fortnightly.

Key on-farm Project activities include:

- delivering a state-wide pig industry biosecurity survey to benchmark existing biosecurity practices and identify improvement opportunities
- improving producer preparedness to apply for movement permits in an EAD response
- supporting verification of enhanced biosecurity practices to provide assurances that underpin government risk assessment processes in an EAD response
- supporting biosecurity practice change through the delivery of tools and resources.

The PIRSA-Pork SA partnership is a model that can be applied to other sectors. The partnership allows government and industry to share the investment and responsibility for EAD preparedness and promotes collaboration to deliver a common goal. Capability of such operational relationships plays an important role in fostering communication, early disease detection, and the ability to respond effectively to an EAD outbreak to support business continuity and market access.

The authors gratefully acknowledge the contributions of former SA CVO Dr Mary Carr and the significant co-investment of SABOR Pty Ltd, Big River Pork and JBS Australia Pork Division.

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Amplifying Australia's Animal Antimicrobial Stewardship Efforts

Dr Kylie Hewson[1], Dr Jane Heller, Peter Coombe
[1]Csiro, Windaroo, Australia

Biography:
Dr Kylie Hewson is the Lead for Animal Health and Environment in the Minimising AMR Mission being coordinated through CSIRO in partnership with DAFF and DoHAC. She has held several leadership roles within the animal agriculture sector over the past 15 years, and was central to establishing cross-sector initiatives on antimicrobial stewardship. She continues this work in her current role with the AMR Mission, which is a One Health initiative aimed at accelerating activity against antimicrobial resistance.

Abstract:
Antimicrobial resistance (AMR) is a threat to animal health. Antimicrobials can minimise the impact of diseases which may not be able to be prevented or treated by other interventions, but not if the pathogens become resistant. Further, antimicrobial usage (AMU) and AMR are increasingly being discussed in the context of trade. This means AMR presents a growing productivity, profitability and biosecurity threat for Australian animal industries and a coordinated effort is needed across the animal health sector to deliver collective impact.

The Australian Veterinary Antimicrobial Stewardship Association, the AMR Vet Collective, and the Australian Animal Industries Antimicrobial Stewardship (AMS) RD&E strategy are independent organisations that provide support to various parts of the animal health sector in improving antimicrobial stewardship. These organisations were borne out of the need for government and industry stakeholders to work together on AMR, AMU and AMS. Currently, these initiatives rely on leveraging project or activity-based funding to undertake the valuable network creation, information sharing and coordination activities that are relied upon by the system. These current approaches to funding create significant challenges for long term sustainability, meaning we risk losing the progress that's been gained.

The Minimising AMR Mission (lead by CSIRO) is coordinating efforts to align and integrate the functions of these organisations under a single umbrella which is needed to pursue options for improving the sustainability of their efforts, and the resultant support to the animal health sector, in the long-term.

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Using behavioural insights to improve fire ant eradication efficacy

Mr Chris Hollingdrake[1]
[1]National Fire Ant Eradication Program, Berrinba, Australia

Biography:
Chris Hollingdrake currently leads the customer experience team in National Fire Ant Eradication Program. He has worked in public information functions on a range of biosecurity programs in Queensland and has worked in communication, marketing, and engagement roles in state and federal government departments, as well as in the private sector. Chris has a professional interest in social marketing and science communication.

Abstract:
The National Fire Ant Eradication Program (the Program) is undertaking a project to better understand human behaviours which are limiting the efficacy of the Program, and design the operational strategies guided by behavioural insights needed for successful eradication.
Using this behavioural research, the Program intends to adjust its service delivery approach across its operational, planning, policy, and communication teams to enhance customer experience, build community support and improve operational performance.
Recent social research shows that 92% of community and industry members support fire ant eradication and they are willing to help. However, the intensity of fire ant eradication treatment and ease through which fire ants can be spread by people, means even small pockets of reticence or resistance can undo the progress of the program.
The Program has partnered with the Queensland Department of Premier and Cabinet's Behavioural Economics and Research Team (BERT) to tackle these issues.

Key behavioural challenges
Phase 1 of the project is looking at gaining support from property owners to access 100% of properties in planned treatment areas. Historically, gaps in treatment related to property access limitations has impacted eradication treatment efficacy. Phase 1 is underway and is using a range of behavioural research and design approaches.

Method
1. Target behaviour workshop – An internal workshop to narrow the scope of the project to focus on 'Who needs to do what differently' to be successful.
2. Customer journey mapping interviews – Two-hour in-depth interviews with access refusers to understand their experiences, mindset, and motivations during the process.
3. Quantitative survey – A survey to quantify the motivational factors uncovered through the qualitative work across the available sample of property access refusers.
4. Co-design solutions ideation workshop – Working with property owner access refusers to develop intervention ideas across the end-to-end process.
5. Behavioural insights solutions testing - A randomised control trial to assess the efficacy of designed solution will be undertaken prior to implementation and scaling.

Phase 2 of the project will look at voluntary compliance with fire ant movement controls to mitigate the risk of fire ants spreading. Incomplete uptake of movement control measures by industry stakeholders is resulting in continued spread of fire ants through human-assisted movement. Phase 2 of the project is scheduled to commence following the completion of phase 1 and will incorporate learning during this phase.

The National Fire Ant Eradication Program is one of the largest and most complex eradication programs ever undertaken in Australia and the world. Community support and social licence is essential for fire ant eradication.

Behavioural science can provide opportunities for designing people-centric eradication service delivery approaches that are understood, appreciated, and supported, leading to long-term operational improvements.

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Introducing Pest READI: Regionally-Enabled Agroecological Decision Intelligence

Dr Hazel Parry[1], Pest READI Project Team
[1]CSIRO, Brisbane, Australia

Biography:
Dr Hazel Parry is a Senior Research Scientist in the Agroecology team at CSIRO with over 14 years of research experience in Australia on area-wide management of insect pests. For more about the CSIRO Agroecology Team and their research see https://research.csiro.au/agroecology/. Hazel is also on X (Twitter) @HazelScienceNut

Abstract:
The new Pest READI (Regionally Enabled Agroecological Decision Intelligence) Project aims to create healthy, abundant landscapes by transforming the way communities work together to manage plant pests. By integrating past, present and future knowledge into a digital platform that connects decision-making across landscapes, the key output from the Project will be tools for scenario-based decision support for Area-wide Integrated Pest Management.

In Australia, the use of agricultural pesticides insecticides, herbicides and fungicides has doubled since 1992, to over 50,000 tonnes per annum, costing growers around $3B. This is unsustainable, and we need to consider how growers will manage pests in an increasingly 'chemically-limited' future. The project will use social research and biophysical data in the development of a digital platform that maps pest risk along with preparedness, to indicate vulnerabilities within a region. The design of the platform will employ the concept of 'Digital Twins': dynamic digital representations of a physical system. Real-time data analytics, simulation and 'what-if' scenario generation will combine to enable valuable management decision-support.

We will use a process of 'Human Centered Design' alongside our research to engage with all sectors of the community, government, and industry in the co-development of the platform and associated applications. This will include building a Community of Practice for Area-wide Integrated Pest Management around the Project and digital tool development within the region. The platform will aim to provide solutions that require fewer pesticides and enable all sectors of the community, including Indigenous, to work together more effectively to suppress pests.

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Building biosecurity awareness and EAD preparedness in NSW high schools

Dr Nicole Schembri[1], Ms Ann-Louise Brockelsby[2], Ms Liz Watkinson[2], Ms Meg Dunford[2], Ms Sally Bannerman[3], Ms Samantha Jarrett[3], Ms Michelle Fifield[1], Dr Emily Doyle[1]
[1]NSW Department of Primary Industries, Orange, Australia, [2]Faster Horses Consulting, Ultimo, Australia, [3]NSW Department of Education, Darlinghurst, Australia

Biography:
Dr Nicole Schembri has a special interest in understanding the human influences of applied animal biosecurity and emergency animal disease (EAD) prevention and preparedness, having a completed a PhD in the field of social veterinary epidemiology. She has worked in the agricultural industry, servicing NSW producers and communities for over 15 years in roles at the University of Sydney, NSW Local Land Services and more recently at NSW DPI. Her current focus is on EAD preparedness and prevention, capacity building and behaviour change through engagement.

Abstract:
With increased emergency animal disease (EAD) detections and outbreaks in the Asia pacific and Australia's near neighbours, there is an ongoing and increasing risk of these EADs in livestock in Australia and NSW. Schools represent one of many key congregation points, which could act as a disease transmission pathway for EADs and zoonotic diseases into the broader community and a unique communication pathway for the broader community.

This study aimed to (1) improve understanding of current biosecurity awareness and implementation, and EAD preparedness in NSW high schools that keep livestock; and (2) based on research outcomes, develop, and pilot a resource toolkit to support biosecurity best practice in partnership with the NSW Department of Education (DoE) and NSW high schools.

This study implemented a multi-phased mixed methods approach, including: (1) a rapid evidence review of key online teacher resources to support animal biosecurity understanding and implementation; (2) semi-structured qualitative interviews, conducted from April to May 2023 with stakeholders, teachers who teach agriculture and other staff who interact with animals in high schools (N=30); (3) a co-design workshop with stakeholders and agriculture teachers (N=13) to identify research-based behaviour change solutions (4) focus group resource and communications testing of potential solutions; and (5) in-school resource pilot and evaluation from October 2023 to April 2024. Thematic qualitative analyses were used for the rapid evidence review, interview, and focus group data. The project will conclude in April with the in-school resource pilot review and evaluation.

The rapid evidence review highlighted a weakness in the quality and accessibility of essential information to support biosecurity best-practice in a school environment. Interview participants understood the importance of biosecurity and associated potential threats. However, their assessment of risk and their perceived ability to minimise it within the constraints of their school environment, had a direct impact on their biosecurity implementation and EAD preparedness. Moreover, the low level of support at the school and DoE level, poor resourcing, competing priorities, and compliance requirements meant there was little time for proactive planning or implementation of greater school biosecurity measures and plans. The co-design workshop focused on addressing 3 key research themes: (1) PREVENTION: Biosecurity best practice; (2) AWARENESS: EAD identification through surveillance; and (3) RESPONSE: Animal disease reporting. Workshop outputs including in-school signage, EAD-specific guides, reporting checklist and decision flow chart were tested among 14 agriculture teachers and refined with their input and feedback. The toolkit was piloted in 5 schools across NSW for 2 terms. Initial feedback was positive, resulting in increased student engagement and discussion on biosecurity. The outcomes and next steps will be reported following completion of the evaluation in April 2024.

Competing priorities in the school environment may have a direct impact on their ability to implement best biosecurity practice, prevent and respond to a biosecurity event. Providing resources to schools, as for this

project, may present a low-cost high impact approach to raise Biosecurity standards in schools and lift broader community awareness of Biosecurity principles and value in protecting our way of life.

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Ehrlichia canis awareness and engagement in Indigenous communities in regional NSW

Dr Nicole Schembri[1], Ms Cecily Moore[1], Dr Ann-Margret Withers[2], Ms Emma Davidson[2], Professor Marta Hernandez-Jover[3], Lynne Hayes[3], Dr Emily Doyle[1]
[1]NSW Department of Primary Industries, Orange, Australia, [2]RSPCA NSW, Yagoona, Australia, [3]Charles Sturt University, Wagga Wagga, Australia

Biography:
Dr Nicole Schembri has a special interest in understanding the human influences of applied animal biosecurity and emergency animal disease (EAD) prevention and preparedness, having a completed a PhD in the field of social veterinary epidemiology. She has worked in the agricultural industry, servicing NSW producers and communities for over 15 years in roles at the University of Sydney, NSW Local Land Services and more recently at NSW DPI. Her current focus is on EAD preparedness and prevention, capacity building and behaviour change through engagement.

Abstract:
Canine ehrlichiosis is a serious and often fatal bacterial infection of dogs caused by Ehrlichia canis (E. canis). E. canis is transmitted primarily by the brown dog tick (Rhipicephalus sanguineus).

While the brown dog tick is known to occur in northern areas of New South Wales, no E. canis infections in dogs have originated in NSW to date. However, human-assisted movement of dogs from E. canis endemic areas has been shown to accelerate spread of the disease and represents a biosecurity risk for NSW. Movement of people and dogs from Northern areas of Australia through primarily Indigenous communities in the West of the state has been identified as a risk factor for spread of E. canis into NSW. These communities also have less access to veterinary care when compared to the eastern part of the state. Connections with local veterinary care providers are key to providing education, prevention, treatment, and notification of cases of E. canis. NSW Department of Primary Industries partnered with the RSPCA NSW Outreach and Education Team who are embedded in the Indigenous Community Companion Animal Health Program (ICCAHP) and Charles Sturt University for this Commonwealth funded initiative.

This project aims to (1) understand the level of E. canis awareness, impact and preventive action in communities in Western NSW with high proportions of Indigenous residents to better qualify the need for ongoing engagement; (2) improve connections with veterinary providers in Indigenous communities in Western NSW; and (3) provide community members with long-acting tick prevention to prevent E. canis infection in dogs within the communities.

The NSW RSPCA has held “Healthy Pet Days” in remote Indigenous communities with the ICCAHP since 2006 in conjunction with local aboriginal land councils, municipal councils, local human service agencies and the community. Veterinary staff provide health checks, vaccinations, and preventative products to pet owners, discuss canine Ehrlichiosis, and distribute information on E. canis prevention. Healthy pet days are conducted in conjunction with local veterinary providers where they exist in the area, offering a free desexing service for community members. This project included an in-person, short, structured quantitative survey to assess the effectiveness of current E. canis engagement, awareness, access to veterinary services and attitudes to and implementation of tick prevention (HREC-H24950). In addition, an animal health survey was conducted for all dogs treated at the project Healthy Pet Days. Both activities were managed by known and trusted members of the RSPCA NSW Outreach and Education Team with all information deidentified for analysis.

With the Healthy Pet Days concluding in April 2024, the outcomes of our engagement, lessons learned and recommendations for continuing timely and targeted support will be presented.

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Biosecurity mates: Raising the profile of biosecurity though community champions

Mr Craig Magnussen, Whitney Smith[1]
[1]Biosecurity Queensland, Department Of Agriculture And Fisheries, Brisbane, Australia

Biography:
Whitney Smith is the Manager of Partnerships and Engagement (Projects), at Biosecurity Queensland, Department of Agriculture and Fisheries and leads critical initiatives including enhancing preparedness capabilities and the new Safeguarding Queensland program. A proactive member of the NBCEN Behavioural Insights sub-group, Whitney leverages behavioural research to advance biosecurity engagement and strategies. With a Bachelor of Business (Management) and a Graduate Certificate in Business (Public Sector Management), Whitney is a highly experienced project manager and stakeholder engagement professional, known for her leadership in coordinating significant projects within various government sectors, including biosecurity, international education, training, and health.

Abstract:
Raising the profile of biosecurity with diverse audiences to increase awareness and improve uptake of positive behaviours is challenging. To help meet this challenge, Biosecurity Queensland has recently appointed six biosecurity ambassadors. The Queensland Biosecurity Mates Ambassadors have been appointed as champions to help raise the profile of biosecurity and strengthen Queensland's collective biosecurity system.

The ambassadors are emerging industry leaders and experts across a range of sectors and will work to advocate for, and engage the community in, biosecurity awareness and preparedness.

In this session, Biosecurity Queensland will provide a brief overview of learnings around establishing an ambassador program followed by insights from one of the state’s appointed ambassadors.

The Biosecurity Queensland Mates ambassador will share their story including insights into why they wanted to become an ambassador, the importance of biosecurity to them and what they hope to achieve in the role as a biosecurity champion.

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Flying under the radar: Southeast Asian bats and the Australian oddities market

Dr Katie Hail-Jares[1], Dr Margo van Felius[1]
[1]Griffith University, Mt Gravatt, Australia

Biography:
Dr Katie Hail-Jares is a lecturer within the School of Criminology and Criminal Justice at Griffith University. Her work primarily focuses on how criminalising behaviour impacts the health of people and their communities.

Dr Margo van Felius is a Lecturer in Transnational Organised and Financial Crime in the Academy of Excellence in Financial Crime Investigation and the School of Criminology and Criminal Justice (CCJ). She is a former Queensland Police Service Detective (working in child protection, organised crime, and economic crime) who researches the role of third parties in preventing and controlling crime and social issues. Margo has a special interest in organised crime, transnational crime convergence, wildlife crime and money flows.

Abstract:
Wildlife trafficking, or the illegal sale and importation of animals and/or their bodies, poses conservation and biosecurity challenges for Australia. While many anti-trafficking campaigns have focused on charismatic megafauna, such as tigers, African elephants, and sea turtles, far smaller creatures are also a fixture of the illegal wildlife trade, including Southeast Asian bats.

Southeast Asian bats are a popular item for sale within the oddities markets, or the sale of fixed (e.g. taxidermied), skeletal, or wet specimens. Oddities are a booming business in Australia—the largest Australian oddities sale group has over 12,000 members—and the importation of bats for this market is especially concerning. Given their cultural association with darkness, bats are a popular item within the oddities market. Additionally, bats are often sold cheaply; sales listings on eBay suggest that the median price for a framed bat was $58.15 AUD. However, the price and popularity of bats within the oddities market obscures the role of wildlife trafficking in procuring these specimens. Bats are impossible to farm, and therefore their collection is almost always achieved by large-scale mist netting of wild population. Bats are then freeze-dried, rather than taxidermied, and fixed into frames or domes. This process does not remove tissue or tan the hides, meaning the carcasses pose a significant biosecurity risk and continues to allow for the transmission of zoonotic diseases.

Yet despite these biosecurity threats, Southeast Asian bats continue to be imported to Australia. In this presentation, we will further introduce the case study of Southeast Asian bats and the Australian oddities market. We will summarise what is known about the impact of the oddities market on both international and domestic bat populations, map the possible importation routes that such specimens may take, and share examples of how such specimens are marketed within Australia. We will also introduce participants to the oddities community's response to bat trafficking. Finally, we will roll out a new three-pronged project that seeks to better explore the roles of Australian biosecurity authorities, oddities sellers, and oddities buyers in this market. Attendees will be invited to participate in the next stages of the study and provide feedback on this initial proposal.

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How indigenous inclusion leads to better relationships and improved biosecurity outcomes

Mr Carlton Bidois[1], Mr Hayden Henry[1], Mrs Matire Duncan[1], Mr Riki Nelson[1], Dr Beccy Ganley[1]
[1]TMBC - Tauranga Moana Biosecurity Capital, Tauranga Moana,, New Zealand

Biography:
Carlton Bidois has been a key driver of engaging with iwi on environmental matters in Tauranga Moana, acknowledging their role as kaitiaki. He has worked with numerous organisations and government agencies to ensure engagement with iwi occurs across private and public sector interests. He is the environmental representative to several iwi including Ngāti Ranginui and Pirirākau hapū. During the Rena disaster in 2011, he ensured the iwi were involved with the marine emergency response. He has been Co-Chair since inception of Tauranga Moana Biosecurity Capital, a community-led initiative promoting biosecurity best practice in New Zealand.

Riki Nelson, Ngati Te Wai, is an indigenous environmental champion who is passionate about minimising the impacts of biosecurity threats to his rohe (tribal lands). Interfacing management and research, Riki has been integrally involved in using and training kaitiaki to use GIS and modern methods in in conjunction with mātauranga (Māori knowledge) to monitor forests within his rohe. He has worked with numerous organisations and government agencies around protection of our native kauri and myrtles from the diseases kauri dieback and myrtle rust. Riki is a member of Tauranga Moana Biosecurity Capital Māori caucus, a community-led initiative promoting biosecurity best practice in New Zealand.

Abstract:
Current biosecurity systems and processes worldwide often have minimal inclusion of indigenous peoples, knowledge, concepts, and values yet indigenous people are often most effected by marine or land-based biosecurity pests that impact native species that they may rely on for sustenance, cultural or spiritual purposes. Similarly, indigenous people hold traditional knowledge based on intimate and long-term interaction with their environment that can lead to improved responses to biosecurity threats, often minimising the effects on indigenous communities and native flora and fauna.

In Tauranga Moana region of Aotearoa New Zealand a community-led biosecurity network called Tauranga Moana Biosecurity Capital (TMBC) was established in 2018 to create awareness and build collaboration around biosecurity problems. Central to TMBC is the partnership with local Māori through the formation of a Māori caucus to ensure Māori voice, values and protocols are part of responses and discussions concerning biosecurity. In addition to the Māori caucus, TMBC's leadership includes community organisations, industry, businesses, science experts, central government and local government representation.

We discuss how TMBC's model of indigenous inclusion has led to improved biosecurity outcomes for Tauranga Moana, providing specific examples around responses to myrtle rust and Asian paddle crabs that have impacted local ecosystems and pose a significant threat to the cultural, environmental and economic wellbeing of the region. We also discuss how it has led to improved relationships and better inclusion of Māori in biosecurity at a national level.

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Collaboration: adopting a think tank engagement model is key to a strong and robust national fruit fly management system

Mr Stuart Burgess[1], Ms Sarah Corcoran, Mr John Webster, Dr Lucy Tran-Nguyen
[1]Plant Health Australia, Deakin, Australia

Biography:
Stuart Burgess has professional expertise in industry leadership in trade and biosecurity related programs with wide ranging experience in whole of industry leadership, management, and development at national, state and business levels, across a broad spectrum of government, industry and commercial sectors.
He is highly experienced, having been the CEO of Fruit Growers Tasmania and Fund Manager and Industry Services Manager at Hort Innovation for many years. Stuart has a rich understanding of biosecurity particularly as it relates to trade and bilateral trade operations and a strong and long-term connection to the Australian horticultural and agricultural sectors.

Abstract:
Background:
Australia has a plant production system worth $25 billion annually and a unique environment to protect. The system not only supports the livelihoods and investments of individual producers, it also protects consumers in domestic and export markets, by maintaining the integrity, quality and sustainability of Australia's food supply.

Australia's National Plant Biosecurity Strategy (2021-31) provides a blueprint for effective collaboration and action by all participants, leading to a resilient and contemporary system that supports our plant industries, economy, environment, and communities.

In Australia's national context, collaboration plays a critical role in ensuring our biosecurity systems are robust, consistent and provide assurance to both external and internal stakeholders. The fruit fly system is no exception.

Methods:
The National Fruit Fly Strategy (NFFS) provides a framework to ensure we effectively manage fruit flies in Australia. Gaining and maintaining access to premium markets for Australia's horticultural products relies on cooperation at all levels of government, and between industry bodies, research institutions, regional groups, growers and the community in general.

The complex process of national coordination of fruit fly management is delivered through the broad strategic framework for plant biosecurity, with an overarching Intergovernmental Agreement on Biosecurity (IGAB). The NFFS 2020-25 stems from this agreement, with oversight for its implementation led by the National Fruit Fly Council (NFFC). The NFFC provides strategic advice and leadership on fruit fly policy and RD&E more broadly.

The NFFS has a simple vision; 'Ensure Australia has a robust fruit fly management system that supports growth in horticultural production, market access and trade'. This vision is delivered through eight key priorities including market access; management of established fruit fly; prevention, preparedness and response; research; surveillance; diagnostics; communication and engagement; and cooperation. A key focus of the Council is further development of cooperation across the national system and the establishment of sustainable funding streams to deliver contemporary solutions into the future.

In the lead up to the 2023 NFF Symposium, the NFFC chose to adopt a tailored think tank engagement model to enhance the effectiveness of our collaborative efforts. This model incorporated a series of strategic conversations initiated through webinars which were presented by thought leaders in respective fields. The outcomes informed the detailed strategic deep dive sessions at the Symposium, with expert panels further enabling the development of the collective view of national priorities for future investment.

Results:
Increased collaboration across all facets of the national fruit fly ecosystem has enabled strengthened partnerships and enhanced two-way communication with deep engagement ensuring we achieve our vision of growth in market access and trade. This has been significantly improved through the recent adoption of the think tank engagement model in the lead up to the NFFS. This, coupled with a long-term sustainable funding stream will contribute significantly to future proof the system.

Conclusion:
A strong and robust national fruit fly management system ultimately relies on a clear and coherent strategy that is delivered through a range of industry, government, research and community settings that are intimately connected and adequately resourced.

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Strengthening Australia's biosecurity - National feral pig coordination is reaping benefits

Dr Heather Channon[1], Dr Narelle Dybing[1]
[1]Australian Pork Limited- National Feral Pig Action Plan, Canberra, Australia

Biography:
Dr. Heather Channon is Australia's first National Feral Pig Management Coordinator. In her role, Heather is responsible for the implementation of the National Feral Pig Action Plan 2021-2031. Prior to her appointment as National Feral Pig Management Coordinator in March 2020, Dr. Channon was General Manager, Research & Innovation at Australian Pork Limited. She has had extensive experience in initiating, leading and conducting research, development and extension programs that aimed to benefit the Australian pork and lamb industries.

Abstract:
The impacts and risks from feral pigs to Australia's unique environment, biosecurity, agricultural industries, cultural and social assets are a matter of national significance and require long term collective and coordinated action to overcome. The National Feral Pig Management Coordinator (NFPMC) Program, funded by the Commonwealth Department of Agriculture, Fisheries and Forestry and managed by Australian Pork Limited, was initiated in January 2020 to address these threats.

The National Feral Pig Action Plan 2021-2031 (the Plan), endorsed by the National Biosecurity Committee in October 2021, has been a major deliverable of the NFPMC Program. The Plan is the first national coordinated plan to proactively and strategically address the widespread impacts that feral pig populations pose, including the transmission of many exotic, endemic and zoonotic diseases by feral pigs to livestock, wildlife, plants and humans. Across Australia, understanding of the role of feral pigs in disease transmission remains challenging, reflecting the variability of feral pig populations in response to climatic conditions and inconsistencies of land managers in applying integrated best practice feral pig management. Economic impacts resulting from an exotic animal disease outbreak are considerable, with costs of $80 billion over 10 years estimated for a multi-state incursion of Foot and mouth disease (FMD) to the Australian economy, whilst a large-scale African swine fever (ASF) outbreak could cost the Australian pork industry more than $2 billion.

Community engagement and coordination is key to suppressing feral pig impacts and their populations. Communication and engagement activities initiated through the NFPMC program are strongly focused on bringing land managers together on a nil tenure basis to deliver private and public benefits from their feral pig management programs, building awareness, sharing knowledge and supporting one another.

Supported by the NFPMC program's initiatives, Australia's environmental biosecurity is being strengthened by bringing diverse skills and expertise of governments, researchers, industry, Indigenous Rangers, service providers and on-ground technical specialists together to fill crucial feral pig-related knowledge gaps and better inform disease preparedness activities. Communication activities led by the NFPMC program to support the Plan's implementation, including online stakeholder forums, national conference, fact sheets and newsletters, aim to broaden stakeholder awareness of outcomes from feral pig biosecurity-focussed projects, new initiatives, and understanding of disease transmission risks.

There are many examples where the role of the National Feral Pig Management Coordinator has acted as a conduit to connect different people and organisations together to support responses to disease threats, simulation exercises and/or improve the robustness of epidemiological and biophysical models. Excitingly, the National Feral Pig Management Coordinator is now collaborating with the USDA's Animal and Plant Health Inspection Services' National Feral Swine Management Program to support preparedness and response planning for a possible incursion of an emergency animal disease, and to share methodologies to enhance feral pig management and impact monitoring.

This presentation will expand on the engagement activities of the NFPMC program, solutions being delivered, and the value that the Program is adding to on-ground management and RD&E programs to mitigate biosecurity risks from feral pigs.

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One Biosecurity program –demonstrating the value of innovative industry and government partnerships in South Australia

Mr Andrew Ewers[2], Cleopas Bamhare
[1]PIRSA, Glenside, SA, Australia

Biography:
Andrew Ewers is Field Operations Manager for the One Biosecurity Program. Since graduating in 1986 (BAgSc.), he has worked in a diverse range of agricultural fields including agribusiness, research, extension and compliance. Andrew has promoted biosecurity as a key component of livestock production in South Australia for over 25 years. Initially, this was through endemic disease control programs, but in the past six years Andrew has enjoyed being part of the One Biosecurity team, promoting biosecurity as the basis for livestock health, production, market access and exotic disease preparedness.

Abstract:
Biosecurity should form the foundation of all animal health management programs. South Australia's online 'One Biosecurity' program is an innovative approach to strengthening the biosecurity capability of production animal industries within the state. It is a model for other jurisdictions, turning state and national policies into practical programs. It complements government's disease surveillance and analysis capabilities, which is vital in maintaining the State's favourable animal health status and on-going market access.

'One Biosecurity' was launched by the Department of Primary Industries and Regions in partnership with industry as a voluntary program for the red meat industry in 2018. It now has over 930 registered enterprises and six years of data. Program membership represents approximately 20% of sheep and cattle production and 7% of property identification code (PIC) registrations in South Australia.

The program seeks to benefit producers by benchmarking enterprise level-farm practices against industry standards through a series of biosecurity and endemic disease questionnaires. The online plans are easy to audit and share with other parties. The program serves to strengthen the biosecurity capability of producers and enables them to promote their strong biosecurity when selling livestock.

As an online program, 'One Biosecurity' enables producer to producer interaction and the involvement of livestock agents if required. It also provides an unprecedented two-way system of communication between producers and government services. This enables ongoing and meaningful contact with a higher number of producers than traditional methods of engagement. Secure, digital, online data allows for easier access and analysis, in contrast to written biosecurity plans. This not only promotes transparency but allows for evidence-based policy decisions. Gaps in farm biosecurity practices can be identified enabling government to provide training and areas of extension to be focussed.

The endemic disease risk ratings feature of the program fosters an alertness for disease detection, making producers more aware of endemic and exotic diseases and better placed to recognise threats and seek assistance. Producers regularly monitor their livestock and thus offer the best opportunity for early disease detection, a founding pillar of biosecurity.

The 'One Biosecurity' online approach is unique to South Australia and promotes transparency, improves the credibility of the biosecurity system for international scrutiny and facilitates risk-based decision making. Future improvements and added features are planned to enhance the capabilities of the 'One Biosecurity' application. This includes additional livestock species, interactive tools for self-assessment feedback and provisions for third party audit. The proposed developments will reinforce the power of the 'One Biosecurity' online application to support the future success and prosperity of livestock industries in South Australia.

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Valuing ACIAR's contribution to biosecurity in Australia and overseas: A case study from mango crops

Dr Tracey Hollings[1], Dr Edith Arndt[1,2], Dr. Anca Hanea[1,2], Dr Lu-Yi Wang[1,2], Christine Li[1,2], Vito Avakumovic[1,2]
[1]Centre of Excellence for Biosecurity Risk Analysis (CEBRA), University Of Melbourne, Melbourne, Australia,
[2]Centre for Environmental and Economic Research, University of Melbourne, Melbourne, Australia

Biography:
Dr Tracey Hollings is a Senior Research Fellow at the Centre of Excellence for Biosecurity Risk Analysis (CEBRA) within the University of Melbourne. She has a PhD in zoology from the University of Tasmania and has held research positions at the Arthur Rylah Institute for Environmental Research and the New Zealand Ministry for Primary Industries. She has a background in ecological modelling, working across various projects in wildlife conservation and biosecurity.

Abstract:
Introduction
Australian Centre for International Agricultural Research (ACIAR) invests heavily in biosecurity-related research both in Australia and overseas, to improve the resilience, productivity and sustainability of food and agriculture. ACIAR funded collaborative partnerships between Australian researchers and partner countries build capacity and improve livelihoods, significantly contributing to Australia's aid and development program. Benefits of investment in these research projects and return on investment can be difficult to attribute to particular funding, in part due to the dynamic nature of biological systems, and quantifying avoided losses, particularly when those benefits can extend over greater temporal and spatial scales than the initial project. ACIAR requires a robust impact assessment methodology that can be applied retrospectively to their portfolio of biosecurity related projects to quantify the benefits of investment in meeting their objectives. The Centre of Excellence for Biosecurity Risk Analysis (CEBRA) has previously developed a new framework to look at the long-term impact of ACIAR's biosecurity research activities. This framework is currently undergoing refinement to deliver a consistent and systematic approach across five different biosecurity streams. Our initial case study used this framework to assess the impacts attributed to ACIAR investment on mango crops in the Philippines and Australia, where integrated pest management (IPM) and supply chain management (SCM) changes aimed to improve fruit yield and quality pre- and post-harvest, thereby improving farmer incomes and livelihoods.

Methods
Two major ACIAR funded projects, and projects with peripheral links, were used to evaluate social, environmental and economic benefits of ACIAR investment. A Theory of Change (ToC), similar to a logic model, is a diagram that describes how project activities and inputs are linked with outcomes and impacts. A separate ToC was developed for the Philippines and Australia and used as the basis for the impact assessment. Cost-benefit analysis and bio-economic modelling were conducted, considering spatial, temporal, and dynamic characteristics to measure changes in farmer incomes, fruit yield, pest damages, production costs, along with social and environmental impacts, relative to what would have occurred in the absence of ACIAR investment.

Results and discussion
Implementing IPM strategies significantly improved small holder outcomes on every farm relative to current practice, arising from both higher yields and incomes, and reduced production costs. Use of pesticides was also significantly reduced, increasing the health benefits to farmers, increasing natural biological control agents, and reducing the chemical load in the environment. In the Philippines, formation of farmer clusters aided in the dissemination of information, increasing adoption rates across the region. Assessment of quality lost through the supply chain identified areas where damage occurs and could be improved, in turn increasing the supply of export quality mangoes which command a substantially higher price. ACIAR impacts from this project are wide-ranging and long-term, particularly in the Philippines, with farmers demonstrating their ability to better manage adverse years, and flow on effects of higher incomes to improved community livelihoods, food security, and gender equity. Evaluating ACIAR research investment will direct and shape future investment opportunities.

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Using partnerships to eradicate fire ants

Mr Mick Jeffery[1]
[1]Biosecurity Queensland, Brisbane, Australia

Biography:
Mick Jeffery currently leads the Fire Ant Suppression Taskforce. He has worked in invasive species and natural resource management in Australia and overseas for almost 40 years, including crazy ant management on Christmas Island, leading national weed eradication programs in north Queensland, and setting up biosecurity partnerships with indigenous stakeholders in the Torres Strait. Mick has a Masters in Community Development and is passionate about empowering stakeholders to find practical and sustainable solutions to pest and weed management.

Abstract:
The evolution of self-management of red imported fire ants (fire ants) by landowners and managers represents the single biggest development in the eradication strategy for fire ants since they were first detected in Queensland in 2001. A recent independent review of current eradication efforts found that for it to be successful more is needed to be done. Self-management represents a significant transformation in the holistic approach to eradicate fire ants from Australia by 2032.
By including the broad community, from homeowners and businesses to all levels of government and industry, represents a unique approach to invasive species eradication. That is why the tools and systems developed by the National Fire Ant Eradication Program to enlist the support and involvement of the community and stakeholders in a biosecurity eradication program, creates an opportunity to extend stakeholder collaboration to other biosecurity responses. The ability to rapidly mobilise large parts of the community, either in specific areas or at specific times, will be a game changer for future biosecurity events.
Partnerships are key
The Fire Ant Suppression Taskforce (FAST) is a team that has been created to onboard stakeholder partnerships in the treatment of fire ants on land they own or manage, while awaiting eradication treatment. To do this, the FAST has implemented the concept of a General Biosecurity Obligation (GBO) with all members of the community in alignment with the Biosecurity Act 2014, which translates into the genuine sharing of responsibilities. Communicating our interdependency and listening to stakeholder priorities is key in defining the shared value for collaborators in the management of fire ants.
Sustainable partnership collaborations are essential for the FAST, and cultivating robust relationships, especially with stakeholders in complex environments (multi-tenure, multi-responsibility operational etc.) is crucial to our success. By creating collaborative models for fire ant self-treatment and surveillance using communication, engagement, and behavioural science methodology, has enabled FAST to engage and onboard multiple stakeholders simultaneously.
Self-management models

The FAST is building partner self-management capabilities by:
- Partnerships: mobilising all levels of government (local, state and federal) to treat fire ants on land they control.
- Assistance: providing large landowners with bait, equipment, treatment-design, and staff training.
- Community-led: increasing community treatment of fire ants through self-management initiatives i.e. registering for free fire ant treatment kits to treat their properties.
- Rapid response: developing new self-management responsive treatment options.

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Working together to help return Country to Country.

Mrs Heidi Kleinert[1], Mr Tim Bloomfield[1], Mr Neil Devanny[1], Mr Brad Spear[1], Ms Jasmine Sinclair[2]
[1]Victorian Rabbit Action Network, Attwood, Australia, [2]Biik Environmental, Alexandra , Australia

Biography:
Heidi Kleinert is a specialist in engaging people in coordinated, effective and sustainable land and water management programs. Heidi has worked with the Victoria Rabbit Action Network for almost 10 years and is also the Director of her own NRM consulting firm.

Heidi has worked across several agencies including for non-profit groups, local and state government working on land and environmental water projects, in particular Ramsar Wetlands.

Her interests lie in working with stakeholders to navigate the system and connect them with the government to talk about partnerships as well as land and water management issues and opportunities.

Abstract:
How do you care for Country when introduced pest species continue to destroy what you are trying to achieve? How do you heal Country when it needs to repair again, to be representative of Country? Who can you go to for advice on pest animal control, if there are limited people in your community or workplace who have the knowledge?

The Victorian Rabbit Action Network (VRAN) has co-designed with the Taungurung Land and Water Council (TLaWC), the Leadership in Rabbit Control Course with the aim for Traditional Owners to become local 'go to' people on rabbit management. The course was designed in collaboration with Biik Environmental, an enterprise established by TLaWC, to boost their knowledge of best practices in implementing effective rabbit control.

The Biik Environmental team provides Cultural and Natural Resource Management services right across Taungurung traditional Country. Cultural land management is the essence of Biik's approach to its work, with Country and culture being at the heart of everything they do.

A twelve-month program was implemented on Taungurung Country to share and exchange knowledge and experience of rabbit management with an emphasis on how this important work can help return Country to Country. It was facilitated by a team of VRAN Mentors, recognised rabbit management experts and go to people in the community, government and private sectors.

To provide ongoing support, confidence and motivation, peer support sessions were also facilitated. The peer support sessions created a space for ongoing learning opportunities through the sharing of perspectives and challenges and providing a deeper understanding of how complex rabbit management can be.

The program has been able to connect the Biik team with local Landcare groups and community organisations who are also working on Taungurung Country, highlighting the importance of relationships, collaboration and custodianship to protect cultural, ecological, agricultural and community assets.

Evaluations of the course and peer support sessions have shown increased confidence in best-practice rabbit control, improved relationships across different parts of the rabbit management system and changed mindsets about how Traditional Owner groups, community groups and institutions can work better together for a shared goal.

This presentation will introduce the VRAN – Biik Environmental initiative's guiding principles and discuss how these local leaders are becoming the 'go to' people to grow a biosecurity to biodiversity movement across Victoria.

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When neighbours become good friends: Discrepancies and overlap in Australian state-based regulation of invasive plants

Mr Jacob Maher[1]
[1]University Of Adelaide, Adelaide, Australia

Biography:
Jacob Maher is a PhD candidate at the University of Adelaide and a member of the Invasion Science & Wildlife Ecology lab led by Phill Cassey. A key area of focus of the lab is the trade of animals and plants online and the implications for conservation and biosecurity. Jacob researchers the trade of invasive plants online and is assessing the emergence of new invasive species. His research also extends to evaluation of current biosecurity regulations and socio-cultural perceptions of weeds.

Abstract:
Effective regulation is essential for preventing the establishment of new invasive plants and managing the environmental, social, and economic impacts of those already established. Invasive plants are regulated by jurisdictions at a variety of regional, national, and international levels. Enhanced coordination of data, policy, and regulations has been identified as a key strategy for addressing the impacts of invasive species; however, coordination between jurisdictions levels, and even across levels, is not always considered. To review regulatory coordination in Australia, we compiled a comprehensive dataset of declared weeds in each Australian State and Territory. We compared these State and Territory lists paired with naturalisation status to classify the current management of Australia's declared weeds. We found that States and Territories on average shared c. 67% (SD = 15%) of declared weeds. However, neighbouring states were not more similar than separated states in their declared weed lists. Declared weed listings are primarily dedicated to preventative management, prohibiting weeds before naturalisation. There were 415 declared weeds regulated in a harmonious manner across states. These were weeds that despite not having naturalised within a state's borders, the declaration of the weed is aligned with a neighbouring state. However, there were 327 declared weeds regulated by states in a discordant manner, potentially leaving neighbouring states vulnerable to invasion. These are weeds that have naturalised in a state but are not declared, despite the weed being declared in a neighbouring state. We recommend States & Territories re-evaluate the regulation of these 327 noxious weeds. We also suggest States & Territories explore existing alternative regulatory approaches to state-based declarations to provide flexibility and/or greater national harmonisation in regulations. By addressing discrepancies in state-based declarations we can achieve a nationally cohesive approach to noxious weeds, which aligns with global strategies for managing invasive species.

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On-Farm Biosecurity Summit – an initiative aimed at fortifying biosecurity measures across the agricultural sector.

Ms Kirsten Phillips[2], Dr Ian McDonald[3]
[1]AgForce Queensland Farmers Limited, Brisbane, Australia, [2]Biosecurity Queensland, Brisbane, Australia, [3]Animal Health Australia, Canberra, Australia

Biography:
Kirsten Phillips has worked as a communication and engagement professional for more than 25 years with 15 specifically in the biosecurity sector. As the Director, Partnerships and Engagement for Biosecurity Queensland, Kirsten is responsible for strategy and coordination of online engagement and engagement capability development.
As a long-term member of the National Biosecurity Communication and Engagement Network (NBCEN), Kirsten is passionate about collaboration and coordination across the biosecurity communication sector nationally. Kirsten also has extensive experience in public information delivery leading the communication and engagement response for multiple incidents including Panama disease, Hendra virus, and white spot disease.

Abstract:
The 2023 On-farm Biosecurity Summit, hosted on 11 July at the Royal International Convention Centre in Brisbane, Queensland, brought together a wide representation of the region's peak agricultural industry bodies. This gathering was a pivotal moment aimed at fostering collaboration, sharing innovative practices, and exploring the latest social research to enhance biosecurity on farms. This presentation provides an overview of the summit's discussions, outcomes, key reflections, and actionable insights garnered from participant feedback and collaborative sessions.
The urgency for actionable biosecurity measures is underscored by the evolving threats to agricultural sustainability and productivity. Recognizing this, the summit focused on strategizing tangible pathways, tools, and policies to strengthen on-farm biosecurity. Post-summit evaluations, through participant surveys, revealed a high level of satisfaction, with over 65% rating the summit as excellent or very good, and a strong interest in continued engagement in similar future events.
A central theme of the summit was the emphasis on practical and scalable on-farm biosecurity plans. Discussions highlighted the need for simplified, adaptable plans that range from basic property strategies to complex, auditable schemes. The consensus leaned towards establishing minimum best practices and considering codes of practice or accreditation schemes to ensure accountability. The role of education and extension services emerged as critical, with a call for support in bridging the knowledge-practice gap and a specific focus on engaging the next generation of farmers.
The summit also identified key drivers for biosecurity uptake, including leveraging market access and aligning biosecurity with other on-farm frameworks like workplace health and safety. The importance of communicating the real costs and impacts of biosecurity threats was underscored, alongside the potential risks posed by peri-urban farming practices.
In response to the collective insights, several recommendations and actions were proposed. Among these, Biosecurity Queensland committed to collaborating with the industry to develop educational resources, including a series of videos featuring biosecurity champions.
The summit demonstrated government and industry partnership in action. It provided for a unified approach to on-farm biosecurity, underscoring the need for continued collaboration, innovation, and education. The discussions and outcomes from the summit signal a promising direction towards securing sustainable, biosecure farming practices that protect and enhance the agricultural landscape in Queensland and beyond.

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What it will take to eradicate fire ants from Australia

Mr Reece Pianta[1]
[1]Invasive Species Council, Brisbane, Australia

Biography:
Reece Pianta is an experienced public policy campaigner in government and non-government roles. Previously, Reece worked with the Invasive Species Council on the successful campaign for a 10-year red fire ant eradication program. He was also involved in the early formation of Yellow Crazy Ant eradication efforts in the Townsville area.

Visits to infestation areas in Cairns and Townsville and living in the Brisbane fire ant biosecurity zone left a deep appreciation of the mounting impacts that little invaders have on every aspect of life.

Previously, Reece worked in Ministerial Advisor roles and with the Queensland National Parks Association.

Abstract:
Australia has had an ongoing policy goal for fire ant eradication for 23 years. Despite this, our national fire ant response has only succeeded in slowing their spread. Eradication efforts persist due to the unique threat fire ants pose to Australia's agriculture, environment and human health. The cost of fire ant eradication is escalating, but so too is the cost of the alternative - learning to live with fire ants forever.

The Invasive Species Council was formed in 2002 in the wake of the alarming first detection of fire ants in Australia. Many lessons have been learned from this two-decades-old eradication effort. The benefits of fire ant eradication work for Australia equates to billions saved in avoided costs. But containment is not a long-term solution. A single inadvertent undetected escape could result in new strongholds in other parts of the country.

A rapid escalation of eradication efforts over the coming decade is our best chance to avoid the worst fire ant impacts. The eradication challenge will be greatest in the dense urban and suburban locations in and around Brisbane. Scaling up proven tactics and deploying new methods can work if it is matched with policy commitment, resourcing and a broad public mobilisation program.

Eradicating fire ants needs an ongoing funding commitment over the coming decade delivered through a durable fire ant eradication authority that moves beyond community engagement to citizen mobilisation.

Self-treatment was a revolutionary change for fire ant eradication efforts. It has proven individuals want to play a meaningful role and understand the importance of fire ant eradication work.

The Invasive Species Council has provided policy recommendations for the future of Australia's fire ant eradication efforts. These changes provide a funding, governance and engagement framework leading into the next long and complicated phase of this eradication project.

This presentation will go through the Invasive Species Council's key recommendations for fire ant eradication success.

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Is anybody out there? The work AgForce is doing behind the scenes to help in dealing with biosecurity challenges

Dr Annie Ruttledge[1]
[1]AgForceQLD, Brisbane, Australia

Biography:
Dr Annie Ruttledge is the senior policy advisor on Biosecurity and Sustainability for AgForce, a peak organisation representing Queensland's cane, cattle, grain and sheep, wool & goat producers. Annie has over 20 years in biosecurity related work, including as a research scientist focused on weeds of agricultural systems. Her role within AgForce is focused on practical advocacy, building relationships, improving policy, and sharing knowledge to strengthen biosecurity, with a focus on broadacre agriculture in the state of Queensland.

Abstract:
AgForce is a peak organisation representing Queensland's cane, cattle, grain and sheep, wool & goat producers. These industries in Queensland generated around $10.4 billion in on-farm value of production in 2021-22. AgForce's purpose is to advance sustainable agribusiness and ensure the long-term growth, competitiveness and profitability of these industries. Over 6,500 farmers, individuals and businesses provide support to AgForce through membership. Our members own and manage around 55 million hectares, or a third of the state's land area. Biosecurity is a key focus for AgForce, largely enabled through its Biosecurity Committee. The committee plays a vital role in reviewing, analysing and recommending improvements to state and federal policy, as well as identifying significant emerging issues and developing response strategies. Partnerships are key to the success of AgForce, who for the last 25 years have worked, often behind the scenes, to resolve issues, influence positive change, and participate in solutions with other industry representatives, government and various stakeholders.
Key biosecurity challenges that AgForce are actively engaged with at present include weeds, pests and diseases of broadacre agriculture in Queensland, with a special focus on resourcing for state biosecurity, eradication programs (Red Imported Fire Ants, Red Witchweed), vertebrate pest management, emergency animal diseases, and farm biosecurity including third party access (e.g. energy and resources). Our work across these areas, and our key partnerships, will be explored further in the presentation.

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A Decade of Progress: New Zealand's Government and Industry Biosecurity Partnership

Mr Steve Rich[1], Ms Leanne Stewart[1]
[1]Government Industry Agreement for Biosecurity Readiness and Response, Thorndon, New Zealand

Biography:
Leanne Stewart is currently Chief Executive of Kiwifruit Vine Health Inc (KVH), a biosecurity organisation dedicated to supporting the New Zealand kiwifruit industry to protect itself from risk. Prior to taking up the KVH role, Leanne was Deputy Chief Executive at Horticulture NZ and General Manager Process Vegetables New Zealand. Leanne has had previous roles in the Ministry for Primary Industries (MPI) working in the import regulatory space and the International Plant Protection Convention in Rome. Under GIA, Leanne is the Chair of the Plant Biosecurity Council, is a director on the GOL Board was previously Chair of the BMSB Council. Leanne also holds many other roles across government and primary industry councils and committees, including regional initiatives such as Tauranga Moana Biosecurity Capital and the Port of Tauranga Biosecurity Excellence Programme and is on the B3 Collaboration Council.

Abstract:
This presentation evaluates the 10-year journey of New Zealand's Government Industry Agreement for Biosecurity Readiness and Response (GIA), with a focus on its contribution to better biosecurity readiness and response outcomes. Drawing on real-life case studies and insights from GIA members, this session will provide a comprehensive overview of GIA's inception, evolution, and influence.
The presentation will describe the milestones in GIA's development, highlighting both successes and challenges encountered along the way. We will emphasise the partnership principles that sit at the heart of GIA, whereby decisions on readiness and response activities are made jointly by the Government and industry sectors. This will highlight the diversity of GIA's membership - uniting the Government with the horticultural, arable, pastoral, forestry, poultry, and aquatic sectors.
To illustrate the benefits of collaboration, practical examples will be used to describe how GIA has worked in biosecurity responses such as for Queensland Fruit Fly, Fall armyworm, Black Grass, and Mycoplasma bovis. We will also use examples to describe the readiness collaborations that have occurred under GIA in relation to Xylella fastidiosa, Foot and Mouth Disease, Fruit Fly, Brown Marmorated Stink Bug, and nursery pathway assurance. The experience of the kiwifruit sector, as the first industry sector to join GIA, will be highlighted. Comparisons will be possible with the analogous Australian models as delivered through Plant Health Australia and Animal Health Australia.
Key issues that have emerged along the way will be discussed, including things such as how sector groups get buy-in from their broader membership to join GIA, how shared decision making really works in practice, the pros and cons of a completely joined up partnership (i.e. plant and animals), the realities of cost sharing, the importance of integrating Māori perspectives into what we do, and gaining consensus on priorities for investment from a limited funding pool across a diverse group.
We will wrap up by providing a stocktake of the status of GIA, along with an analysis of the risks and opportunities that lie ahead as we embark on the next decade of our journey.

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Evaluating ACIAR's contribution to biosecurity in Australia and Southeast Asia

Dr Lu-Yi Wang[1,2], Dr Tracey Hollings[1,2], Dr Edith Arndt[1,2], Dr. Anca Hanea[1,2], Christine Li[1,2], Vito Avakumovic[1,2]
[1]The Centre for Environmental and Economic Research, The University of Melbourne, Parkville, Australia, [2]The Centre of Excellence for Biosecurity Risk Analysis, The University of Melbourne, Parkville, Australia

Biography:
Dr Lu-Yi Wang is an evolutionary biologist by training, working on visual, thermal, and behavioural adaptations of jewel beetles. She joined the Centre of Excellence for Biosecurity Risk Analysis (CEBRA) at The University of Melbourne in 2023 and has expanded her research focus from animal colouration and biomechanics to biosecurity and economics. She now works on an ACIAR project, evaluating ACIAR's impact in Australia and Southeast Asia.

Abstract:
Pre-border biosecurity is an essential component of our biosecurity measures and preparedness. ACIAR has been devoted to biosecurity-related research and capacity-building activities in the region for roughly 50 years. Its investments have covered a wide range of biosecurity issues both in Southeast Asia and for Australia. However, its impacts on local communities overseas and Australia are not always clear. In this project, we aim to understand ACIAR's impact in terms of biosecurity in Australia and Southeast Asia. We select four of ACIAR's past biosecurity-focused projects, specifically animal diseases, pest management, crop production, and forest health in the Philippines, Indonesia, and Vietnam, as our case studies. Using an integrated multidisciplinary approach including counterfactual analysis, pest and disease spread modelling, cost-benefit analysis, sensitivity analysis, and primary data collection through established databases and surveys of program participants in the region, we estimate the environmental, social and economic, biosecurity, and health impacts of these selected projects. We particularly evaluate the impact in terms of improvement of income and food security among smallholder farmers and rural communities, reduced negative environmental impacts, gender equality and women empowerment, and resilience to climate change as these are relevant objectives in ACIAR's current 10-year strategy. Our project will help serve as a guideline for future impact evaluation programs, and we aim to show that a retrospective evaluation of past biosecurity projects will reveal lessons for future biosecurity research investment.

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A proof of concept for facilitating resource allocation at the border

Dr Edith Arndt[1], Dr. Anca Hanea[1], Dr Chris Baker[1,2,3], Dr Thao P. Le[1,2,3], Prof Andrew Robinson[1], Dr Aaron Dodd[1], Dr David Rolls[1], Jo Morris[1]
[1]Centre of Excellence For Biosecurity Risk Analysis, The University Of Melbourne, Australia, [2]School of Mathematics and Statistics, The University of Melbourne, Australia, [3]Melbourne Centre for Data Science, The University of Melbourne, Australia

Biography:
Dr Edith Arndt is an alpine ecologist and research fellow at the Centre of Excellence for Biosecurity Risk Analysis (CEBRA) at the University of Melbourne. Within CEBRA, her prior projects have encompassed a wide array of topics, including the development of an evaluation framework for Australia's national biosecurity system, the examination of factors influencing marine vessel biofouling and its prevention and management, as well as the optimisation of resource allocation for border biosecurity risk controls. Before joining CEBRA, Edith worked in the Victorian government on topics such as monitoring, evaluation, and reporting; fire severity mapping; and database development.

Abstract:
Biosecurity risk controls are implemented at Australia's borders to reduce the risk of biosecurity material entering through import pathways, such as the sea container pathway. Biosecurity managers face the challenge of determining the most effective way to allocate resources to these risk controls, especially with constrained budgets in all sectors, including biosecurity. A data-driven approach can assist in this task. The use of interception and import management data allows more informed and defensible management decisions to be made about the allocation of resources between border management activities.

We developed a proof of concept for a simple and innovative resource allocation tool to assist managers in making investment decisions within and across import pathways.

Our methodological approach models the complex interactions between biosecurity risk controls applied to containers or goods entering Australia, without making significant simplifying assumptions. To achieve this, we used Bayesian Networks (BNs) to model two different import pathways: the sea container pathway and the cut flowers pathway. BNs are increasingly being used in import risk analysis due to their ability to capture complex interactions. We parametrised the BNs with import management and border inspection data provided by the Department of Agriculture, Fisheries and Forestry. Once parametrised we then used them in simulation exercises, under different scenarios. To increase usability, we created a custom-built R Shiny application. The model output of interest is the leakage rate, which varies depending on the management scenario. Each scenario involves the selection of risk controls and the level of investment in these controls. Furthermore, the application is connected to the CEBRA value model, which is a spatially explicit bio-economic model that estimates asset damage caused by pests or diseases spreading across the landscape (given a certain leakage rate). In this way, the mix of investments in risk controls, associated with different scenarios, can be evaluated by comparing the associated estimated damages in dollar terms.

Our proof-of-concept resource allocation application has demonstrated that it is possible to model and estimate the consequences of changing investments in border risk controls to mitigate biosecurity risks.

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Developing real-time modelling capabilities for animal disease outbreak response

Dr Chris Baker[1,2,3]
[1]School of Mathematics and Statistics, The University Of Melbourne, Parkville, Australia, [2]Centre of Excellence for Biosecurity Risk Analysis, The University Of Melbourne, Parkville, Australia, [3]Melbourne Centre for Data Science, The University Of Melbourne, Parkville, Australia

Biography:
Dr Christopher Baker is a Senior Research Fellow at the Centre of Excellence for Biosecurity Risk Analysis (CEBRA) and the Melbourne Centre for Data Science in the School of Mathematics and Statistics at The University of Melbourne. Dr. Baker's reserach focuses on the nexus of mathematical modelling and policy to improve outcomes for environmental and infectious disease managment.

Abstract:
Successful management of disease outbreaks requires deliberate and rapid response. As seen throughout the COVID-19 pandemic, mathematical modelling can provide important and novel insights from data as it gets collected, which provides an evidence base to support policy and decision-making. To improve modelling capability to support decision making in animal disease outbreak response in Australia, we are developing a suite of modelling workflows to estimate current spread and forecast future spread using outbreak data. We are also developing a range of decision-support workflows to improve how modelling can be used to support evidence-based policy. In this presentation I will provide an overview of forecasting and modelling workflows and describe how we are using them as the basis of simulation exercise workshops. These workshops will provide important insights on the uptake of modelling to support decision-making.

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One Biosecurity – demonstrating the value of data for decision-making, market access, and disease preparedness

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Biography:
Dr Cleopas Bamhare is a veterinarian with post-graduate training in livestock economics, veterinary epidemiology and information systems. His experience includes the development and management of national animal health programs, surveillance for trans-boundary animal diseases; regulatory veterinary medicine and veterinary public health. He has also worked in the development and maintenance of regional disease information systems, livestock identification and traceability as well as risk analysis for import control in Africa where he worked for 26 years. He joined Biosecurity SA in 2013 has been involved in the development and management of South Australia's One Biosecurity, an online farm biosecurity management application.

Abstract:
Access to local and international markets is dependent on the Australian livestock industry's ability to provide data that assures trading partners. Data that underpins claims of animal health status is particularly important for export certification. Whilst the National Livestock Identification System database provides accessible data on livestock traceability requirements the same is not true for data regarding on-farm biosecurity practices. The South Australian, online One Biosecurity program seeks to address this gap.
One Biosecurity is an innovative program that facilitates the creation of a farm biosecurity management system online. The program allows producers to assess their biosecurity practices against industry standards. During the process, producers learn about good biosecurity practices, identify pathways for improvement and nudge towards positive change. The questionnaires include disease risk which together with the knowledge of biosecurity practices provide a sound framework for risk-based trading.

One Biosecurity provides government veterinary services with current information on the biosecurity status of sheep and cattle properties within South Australia. This enables government and industry to report on biosecurity practices. It also provides data to underpin access to markets. In addition, the program allows for oversight of strengths and weaknesses in biosecurity across the State, enabling targeted education and support for producers in combatting endemic diseases as well as preparing them to deal with emergency animal diseases.

A recent analysis of the program's data shows that the average property biosecurity score is 3.73 out of 5 (a score of 3 meets industry standards). This indicates most members have an acceptable level of biosecurity for day-to-day operations. However, close analysis of individual practices highlights an opportunity to improve the level of biosecurity required to mitigate the impact of an Emergency Animal Disease outbreak. The consistent application of good biosecurity in every key area was also highlighted as an area for improvement.
Online biosecurity data promotes transparency, allowing evidence-based policy decisions and the opportunity for two-way communication between government services and producers. One Biosecurity has provision for other parties (e.g., rural vets, livestock agents/contractors) to provide additional input such as verification and certification via the web portal. Thus, One Biosecurity provides a framework that promotes and builds a strong biosecurity culture across industry.
Managing risk is dependent on the quality and timeliness of available data. One Biosecurity provides credible and auditable data that can facilitate timely decision-making, underpin market access and strengthen preparedness to combat the ever-present threat of emerging animal diseases.

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Modelling the incursion, spread, detection and control of khapra beetle in Australia

A/Prof Richard Bradhurst[1], Dr James Camac[1], Dr Tracey Hollings[1], Mr Callum Fletcher[2], Dr Ken Young[2]
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Biography:
Associate Professor Richard Bradhurst is a Principal Research Fellow and Chief Investigator at the Centre of Excellence for Biosecurity Risk Analysis (CEBRA) within the University of Melbourne. He specialises in the fusion of analytical, agent-based, network, and cellular automata approaches to simulating the spread and control of emergency animal disease, and plant and environmental pests (www.aadis.org). Richard collaborates with animal and plant health authorities in Australia, New Zealand, USA, Canada, and throughout Europe, as well as the Food and Agriculture Organisation of the United Nations.

Abstract:
Introduction
Khapra beetle (Trogoderma granarium) are a globally significant pest that has the potential to threaten global food security, disrupt international trade, and cause severe economic losses for infected countries. They are voracious feeders of stored grain products, affecting both the quality and quantity of infected products, and posing a risk to human health from larval cast skins and hairs. Though primarily a pest of grains and stored grain products, khapra beetle can infest and reproduce on an array of different commodities, including animal origin and non-grain plant materials such as dried fruit, nuts, spices, and cow's milk power. More than 100 different commodities have been recorded hosting khapra beetle populations. It is estimated that establishment of khapra beetle could cost the Australian economy $17 billion over 20 years. This includes significant losses from damaged grain and trade embargos by non-khapra beetle countries.

Spatiotemporal models can assist in the formation of plant health policy for priority pests, especially where field studies are not possible or practical. We describe the development of a decision support tool to assist policy makers explore the potential spread and control of khapra beetle in Australia.

Materials and methods
The Australian Plant Pest & Disease model (APPDIS) was extended with:
- a khapra beetle habitat suitability layer based on ALUMC land use categories
- a population growth sub-model that considers the influence of ambient climatic conditions
- a spread pathway that represents hitchhiking spread of khapra beetle via infested shipping containers discharged at Australian ports and then dispatched to distribution centres
- a spread pathway that represents secondary spread of khapra beetle from distribution centres to nearby suitable sites
- detection of khapra beetle via general surveillance and trapping systems
- response to khapra beetle detections with delimiting surveillance, treatment, and post-treatment surveillance

Incursion scenarios were simulated at 13 Australian ports which are responsible for 99.9% of arriving containers.

Results & Discussion
The distribution of the simulated outbreaks was consistent with previous risk mapping work on khapra beetle.

The developed model provides a useful decision support tool for comparing different strategies for khapra beetle surveillance and response and assessing the consequences of early/late detection.

The developed methodology provides a useful framework for future work on other priority pests that may hitchhike into Australia via shipping containers.

The presentation will include a demonstration of the APPDIS-KHAPRA model running example scenarios of khapra beetle incursion, spread, detection, and control.

Understanding on-property biosecurity attitudes and behaviours

Ms Nicole Cairns[1], Ms Kellyanne Harris[1], Mr Ryan McKenzie[1], Whitney Smith[2], Ms Olivia Gardner[2], Dr Nicole Schembri[3], Dr Ian McDonald[4], Ms Amanda Yong[5], Ms Cat Banks[6]
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Biography:
Nicole Cairns is the Communications Manager for Emergency Animal Disease Preparedness at the Department of Energy, Environment and Climate Action in Victoria. She has been working in the biosecurity communications space for seven years, a member of National Biosecurity Communications and Engagement Network (NBCEN) and the National Biosecurity Response Team (NBRT) public information. Previous to government, she worked as a journalist and for not-for-profits.

Kellyanne Harris has worked for Agriculture Victoria for 24 years. She is currently working as Emergency Animal Disease Industry Engagement Program Manager at DEECA.

Abstract:
With risks of biosecurity threats increasing, biosecurity has never been more paramount. Practices landholders implement on their properties are a key part of the biosecurity system – whether large-scale production; have a small property with a veggie patch or keep livestock as pets to everything in between.

Victoria partnered with New South Wales and Queensland governments, Animal Health Australia, Plant Health Australia and SEC Newgate to research the knowledge, attitudes and behaviours landholders have towards biosecurity and to make recommendations for future communications.

The research included two parts: qualitative followed by quantitative.

The qualitative component highlights findings from 30 interviews with livestock owners and produce growers. This included nine from Queensland, 11 from New South Wales and 10 from Victoria, with 21 livestock properties, four horticulture only and five mixed; 12 full production, nine semi-production and nine non-production; with a focus on smaller properties: 12 had less than 20 livestock, 11 and between 20 and 250 livestock, while only three had more than 250 livestock.

For communications; the results found there are three inherent beliefs that must be challenged to encourage better biosecurity behaviours:

1. This is about other people. It won't affect me because I am isolated... or I don't have many animals... or my animals don't leave my property... or FMD is just for cows and sheep.

2. It's not in the country yet. Once it is, I'll take action. There isn't any need to do anything now, and it will take time and energy I don't have.

3. There's not much point in me doing this, because other people will do the wrong thing. Regardless of how much effort I make, the chances are that other people who don't know or don't care about the consequences of their actions will bring the disease to me. Look at what happened with COVID – we put strict measures in place but it still got through.

The quantitative online survey with 333 livestock owners explored the differences between farmers (66 participants) and hobby farmers (267 participants).

Survey findings highlight participant issues, such as where biosecurity fits, knowledge of biosecurity and perceived role, through to specific actions and awareness.

Examples of some of the findings that identified room for improvement are:

Three in ten farmers (29%) and well over half of hobby farmers (58%) say they know little or nothing about biosecurity.

Less than half of farmers (47%) and just over a quarter (28%) of hobby farmers feel very or extremely confident in their preparedness to identify and respond to a biosecurity incident.

Only 62% of hobby farmers say they follow strong biosecurity practice most or all of the time (89% of farmers do), and both groups see a number of significant barriers in doing so.

The report also identifies the most effective messaging for both the hobby farmer and farmer cohorts that have the greatest potential to effectively advocate for or against a proposition. These insights will be used to create targeted behaviour change across the continuum through evidence-based communications.

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‘Destroy and let lie’ - An evaluation of a carcass disposal approach under Australian field conditions

Assoc Prof Rowland Cobbold[1], Dr. Renee Thompson[2], Prof. Rachel Allavena[1], Dr. Tamsin Barnes[1], Bec Brayley[2], Dr Jaimie Hunnam[3], Mr David McNab[2], Prof. Joanne Meers[1], Tara Moore[1], Dr. Sarah-Jane Wilson[4], Duncan Worsfold[3]
[1]UQ School of Veterinary Science, Gatton, Australia, [2]Queensland Department of Agriculture, Brisbane, Australia, [3]Agriculture Victoria, Rutherglen, Australia, [4]JCU School of Veterinary Science, Townsville, Australia

Biography:
Associate Professor Rowland Cobbold worked in mixed animal practice in Australia and the UK before completing a PhD in microbiology at UQ and with the CSIRO. Following a faculty research position in food safety epidemiology and microbiology at Washington State University, he commenced a teaching and research position with the UQ School of Veterinary Science. Rowland’s research centres on zoonotic and food-borne pathogens – their natural ecology and potential public health risk, and control strategies. He also conducts research and teaching on biosecurity and infection control. He has extensive experience in curriculum development and teaching, including in international standards setting.

Abstract:
Introduction
During an emergency animal disease (EAD) response in Australia, timely disposal of carcasses will be challenging, particularly in a scenario involving remote animal populations. Destroy and let lie (DLL) research being conducted through the Queensland Department of Agriculture and Fisheries is examining the potential for field decomposition to reduce the likelihood of carcasses contributing to transmission of foot-and-mouth disease virus (FMDV) and African swine fever virus (ASFV). This work aims to support risk-based decision-making in scenarios where extensively produced livestock or feral animal populations are destroyed as part of an EAD response.

Method
This research project included summer and winter trials run at each of three geographical locations across eastern Australia, representing different climatic zones. Monitoring at regular intervals for 24-48 hours following humane euthanasia was undertaken in four species (cattle, sheep, goats and pigs). Temperature and pH data were recorded in six anatomical sites (superficial and deep muscle, thoracic and abdominal cavities, bone marrow and brain). Field data were compared with published FMDV and ASFV inactivation data to evaluate whether changes in pH and temperature during the decomposition process would inactivate these viruses.

Results and Discussion
The findings demonstrated a general decline in tissue pH data within 6-12 hours following death, with temperature data typically lagging ambient temperature and varying relative to superficial or deep anatomical site. Data recorded indicates likely inactivation of FMDV in all anatomical sites except the cranial (brain) and long bone (marrow) cavities through the effect of decreased tissue pH, with similar findings across all seasons and species investigated. Where temperature-time combinations would reduce FMDV viability, inactivation by pH preceded the effects of increased tissue temperature. Inactivation of the robust ASFV by pH changes was found to be unlikely in any tissue within the time-period investigated, however temperature-time combinations may decrease ASFV counts by one or two logarithms.

Results of this research indicate DLL could be a valuable tool to manage the risk of disease spread from carcasses in the event of an FMD outbreak. However, in the case of ASFV, pH and temperature-associated infectivity reduction would be minimal within the first 48 hours of decomposition. Additional research extending the monitoring time-period in pigs is currently underway.

Pairing data derived from Australian field conditions with known viral inactivation thresholds for EADs of current concern such as FMD and ASF furthers our understanding of the conditions under which DLL would be

a practical and effective solution for disposal of livestock species, where other disposal methods are unfeasible or impractical. Understanding the limits and constraints of DLL as a disposal option for livestock carcasses in respect to potential viral inactivation will allow for better informed risk-based decision making in a time and resource-constrained response environment.

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The power of network data for faster intelligence, traceability and disease spread prediction in the primary sector

Guy Davidson[1], Connagh Wellington
[1]Onside, Christchurch, New Zealand

Abstract:
Biosecurity threats pose significant risks to the agricultural industry, and early detection, rapid response, and efficient management are critical to mitigating these threats. Onside Intelligence offers a cutting-edge biosecurity traceability, preparedness, and response solution that leverages network science and real-time data to provide unparalleled insights into disease spread and movement patterns. By harnessing data from various sources, including check-in data from farms and third-party sources like fruit bin trackers and vehicle telemetry, Onside Intelligence creates a comprehensive network of rural movements.

Our sophisticated network science algorithms analyze this data to:

1. Trace and predict disease spread, enabling early detection and swift response.
2. Optimize monitoring and surveillance, ensuring resources are allocated effectively.
3. Inform risk-based testing regimes and direct response resources, minimizing the spread of disease.

Onside Intelligence offers numerous benefits for primary industries, including:

1. On-farm biosecurity excellence: Producers can set and update biosecurity rules, documents, and questions in real-time, ensuring all staff, contractors, and visitors comply. Traceability reports provide proof of who has been on the property, their job, and duration.
2. Managing established pests and diseases: Onside Intelligence helps to direct management resources efficiently, containing and managing endemic pests and diseases
3. Improving industry tracing data collection and access: Onside Intelligence collects live data on people, machinery, equipment, and plant material movements, visualized through web-based dashboards for real-time monitoring and response.
4. Optimizing industry preparedness: Network science algorithms identify priority properties for regular surveillance, enhancing early detection capabilities, and expanding community awareness. The Onside Intelligence dashboard facilitates simulation exercises, ensuring industry readiness for a real response situation.
5. Prioritizing resources in a response: Onside Intelligence's algorithms identify priority properties to target in a response, containing the incursion quickly and avoiding blanket movement shutdowns, resulting in faster recovery for business continuity and regaining market access.

Join us in this presentation to explore how Onside Intelligence's innovative approach to biosecurity can revolutionize the way we manage disease threats, ensuring a safer and more sustainable future for the primary sector.

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Analytics to Action: powering biosecurity risk reduction by harnessing diverse data sources

Dr Habacuc Flores-Moreno[1], Jane Muller[1], Dr Judith Stahl[2], Mrs. Kerry Collins[1], Dr Rieks van Klinken[1]
[1]CSIRO Dutton Park, Brisbane, Australia, [2]CSIRO Black Mountain, Canberra, Australia

Biography:
Dr Habacuc Flores-Moreno is an ecologist interested in the links between terrestrial biodiversity and ecosystem processes. In his research, Haba models ecological risk of trade-related operations through the lens of ecological communities, biotic interactions and ecophysiology theory. His research is integrative, using a diverse set of quantitative and statistical 'big data' science approaches in combination with basic ecological tools. Haba has previous experience translating research into policy as well as managing research infrastructure as a Data Curator for a national ecological monitoring network and as a consultant for a multilateral environmental organization.

Abstract:
The increasing growth and diversity of products in global trade coupled with the increasing volume and speed of passenger and freight movements is an emerging biosecurity challenge. While there is significant investment by many players to generate records and data to demonstrate and verify compliance with biosecurity requirements, most of this data remains single-purpose and held in isolation. Current systems are not designed to enable existing data resources to be collated to inform adaptive management or support meaningful analysis for wider strategic applications. Key to solving this challenge is our ability to integrate, harmonize and communicate phytosanitary-relevant information in real time, harnessing diverse data sources. It follows that efforts to develop digital systems to facilitate the harmonization and exchange of data could significantly contribute to simplifying trade (especially of perishable goods) without compromising biosecurity standards. Here, using surveillance data for codling moth, we demonstrate how compliance data collected by government and industry can be re-purposed, shared and analysed to generate new insights that can be used by farmers, industry and governments to optimise phytosanitary risk management through the supply chain. "Big data" and advanced analytical tools provide actionable insights to detect patterns and to better target pest surveillance and inspections. We argue that developing human and machine-readable systems to coordinate the dissemination of information on emerging pest risks and changes in pest status, including establishing common data standards across farmers, industry and governments is crucial.

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Quantitative Rapid Risk Analysis - an effective tool during the NSW Varroa Destructor mite outbreak

Dr Catherine Fraser[1]
[1]NSW DPI, Orange, Australia

Biography:
Dr Catherine Fraser has extensive experience in emergency management, as the NSW state epidemiologist for events including diseases and pests of terrestrials, aquatics, plant pests and invasive species. Graduating from Sydney University in 1993 (BVSc), she worked in mixed practice in Australia and England, prior to joining NSW Agriculture from 1997 to 2008, where she worked in the field, involved in disease investigations, research, policy, health programs and epidemiology. She attained a Master of Veterinary Public Health Management (MVPHMgt) at Sydney University in 2006, rejoined NSW DPI in 2016, and achieved Memberships of the ANZCVS Epidemiology chapter in 2021.

Abstract:
Introduction: Scientifically based decisions must be made quickly during an emergency response, due to biosecurity, welfare, social or economic reasons. During the NSW Varroa Destructor Mite (VDM) incursion, quantitative Rapid Risk Analysis (RRA) were undertaken to assess the impact of proposed movements or policy changes on the success of the eradication strategy, in a structured and consistent manner. Movement controls are critical to prevent and minimise spread of a disease or pest during an outbreak. New tools were developed to assist lay people in making consistent decisions for movement permits based on levels of risk or probability of infestation.

Methods: A NSW Department of Primary Industries RRA Animal Biosecurity template was altered to suit the host, including agent information, sourced from experts, peer reviewed literature and updated using real time learnings. For each RRA, a risk pathway diagram with mitigation was drawn using the program lucidchart™. Quantitative likelihoods for each pathway step were based on 6 probability levels deduced from best knowledge and were combined for final likelihood probability. Final risk was ascertained from combined likelihoods, and consequences and impact to the eradication objective if spread occurred. The level of confidence in the risk estimate ranged from unsatisfactory to good.

The acceptable level of protection or risk (ALOP) for the NSW VDM Emergency Management (EM) response was low. The result from the RRA needed to be at or below that risk level for the movement or proposed policy change to be allowed.

Results: Over 50 RRA were undertaken assessing the impact of movement or policy decisions on the objective of eradication, not all met the ALOP. Secondary tools were developed from the RRA process to assist laypeople to assess individual permits with confidence and consistency. A RRA for decreasing EM zone sizes due to risk was formalised towards the end of the response, although the effectiveness of this was unable to be challenged due to the change in strategic direction of the response from eradication to management.

Discussion/Conclusion: RRA are an effective, critical tool used within emergency responses and have a role in both operational and broader policy decisions. Being based on best knowledge at the time, they can be revised and updated as further information comes to light. The RRA process provides a basis for structured scientific decision making, enabling consistent risk-based decisions, inclusion of mitigation strategies and was the genesis of development of secondary tools helping laypeople assess risk with confidence and consistency. The use of RRA to assess risk of changing the size of EM zones and resultant impact to producers is a process that should be used during EM responses.

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Digital tools to support evaluation and reporting on the outcomes of invasive species management

Dr Jens Froese[1], Dr Ben Gooden[2], Dr Maryam Golchin[3], Dr Simon Linke[1], Dr Stewart Macdonald[3], Dr Marina Scarpelli[1], Dr Kyana Pike[3], Dr Wen-Hsi Yang[1]
[1]CSIRO, Dutton Park, Australia, [2]CSIRO, Canberra, Australia, [3]CSIRO, Townsville, Australia

Biography:
Dr Jens Froese is a landscape ecologist and Senior Research Scientist in CSIRO's Health & Biosecurity business unit. He brings 15 years of diverse experiences in the biosecurity domain across institutions, sectors (weeds, pest animals, plant pests and diseases, animal diseases) and functions (research, policy, operations). Jens leads research teams that specialize in developing digitally-enabled methods, workflows and decision support tools to enable adaptive management of invasive species and other biothreats for improved on ground and policy outcomes.

Abstract:
Established invasive alien species must be managed in perpetuity and at great cost to reduce their significant harm to biodiversity and agricultural assets. However, limited resources for on-ground control activities may not always be invested efficiently and effectively due to limited understanding of whether, where and when these activities lead to beneficial outcomes (which may refer to reduced invasive species populations, reduced invasion of new locations, or maintained or enhanced asset condition). A key challenge is the lack of appropriate monitoring, evaluation and reporting processes and supporting tools to facilitate such understanding in an adaptive management context. There are many difficulties contributing to this challenge, from capturing informative and consistent monitoring data, to robustly integrating and analysing multiple data sources, and delivering insights that are actionable, i.e. embedded within existing decision-making structures and processes. Digital innovations can help to address some of these difficulties. Potential game changers include remote monitoring technologies, automated analytical workflows based on statistical, Machine Learning or AI methods, and interactive decision support tools.

The CSIRO has responded to this research and development need by investing in digital proof-of-concepts that have the potential to transform adaptive, outcomes-focused invasive species management in the broader sector. Here, I report on the early results of two research projects: In a project focused on adaptive management of invasive plants, we partner with the ACT government who have curated best-practice longitudinal data sets at both invasive plant control sites as well as hundreds of vegetation monitoring plots. We are developing workflows that analytically integrate these fragmented data sources and generate novel, actionable insights on (i) invasive plant cover trajectories under alternative control scenarios and landscape contexts, and (ii) the biodiversity maintenance or enhancement outcomes of invasive plant management. In another project, we partner with Bush Heritage Australia to demonstrate the utility of passive acoustic sensor technology for collecting consistent longitudinal monitoring data on (i) invasive animal activity and (ii) impacted biodiversity indicators simultaneously, autonomously, and efficiently. We are particularly focused on developing streamlined, transferable, and scalable end-to-end (data capture-to-evaluation) workflows to address the challenges posed by big data volumes and land manager capacity constraints in evaluating acoustic data. In both projects, we aim to deliver actionable insights via prototype decision-support tools that enable our partners to better demonstrate/report the benefits of invasive species management as well as adaptively prioritise limited on-ground resources for improved biodiversity outcomes.

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Feral herd management in Northern Australia: insights from GPS track and survey data

Dr Maryam Golchin[1,2], Dr Justin Perry[4], Mr Justin Middler[1], Mr Sam Nelson[1], Mr Aasish Adhikari[5], Dr John McEvoy[1], Dr Drew Terasaki Hart[1], Mr Scott Forrest[3,1], Mr Eric Vanderduys[1], Mr Rohan Fisher[5], Dr Andrew Hoskins[1,2]
[1]Commonwealth Scientific and Industrial Research Organisation (CSIRO), , Australia, [2]James Cook University (JCU), Townsville, Australia, [3]Queensland University of Technology (QUT), Brisbane, Australia, [4]North Australian Indigenous Land and Sea Management Alliance Ltd (NAILSMA), Brinkin, Australia, [5]Charles Darwin University (CDU), Casuarina, Australia

Biography:
Dr Maryam Golchin is a Research Scientist in machine learning at CSIRO. Her main focus is on applying machine learning to understand animal movement for decision support systems better. She has developed many novel machine learning algorithms and applied them to many problems in acoustics data analysis, spillover risk prediction, genomic data analysis, medical data analysis, construction data analysis, and text mining.

Abstract:
Feral buffalo and cattle initially introduced by settlers in the 1800s, pose significant threats to Northern Australia's ecology and economy, including land degradation, overgrazing, destruction of rivers and wetlands, and loss of biodiversity. In addition, these herds can be a good resource for local consumption and economic growth. However, the potential benefits for many Indigenous communities are not often realised. To address these challenges, CSIRO, NAILSMA and partners have initiated the SpaceCows project, to track and manage feral herds using satellite technologies and advanced analytics.

This abstract focuses on the development of an analytical architecture within the SpaceCows project to predict feral herd abundance up to seven days in advance. The architecture consists of three primary pipelines, each leveraging machine learning techniques and animal movement data:

In the first pipeline, a multilayer perceptron (MLP) model is developed to predict the daily presence probability of an animal within a 100 meters by 100 meters grid. Soil type, land cover, and tree height are utilised as predictors, with validation conducted using expert knowledge and historic survey data.

The second pipeline builds upon the predictions of the first by building an abundance MLP model, incorporating additional predictors such as Sentinel 2 spectral bands (aerosols, blue, green, red, near-infrared, water vapor, and shortwave infrared), and fire scars. Kernel density estimation of the animal movement data are employed to generate the abundance response variable, with validation through expert knowledge and historical survey data.

Finally, the third pipeline employs a convolutional neural network to forecast herd abundance based on the history of the past seven days, with plans to calibrate model parameters using new track data.
This analytical system developed through the SpaceCows project aims to support Indigenous rangers in land management planning and local decision-making processes. By leveraging satellite data and advanced analytics, SpaceCows offers innovative solutions for mitigating the impact of feral herds in Northern Australia and promoting sustainable ecosystem management.

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Forecasting and optimally managing the spread of urban invasive forest pests

Dr Emma Hudgins[1]
[1]The University Of Melbourne, Brunswick West, Australia

Biography:
Dr Emma Hudgins is interested in the ecology, impacts, and management of species that are changing their distributions due to humans. Emma works on the optimization of management and surveillance for species with dynamic ranges, including for invasive pests and trees undergoing climate-induced range shifts. Emma is interested in creating better forecasts of future movement patterns, and better recommendations for invasive species management at large scales.

Abstract:
Urban trees are important nature-based solutions for future wellbeing and livability, but are at high risk of mortality from invasive insects and pathogens. To plan effective mitigation, managers must know which tree species in which communities will be at the greatest risk, as well as the highest-risk species. This presentation will cover related models in urban forest health in the face of species invasions that range from descriptive to prescriptive. First, I will summarise an economic impact assessment on United States (US) street tree mortality due to invasive insects. This approach combined models of street tree populations in ~30,000 communities, species-specific spread predictions for 57 invasive insect species, and estimates of tree death due to insect exposure for 48 host tree genera. We estimated that 1.4 million street trees will be killed by invasive insects from 2020 through 2050, costing an annualized average of US$ 30M. Further, 90% of all mortality will be due to emerald ash borer (Agrilus planipennis, EAB), which is expected to kill virtually all ash trees (Fraxinus spp.) in >6000 communities. Second, I will discuss a recent project that has reformulated this impact model as an optimal control framework to determine the ideal management strategy for urban tree persistence. We found that the best management strategy always included a combination of site-focused (biological control) and spread-focused (quarantine) management measures, and that failing to use a mixed strategy could result in losses of upwards of one million street trees in the next 30 years. I will end with a discussion of how I have begun adapting this approach to the Australian context across a range of potential applications, including an extension to the feed insect industry.

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Modelling the consequences of myrtle rust (exotic strains) across the Australian landscape

Dr Thao P. Le[1,2,3], Dr Meryl Theng[1,4], Dr Philippa Griffin[5], Dr Mirja Guldner[5], Vito Avakumovic[1], Dr Chris Baker[1,2,3]
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Biography:
Dr Thao P. Le is a research fellow at the Centre of Excellence for Biosecurity Risk Analysis, Melbourne Centre for Data Science, and the School of Mathematics and Statistics at the University of Melbourne. Dr. Le graduated with a PhD from University College London in quantum physics and is now working in mathematical biology and biosecurity. They have extensive experience modelling COVID-19, including delivering modelling to support global vaccine policy, and have worked on several projects for the Department of Agriculture, Fisheries and Forestry to support biosecurity decision-making.

Abstract:
Estimating the consequences of potential establishment and spread of pests and diseases is essential for the quantitative estimation of biosecurity risk and important for supporting evidence-based decision-making. Frequently, information about pest consequence to different assets is derived from expert elicitation. Here we report an alternative data-driven modelling approach that uses existing national ecological datasets. We apply it to determine the impact of myrtle rust (exotic strains) on carbon sequestration Australia-wide. We draw on genus-level contributions to carbon capture and impacts of myrtle rust at the species level estimated in scientific studies. By combining this information, we estimate the reduction in carbon sequestration due to myrtle rust, across the Australian landscape. We find that myrtle rust could lead to a 10% national reduction in carbon sequestration if it were to spread across Australia. This method could be further extended to estimate other environmental impacts of plant pests, such as erosion control and soil/air mediation. Our approach allows for systematic estimation of the impact of plant pests on carbon sequestration, and thus also has applicability to climate-change related initiatives including net-zero emissions targets and reforestation efforts, as well as utility in supporting biosecurity decision-making.

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A systematic review of epidemiological modelling for preparedness and response to lumpy skin disease outbreaks

Mr. Simin Lee[1], Dr Chris Baker[2,3,4], Dr Emily Sellens[5], Professor Mark Stevenson[1], Dr Sharon Roche[5], Dr Robyn Hall[6], Dr. Andrew C. Breed[5], Associate Professor Simon Firestone[1]
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Biography:
Simin Lee graduated from Jeonbuk National University's College of Veterinary Medicine in South Korea and obtained a master's degree in veterinary immunology, contributing to the development of vaccines for foot-and-mouth disease and conducting analyses for various infectious animal diseases. Currently, as a Ph.D. student at the University of Melbourne, Simin's research is centered around effective strategies to control lumpy skin disease. Simin's background in immunology, infectious diseases, and vaccine development, coupled with experience in the public sector, positions him to make a meaningful contribution to the field of veterinary science.

Abstract:
Introduction: In the early stages of infectious animal disease outbreaks, limited availability of resources and data presents challenges in estimating outbreak spread and impact. This study developed a dynamic transmission modelling framework to support outbreak response decision-making.
Methods: An equation-based hybrid model was fit to early “time slices” from each of the major outbreak foci from the outbreak of FMD in the UK in 2001 using Approximate Bayesian Computation-Sequential Monte Carlo processes. Forward simulations were conducted from 7 to 200 days after disease detection in each cluster, from which 1000 simulated epidemic curves and risk maps were generated, along with inferred distributions for parameters for the underlying model processes. Model outputs were compared with the observed data to assess predictive ability.
Results: The dynamic transmission model was found to produce stable and accurate predictions of spatial risk from early in the outbreak in each cluster. Forecasts of the epidemic curve and spatial scale became reliable within 20-30 days after disease detection, and scenario-based forward simulations under different control strategies allowed early identification of farms at risk of infection and the evaluation of the effectiveness of controls.
Discussion: The accuracy of the model is contingent on the quantity of input information and enhancing the accuracy of simulation results requires continuous data updates. During model development, observed data on delays in detection and implementation of depopulation, directly related to levels of resourcing, were critical for the accuracy of both now- and fore-casts. This underscores the importance of constructing models while considering both current outbreak information and disease characteristics.
Conclusion: The dynamic transmission modelling framework can address key questions related to outbreak scale, duration, pattern, and response measures. This approach can be adapted swiftly to changing circumstances as a disease outbreak unfolds, assisting decision-making during the early stages of infectious disease outbreaks.

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Modifications to shipping container designs reduce biosecurity risk

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Biography:
Dr Samuel Lymbery has worked in entomology and behavioural ecology at UWA and The University of Exeter, before joining Murdoch University as a postdoctoral fellow in biosecurity in 2022. The main focus of Samuel's current research at Murdoch is the microhabitat potential of shipping containers for hitchhiker pests, and how our knowledge of pest behaviour and ecology could be leveraged to provide biosecurity management outcomes. Samuel also works more broadly in the areas of pest behaviour and conservation entomology.

Abstract:
Hitchhiker pests in the global sea container pathway represent a significant risk to international biosecurity. Design elements of sea containers may provide microhabitats for hitchhikers and enhance the rate of contamination, thereby increasing propagule pressure and the risk of pest invasion and establishment. The structure of sea containers also influences the speed and efficiency of inspections by biosecurity officers. New sea container designs have been produced which aim to minimise gaps and other microhabitats for pest species while providing easier inspection surfaces. We tested these new (Modified) container designs in a closed shipping loop in Western Australia alongside traditional general purpose (Standard) containers. We found that Standard containers posed a significantly higher biosecurity risk than Modified containers, being more than five times more likely to be contaminated. Standard containers were particularly prone to contamination on the underside, and to contamination with seeds and invertebrates. In addition, Standard containers took significantly longer to inspect than Modified containers. These results provide the first formal statistical demonstration of the effect of container redesigns on biosecurity risk, and suggest that modifying containers can be a viable approach to management.

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Mixed methods and Bayesian Network modelling to design interventions for NSW marine estate biosecurity activities

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Biography:
Dr Jennifer Manyweathers graduated as a vet from Sydney University, working for several years in rural mixed practice. This was followed by three years at Tsukuba University, Japan, lecturing in science communication. Completing her PhD in risk perception of horse owners and veterinarians concerning Hendra virus, she worked as a postdoctoral research fellow developing a farmer-led partnership system for improved surveillance for Foot and Mouth Disease.

Jennifer is currently Senior Lecturer in Ruminant Health and Epidemiology at Charles Sturt University, interested the social and psychological factors play in stakeholder decision-making in the animal health arena, and how this impacts veterinary education.

Abstract:
Australian aquatic environments are at risk of incursions of non-indigenous species (NIS) that can impact livelihood and food security. Recreational vessels, particularly small to medium vessels (up to 30m in length) that are permanently moored, play an, as yet, unquantified, role in the dissemination of such incursions from larger ports to smaller, widespread waterways. There is currently little knowledge on the boat cleaning and biosecurity practices of marine estate users and their, and other stakeholder, perception, of their role in managing and mitigating biosecurity risks of NIS incursion.

This project aimed to better understand the risk that small to medium, permanently moored recreational vessels pose for disease and pest incursion and spread in the New South Wales (NSW) marine estate and identify strategies to mitigate this risk. A mixed methods approach was undertaken, including stakeholder identification and mapping, interviews and a cross-sectional survey of marine estate stakeholders, and Bayesian Network (BN) modelling for segmentation of respondents.

Using a data-driven approach, project outcomes included a clearer understanding of the risk of disease incursions within the NSW marine estate, and the identification of the need for better communication channels that are tailored for specific audiences. Strengthening partnerships amongst stakeholders, including government agencies and industry groups was also identified as being crucial to mitigating marine estate biosecurity risks.

Segmentation of respondents using BN modelling allowed for vessel owners to be charactered into three groups by their understanding and knowledge of their biosecurity duty. Using these groups provided an avenue to develop specific recommendations aimed at reducing the disease incursion risk in waterways across the diverse respondent population, avoiding a one-size fits all approach. Recommendations included tailoring communications at segmented populations to address specific barriers to practice adoption, investing in relationships between stakeholders and streamlining information channels. Future work includes evaluation of the implemented recommendations and uptake of biosecurity practices amongst small to medium vessel owners.

Funding for this project was provided by the NSW Government under the Marine Estate Management Strategy. The ten-year Strategy was developed by the NSW Marine Estate Management Authority to coordinate the management of the marine estate.

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Can Track and Trace Technology support early detection and rapid response to biosecurity threats?

Miss Leonie Martin[1], Louise Rossiter Louise Rossiter[1]
[1]NSW Department of Primary Industries, Orange, Australia

Biography:
Leonie Martin has worked with NSW Department of Primary Industries for over twenty years and currently works in Plant Biosecurity. Leonie works extensively with the NSW Viticulture industry on biosecurity preparedness and conducts industry training in this space. She is passionate about biosecurity and believes that if new technology can be used for the early detection and or prevention of pests and diseases, it is totally worth investigating.

Abstract:
Introduction
The New South Wales wine industry is a vital part of the NSW economy contributing $14 billion to NSW. This industry was keen to test new technology for capability to minimise and manage biosecurity threats and reduce the economic impact these have on growers. Their highest priority was to identify opportunities to improve biosecurity management and mitigation strategies at the farm, supply chain and community levels.

Aim
The Track and Trace project was a proof-of-concept project to test new technology to collect real-time vineyard movement data. The aim was to investigate if tracking data management systems could support the early detection of pests or diseases and reduce their economic impact in the short and long term. Providing a risk-based, data-driven approach for optimising readiness and response and minimising the adverse effects and economic impacts of an incursion were important. It also focused on increasing biosecurity awareness and compliance.

The project had two components; the first being the Track and Trace System and the second regional simulation exercise to test the use of the data captured during the project.

Method
The project involved 90 properties across four NSW wine growing regions. These properties used the Onside Check-In App for 12 months to capture movement data associated with people, machinery/equipment and plant material. People movement, equipment and plant material were captured and declared as part of the check-in process. Vehicles were tracked using Knode data loggers attached to them.

The data was then used in a simulation exercise to identify the systems use and drawbacks and to investigate if having access to real time data could improve biosecurity preparedness and response activities.

Results/Conclusion
Results showed that outlier businesses may be able to resume business as usual much quicker if they are able to easily provide information on movements onto and off their properties. Response planning can be more strategic with resource allocation and routine surveillance can target higher risk entry and spread pathways. If the decision-making process was influenced by real time data, it may gain more support from Industry and possibly assist with funding future responses or ongoing surveillance.

A number of risks were identified with the use of new technology, including achieving widespread uptake across industry, data confidentiality and compatibility with government systems. There are also the issues of the rate of increase of new technologies, data breach or tampering. Unfortunately, data does not cover backyards or abandoned vineyards.

Overall, the project indicated that substantial cost savings could be made through the uptake and use of new technology and that preparedness efforts could be more strategic using real time data. However as new

technologies are developing quickly by different provider companies, keeping up with rapid change will be essential to ensure there is widespread uptake and consistent use of it across industry now and into the future.

The project highlighted the importance of government and industry working together to ensure that preparedness and response activities meet expectations of both and minimise the impact as much as possible.

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As part of the Managing Biosecurity Risks activity, funded through the Agricultural Innovation Hubs Program.
- NSW Department of Primary Industries
- Department of Agriculture, Fisheries & Forestry
- Southern NSW Innovation Hub
- NSW Wine
- Onside Technology

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Varroa mite detection technology (BeeRight) pilot study

Mrs Melissa Hindle, Ms Jessica May
[1]Department Of Agriculture, Fisheries and Forestry, Canberra, Australia

Biography:
Jessica May has been with DAFF since 2019, with experience in both the Australian Public Service and private enterprise as the CEO of her start-up Enabled Employment.

Jessica is a leader in strategic innovation, change management and reform and has a wealth of experience, currently studying an Executive Masters of Public Administration at the ANU. Jessica has received several awards throughout her career including 2017 Global Stevie Awards Entrepreneur of the Year, Asia, Australia or New Zealand, the National Telstra Business 2015 Woman of the Year - Startup category and a 2011 Prime Minister's Award for Excellence in Public Sector Management.

Abstract:
The Department of Agriculture, Forestry and Fisheries (DAFF) is partnering with CSIRO under the Catalysing Australia's Biosecurity (CAB) Initiative to launch a collaborative pilot study with the ACT Government, Queensland Department of Agriculture and Fisheries (QDAF), the University of Canberra, industry and registered Beekeepers on the east coast of Australia. This pilot study is trialling new hive health AI technology alongside eDNA technology which could assist in the fight against Varroa destructor and Varroa jacobsoni which have reached Australia in recent years.

Vimana Tech's BeeRight technology is a low-cost 'Internet of Things' (IoT) based solution, packed full of intricate sensors that provides valuable insights to beekeepers on the overall health of their hives and has the potential to detect Varroa mite. It can easily be installed into any hive without disrupting the bees or damaging the hive. BeeRight technology has successfully detected Varroa mite in New Zealand but as these bees behave differently to those in Australia, further testing is required here to build the necessary artificial intelligence (AI) models.

The ACT pilot will use a citizen science approach to trial BeeRight technology with up to 30 local backyard beekeepers/hobbyists in the ACT region. This is a unique opportunity to access urban and peri-urban areas in Australia that has been a challenge for government in the past and to also confirm whether the ACT continues to be free of Varroa mite. The pilot also explores the concept of seamless data exchange between the public, industry and government for early detection and response.

The NSW pilot will trial Vimana Tech's BeeRight technology on 150 hives in NSW. These hives are either infected with Varroa mite already or are placed within the management emergency zone. There will also be a citizen science component similar to the ACT approach with 10 privately owned hives.

ACT and NSW backyard beekeepers are very interested in taking part in this pilot as the technology could be a real game changer for beekeepers in cooler climates where opening hives for inspections is easier said then done.

During the Varroa response the ACT Biosecurity Team struggled to get beekeepers on board to undertake routine surveillance for Varroa. People didn't want to open their hives in coolers conditions or didn't agree with the alcohol washing approved method. 30 beekeepers volunteered to undertake the alcohol washing testing in line with the NSW response. If BeeRight is successful, hives would only need to be disturbed if a heath trigger is reached, this change with monitoring saw over 130 beekeepers expressing interest in participating in the pilot.

The technology will enable commercial beekeepers to monitor hives without labour intensive, invasive procedures and reduce the loss of bees. Being able to have real time hive statuses will enable beekeepers to streamline their operations and have confidence in hive health when sharing apiary sites or moving hives.

This Pilot is due to finish up in June 2024 with results and lessons learned available to be part of the presentation at the Symposium in August.

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‘Eliminate, minimise and/or mitigate’ – how can Australia meet new global biodiversity targets on invasive species?

Andrew Cox[1], Dr Andy Sheppard, Ms Carol Booth[1], Shalan Scholfield, Professor Melodie McGeogh, Ms Christine Milne
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Biography:
Dr Andy Sheppard is the Chief Research Scientist in CSIRO having joined the organisation in 1986 based in France. Based in Australia working on biosecurity and invasive species management. Current primary role is a secondment into the Commonwealth Department Agriculture Fisheries and Forestry as Co-Executive Director of DAFF-CSIRO Catalysing Australia's Biosecurity Initiative after instigating this partnership across both agencies. This $50-$100M Mission launched in early 2024. He is the non-residential Director of CSIRO’s European Laboratory in Montpellier since 2002.

Carol Booth is the Principal Policy Analyst for the Invasive Species Council. She leads the work for the Invasive Species Council's forthcoming State of Environmental Biosecurity Report on which this talk is based. Carol has an academic background in science and environmental philosophy, and has worked as an advocate, policy analyst and writer for environmental NGOs across many different nature conservation issues.

As the Principal Director of the Environmental Biosecurity Office (DAFF), Shalan's work focuses on reducing the impact of exotic and established pests, diseases and weeds, strengthening environmental biosecurity outcomes, responding to incursions, building community understanding and supporting research, development and extension. She works closely with state and territory jurisdictions, non-government organisations and stakeholders on a range of shared priorities. A graduate of the Australian Institute of Company Directors and with an honours degree in marine science, Shalan joined the department in 2010, having worked as a research scientist, and with the Australian Fisheries Management Authority prior.

Abstract:
Context: In December 2022, federal environment minister Tanya Plibersek attended COP15 for the Convention on Biological Diversity where Australia agreed to Kunming-Montreal Global Biodiversity Framework (GBF) that sets out 2030 goals and targets, including target 6 to prevent and manage invasive alien species threats. This was huge step forward for Australia in environmental conservation and now revised national environmental legislation is being prepared to support these objectives. The challenge now is achieving the invasive species target in the light of recent alarming trends in new naturalisations.

This session will discuss how Australia can achieve the invasive species target and explores whether policies such as Australia’s Strategy for Nature 2019-2030 and the National Biosecurity Strategy is fit for purpose in ensuring this target is met.

Intro (10 mins): Explanation of the invasive species target and its requirements, with a focus on the prevention elements of the target.

Panel questions (40 mins):
1. How well did Australia perform with respect to the last biodiversity target (Aichi target 9)? What were the reasons for this?
2. What needs to change pre-border for Australia to meet the GBF target 6?
3. What needs to change post-border for Australia to meet the GBF target 6?
4. Does Australia’s Strategy for Nature 2019-2030 and the National biosecurity Strategy provide a fit-for-purpose roadmap to achieve GBF Target 6?
5. What needs to change with respect to particularly prevalent groups of invasive species (each panelist to focus on one group, e.g. weeds, fish, pathogens)?

Audience questions (10 mins)

Target 6, Kunming-Montreal Global Biodiversity Framework:
Eliminate, minimise and/or mitigate the impacts of invasive alien species on biodiversity and ecosystem services by identifying and managing pathways of the introduction of alien species, preventing the introduction and establishment of priority invasive alien species, reducing the rates of introduction and establishment of other known or potential invasive alien species by at least 50 per cent by 2030, and eradicating or controlling invasive alien species, especially in priority sites, such as islands.

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Invasive species cost assessment for New South Wales: A rapid review of incurred and current costs

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[2]Centre for Environmental and Economic Research (CEER), The University of Melbourne, Parkville, Australia

Biography:
Dr Nicholas Moran is a Research Fellow in Biosecurity Analytics within the Centre of Excellence for Biosecurity Risk Analysis (CEBRA), at the University of Melbourne. His current work is focused on analysing the introduction pathways of invasive plants, animals, and pathogens to inform biosecurity decision making.

Abstract:
Estimating the costs of invasive species to the economy, environment and community is important for biosecurity decision making and resource allocation. As part of a broad, state-level invasive species cost assessment for NSW, an expedited systematic review ("rapid review") was conducted to compile cost estimates from published and grey literature, using the InvaCost database (v4.1) as the starting point. This major global database has been the foundation of global, regional, and national studies to estimate the current and cumulative costs of invasive species, including for the USA, North America, Central and South America, Europe, and Australia. InvaCost data was supplemented by an independent systematic literature search focused on NSW, to produce a comprehensive database of cost estimates either within or including NSW. Spatial modelling tools via the Biosecurity Commons platform were then used to partition and apply non-NSW specific estimates (e.g., national estimates) to NSW. Our findings support previous reviews, which show that invasive species costs in NSW are in the scale of billions of dollars annually. Additionally, this work highlights the value of open resources (e.g., Biosecurity Commons and InvaCost) to support biosecurity research and decision making in rapid timeframes.

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Aquatic Invasive Species Explorer - An interactive interface linking complex risk models and decision-support tools with every-day biosecurity decisions

Dr Petra Muellner[1,2], Dr Amy Kinsley[3], Dr Alex Bajcz[4], Nick Snellgrove[1], Dr Uli Muellner[1], Associate Professor Nicholas Phelps[4]
[1]Epi-interactive, Wellington, New Zealand, [2]Massey University, Palmerston North, New Zealand, [3]University of Minnesota - College of Veterinary Medicine, St Paul, USA, [4]University of Minnesota - Minnesota Aquatic Invasive Species Research Center, St Paul, USA

Biography:
Uli Muellner's broad experience around system architecture, data and reporting, coupled with a keen sense for quality execution, makes him one-of-a-kind in the information technology universe.
As the operational engine of our team he helps our clients navigate the technology jungle while overseeing our design and production pipelines. Uli ensures that our projects run like clockwork and our outputs are both precise and beautiful. He is also in charge of our Posit partnership programme; helping our clients getting the most out of R and Posit products.

Abstract:
Invasions of aquatic invasive species (AIS) have caused significant economic and ecological damage to global aquatic ecosystems. Once an invasive population has established in a new habitat, eradication can be financially and logistically impossible, motivating management strategies to rely heavily upon prevention measures to reduce the introduction and spread. To be productive, on-the-ground management of aquatic invasive species requires effective decision-making surrounding the allocation of limited resources.

Aquatic invasive species are one of the greatest threats to preserving Minnesota's aquatic natural resources and substantial resources are spent on county-based watercraft inspection programs. Using a data-driven approach to identify and prioritize waterbodies at high risk of invasion can help inform effective and efficient control programmes.

Researchers at the Minnesota Aquatic Invasive Species Research Centre have developed a suite of R and Python models to provide operational decision support in a variety of activities and outcomes across the Minnesota waterway and boater movement networks. These include optimising the placement of watercraft inspection stations at lakes, estimating infestation risk scores for individual lakes, predicting results of different intervention activities and collaboration efforts between counties.

These models have been embedded in the AIS Explorer, an online user-friendly dashboard and decision support tool for local and state managers. This project showcases how quantitative modelling, implemented in specialist software can directly be linked with operational decision-making in biosecurity and connect field work conducted by regional authorities with cutting edge science in a timely manner. A diverse set of technologies, like R, R Shiny, Python and cloud computing was integrated to a create an analytically complex, yet user-friendly tool that matches stakeholder needs. The AIS Explorer (https://www.aisexplorer.umn.edu/) supports stakeholder engagement and smart use of data for rapid detection and response to biosecurity threats in a practical and cost-effective way.

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The Varroa Mite Response: Australia's largest plant biosecurity emergency response

Dr Shannon Mulholland[1], Chris Anderson, Satendra Kumar, Shane Hetherington, Lloyd Kingham, Adrian Knobel, Louise Rossiter Louise Rossiter, Sandra McDougall
[1]NSW Department of Primary Industries, Ourimbah, Australia

Biography:
Dr Shannon Mulholland is a senior plant biosecurity officer based in the Plant Biosecurity Planning and Preparedness team of NSW Department of Primary Industries. Presently she works with a myriad of plant industries across NSW preparing for and responding to new pest and disease incursions. Shannon has extensive experience in emergency management, routinely involved in biosecurity emergencies, supporting an evidence-based biosecurity-focused approach to response efforts for emergency plant pests. A key area of interest for Shannon is the development of preparedness strategies, combining technical input and industry engagement to develop sound strategies for responding to pest and disease incursions.

Abstract:
Introduction: Varroa mite (Varroa destructor) is an ectoparasite of European honeybees (Apis mellifera). Varroa parasitises both adult and juvenile bees, can transmit a number of viruses and at high enough levels can lead to colony collapse. Given much of our agricultural industry is supported by honeybee pollination varroa poses a threat to 16 different plant-based industries across Australia. Varroa mite was detected in Australia on 22 June 2022 at the Port of Newcastle within sentinel hives that are part of the National Bee Pest Surveillance Program. This triggered the largest plant biosecurity response in Australia supporting an industry comprised of 12,000+ commercial beekeepers and recreational beekeepers in NSW.

Aim: Recognising the threat of varroa to Australian agriculture NSW DPI had a pre-agreed eradication strategy with the Australian beekeeping industry.

Methods: A 72hr hive standstill occurred in the early days of the response to halt further bee movements, later replaced by movement controls under the Emergency Order. An eradication zone was imposed on a 10km radius from every infested premise, a surveillance zone from 10-25km from each detection and the remainder of NSW was classified as a general emergency zone.

Results: The varroa response was large and complex. Over 2500 personnel participated in response efforts including industry beekeepers, biosecurity agencies from across the country and support agencies such as RFS and SES. Crews were operating almost around the clock to complete:

- Delimiting surveillance with a total of 72,480 hives surveyed across 4,803 cases
- Industry led surveillance where beekeepers surveyed a further 227,225 of their own hives
- Hives within 10km of an infested premise were euthanised by response teams to eradicate the mite with 60,575 hives euthanised across 4,311 cases
- Disposal operations engaged the Public Works Authority to assist
- The wild European honeybee baiting team completed an ambitious array of bait stations targeting wild honeybees in the eradication zone
- 35 penalty notices were issued with 3 prosecution cases before the courts for breaches of the Emergency Order
- 611 media enquiries, 205 interviews, 256 email newsletter updates, 14,812 calls to the hotline, 4,283 calls to resilience officers, 221 posts on social media to keep the community up to date with new detections and to combat misinformation

Conclusion: By September 2023 the eradication zone had exceeded 1,512,877 ha across NSW. Ultimately spread of the mite and non-compliance from some in the industry saw the extent of the infestation grow to a point where eradication was no longer technically feasible. NMG agreed on 19 September 2023 that the response would change direction from eradication to management. The program team overhauled the Response plan and work will continue during 2024 to support industry in learning how to manage this new pest. NSW DPI are now exploring the lessons learned. Work will also be required to help horticultural

industries adapt to changing pollination practices. As varroa spreads and wild honeybees are impacted new strategies will be required to ensure pollination needs are able to be met while living with Varroa.

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Review of transmission pathways and surveillance strategy in an Australian context for Varroa destructor

Dr Shannon Mulholland[1], Dr Catherine Fraser[1], Sheila Stokes[1]
[1]NSW DPI, Orange, Australia

Biography:
Dr Shannon Mulholland is based in the Plant Biosecurity Planning and Preparedness team of NSW Department of Primary Industries. Presently she works with a myriad of plant industries across NSW preparing for and responding to new pest and disease incursions.

Dr Catherine Fraser is the NSW state epidemiologist for events including diseases and pests of terrestrials, aquatics, plant pests and invasive species, achieving Memberships of the ANZCVS Epidemiology chapter in 2022.

Both Shannon and Catherine have extensive experience in emergency management, routinely involved in biosecurity emergencies, supporting an evidence-based biosecurity-focused approach to response efforts for emergency plant and animal pests and diseases.

Abstract:
Introduction: In June 2022 an emergency response was launched to contain and eradicate Varroa mite Varroa destructor (VDM) impacting the European honeybee Apis mellifera in NSW. Initially, strategic targets for surveillance were set based on known transmission pathways, based on international literature on pest biology, knowledge of local spread between nearby premises and via tracing of human-mediated spread of hives and equipment onto and off infested premises. Analysis of data collected from infested premises was undertaken throughout the response, with transmission pathways displayed in network maps to understand how the parasite was moving in an Australian context. This led to the observation that people networks, not linked to direct hive movements, were an important risk factor and that mapping these networks and understanding the community connections were key to predicting new areas of risk for varroa spread.

Methods: An epidemiological assessment was undertaken for each infested premises when detected, examining tracing data, potential sources of introduction and spread. This was summarised in epi network diagrams created in lucidchart™. We also analysed beekeeper registration, hive movement declarations and known beekeeper commercial and recreational networks. This enabled us to include analysis of beekeepers with multiple hive locations in different VDM Emergency Zones, and social and commercial beekeeping networks, allowing us to rank surveillance targets based on levels of risk. Simultaneously, surveillance within the Surveillance Emergency Zone (SEZ) changed from normal routine surveillance to targeted risk based surveillance based on the analysis outcomes.

Results: Transmission pathways such as contact between infested bees and equipment and movement of infested hives was spreading mites between apiaries, as predicted. A small degree of natural spread was occurring in some areas due to bee activity and foraging. Human-mediated spread was the primary factor behind large geographic leaps in transmission to new areas. Poor biosecurity between apiaries was responsible for some mite transmission even in the absence of hive or bee movements. It also highlighted that people networks involved in human-mediated spread had disproportionate risk profiles and nodes of transmission were identified in some social and commercial beekeeping networks. The response team was able to communicate this knowledge of transmission to industry via public briefings and email newsletter updates, encouraging beekeepers to improve their biosecurity practices and prevent further spread.

Discussion/Conclusion: Identifying new risk areas permitted amendments to the surveillance strategy, resulting in a significant increase in detection rates of infested premises in early 2023. Understanding the human-mediated pathways better also allowed us to modify and even anticipate surveillance and public information needs resulting in a feedback loop of traditional epidemiological tools, surveillance and public

education to limit spread of the pest. During a large biosecurity response, it is critical to regularly review surveillance and tracing data to monitor trends and risk profiles in the area of operation.

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Assessing and managing the ongoing risk of non-native invertebrate detections in the Antarctic region

Dr Isabelle Onley[1,2], Dr Melissa Houghton[3], Ms Kirsten Leggett[4], Prof Phill Cassey[1,2], Dr Zach Carter[1,2], Dr Justine Shaw[5]
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Biography:
Dr Isabelle Onley is an early career researcher interested in developing adaptive management strategies for species and ecosystems under climate change. Her research to date has combined a variety of disciplines, including genetics, morphology, field ecology and environmental monitoring to develop improved conservation strategies in a changing climate, with a particular focus on translocation. She also has experience in policy development and stakeholder engagement at both state and Federal levels, and is particularly interested in bridging the gap between science and policy for improved decision-making towards future-proofing species and ecosystems. Isabelle recently participated in the Denman Terrestrial Campaign in deep-field Antarctica.

Abstract:
The Antarctic continent has remained relatively free from the impacts of invasive species to date. However, Antarctica is under increasing anthropogenic pressure from both human activity and climate change, potentially elevating the risk of novel alien species introductions. Scientific research and the maintenance of research stations by Antarctic Treaty Parties requires the transfer of large amounts of equipment and cargo, which can harbour biosecurity risk material. Our study assessed two decades of data collected by the Australian Antarctic Division on the detection of biosecurity risk material in its facilities and vessels, both during transport and in Antarctica. We used this data to identify emerging risk species and pathways, and to compare the variability in detections over time. We also constructed a consequence risk matrix based on the data to facilitate more effective responses and resource allocation to future detections, translating our research findings into guidance for decision-makers. We found that despite the development of policy instruments for the prevention of alien species introductions to Antarctica, the risk of introductions is ongoing. Live invertebrates are at times transported to Antarctic research stations, with flies and spiders the most common taxonomic groups. Live spiders were found to be particularly prevalent in cargo, indicating that additional treatment may be required during cargo packing prior to transportation. While these species are yet to establish in the Antarctic environment, this work demonstrates the need for ongoing training, investment and support for expeditioners in the reporting and management of non-native species detections. We therefore provide tools and recommendations for decision-makers and on-ground managers in the Antarctic biosecurity space based on our research.

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The methodology of biosecurity system evaluation – the New Zealand case study

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Biography:
Dr Julia Polak is an econometrician specialising in biosecurity analytics. Her research focuses on modelling the economic value of biosecurity systems to support data-informed decision-making.

Abstract:
New Zealand operates a comprehensive biosecurity system to protect its extensive natural and agricultural resources, along with cultural assets. Substantial research efforts have been made to evaluate specific biosecurity measures and the damages incurred from particular biosecurity threats. However, no comprehensive attempt has yet been made to evaluate the entire system. The value of the entire biosecurity system and its components is of a great interest to government, Treaty partners and the public, and is crucial for ensuring appropriate resource allocation for the maintenance and optimization of the biosecurity system. Evaluating the whole biosecurity system requires a novel methodology. Such a methodology was recently developed and applied to Australia's biosecurity system. It is now being adjusted for New Zealand's biosecurity system. We are developing a comprehensive, dynamic and large-dimensional simulation model to estimate the value of New Zealand's biosecurity system. Starting with detailed asset layers and potential damage functions from invasive pests, the model will simulate the arrival, spread, and impact of biosecurity hazards (in terms of asset yield or value reduction) under different biosecurity operational scenarios. It will also estimate the economic value of biosecurity interventions.

This talk will present the methodology for estimating the tangible value of New Zealand's biosecurity system, as a whole, in terms of its impact in safeguarding New Zealand's natural, cultural and economic assets. This is a large and ambitious project, in which we estimate the value of seventeen NZ assets (e.g. agriculture, fishery, flood control, gene pool, tourism and marine non-market services) and how they may be damaged by exotic invaders (pests and pathogens) over time. We are considering 48 biosecurity hazards that may affect New Zealand's vegetation, agriculture, animals, aquaculture and marine ecosystems, and cultural assets.

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The role of APVMA in biosecurity responses: Off-label use of chemicals against invasive ants

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Biography:
Nirosha Ranawaka is a member of the Permits team at the Australian Pesticides and Veterinary Medicines Authority (APVMA). The APVMA is the Australian national regulator for agricultural and veterinary chemical products, which regulates products up to, and including, the point of sale. The Permits team evaluates applications for permits, which allow offences against certain sections of the Agricultural and Veterinary Chemicals Code Act 1994 (The Code). Permits can be issued for minor, emergency, and research use of chemical products, as well as for the export of unregistered products, and other specific offences against The Code.

Abstract:
Invasive ants have become a major biosecurity concern in Australia due to their impacts on agriculture, native fauna, wildlife and social wellbeing which can directly affect a country's economy.

The major invasive ant species in Australia include Red imported fire ant (Solenopsis invicta), Argentine ant (Linepithema humile), Yellow crazy ant (Anoplolepis gracilipes), African bigheaded ant (Pheidole megacephala), Tropical fire ant (Solenopsis geminata) and Electric ant (Wasmannia auropunctata). Their ability to compete with other invertebrate species for food and space, and to thrive in different ecological conditions have enabled them to spread and establish quickly in the countries they invade.

The Australian Pesticides and Veterinary Medicines Authority (APVMA), as the national regulator for pesticides, is responsible for assessing and approving chemical options for eradication and ongoing management of these invasive ant species.

The APVMA authorises off label use of registered and/or unregistered chemical products via permits. Emergency Use Permits are often issued during the initial response to a biosecurity incident. Subsequently, uses might be transitioned to minor use permits to assist in the ongoing management of these highly destructive ant species.

Before the APVMA can authorise any use under permit, the Agency must conduct an evaluation to ensure that the proposed uses are safe for users, the public, and the environment; will not prejudice Australia's trade; and will be efficacious against the target organism.

This poster highlights the major species of invasive ants currently found in Australia and the types and number of permits that the APVMA has issued in response to these incursions. It also outlines what active constituents are available through permits to control invasive ants in Australia and what situations and geographic regions are covered by these APVMA-issued permits.

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Biosecurity risk calculator: Tracking biosecurity risk of export fruit along the cold supply chain

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Biography:
Dr Himali Ratnayake is an ecophysiologist and ecological modeller who is passionate about doing impactful, pragmatic science and communicating her research with stakeholders at all levels. Himali's doctoral research focussed on the impacts of extreme heatwaves on the physiology of Australian flying-foxes. In her current role with CSIRO, Himali leads the development of a 'Biosecurity Risk Calculator', which aims to provide data-driven analytics to calculate and update insect pest infestation risk in fresh produce consignments as they pass along the supply chain.

Abstract:
Phytosanitary requirements for imports and exports are typically very prescriptive, with a set of entry requirements needing to be met before trade can proceed. This approach, however, is often costly for business to implement and regulators to oversee and can result in excessive treatment requirements. Further, a prescriptive approach overlooks the contribution that commercial systems and technologies may make to risk reduction and does not reward good industry practice. There is growing interest across governments and industry to establish a more risk-based approach that relies upon continuous assurance and harnesses sensor and digital technologies to automate and streamline compliance. To support this transition, we have prototyped a 'Biosecurity Risk Calculator' that uses data-driven analytics to track infestation risk in consignments as they pass through production and the supply chain. Our initial focus was on the effect of cold storage on infestation rate in horticultural produce as cold temperatures are used as an end point treatment as well as a storage option along most of the supply chain. We collated data from 24 published studies which measured the time taken for different fruit fly species to die in different host fruits at different set temperatures. We then created a model that can predict how long it would take for a particular fruit fly species to die within a given temperature range. We used this model to quantify the mortality effect of exposure to variable temperatures across the supply chain. Our analysis showed that in some cases residual risks can be very low, suggesting the mandated cold disinfestation treatment (at a particular temperature for a particular time duration) may not be necessary to meet the acceptable level of biosecurity protection in the receiving market. The calculator could be used by regulators to make decisions based on real-time risk analysis, thereby making more efficient use of limited inspection resources. It can also assist commercial entities maintain quality and reduce costs related to pest detection and management. Ultimately, the Biosecurity Risk Calculator could be developed for a wide variety of uses beyond fresh produce, such as to calculate the biosecurity risks associated with shipping vessels, grains, and seeds for planting.

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Uncovering Scale's Sooty Secrets: Sooty Mould Communities Reflect Scale Insect Infestation on a Remote Island

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Biography:
Zohara Scott is a PhD student at Murdoch University with an undergraduate degree in Horticultural Science from North Carolina State University and an honours degree in Environmental Science from Murdoch University. She currently researches native Ficus trees in the Western Australian Pilbara and their interactions with non-indigenous scale insects. Non-indigenous scale insects can result in heavy sooty mould infestations and their combined influence can have a considerable negative impact on host plant health. Ficus trees are an important source of food and shelter for Western Australian fauna, therefore protecting their health aids in protecting their surrounding ecosystem.

Abstract:
Sooty moulds are communities of saprophytic fungi that feed on honeydew excreted from Hemipteran insects. Hemipteran infestations combined with sooty mould can cause canopy dieback, reduced fruit production, and at times host plant mortality. Little is known about sooty mould communities, the species that comprise them, their growth, and the factors that influence their abundance. Therefore, we investigated the influence of the honeydew excreting non-indigenous scale insect Saissetia miranda, on sooty mould community composition. On a remote island in Western Australia, samples of sooty mould were taken from Ficus brachypoda trees with either a presence or absence of the honeydew excreting Saissetia miranda. Species in the sooty mould communities were identified using metabarcoding of the ITS2 region of their DNA. We found that the absence of Saissetia miranda led to the sooty mould community being dominated in abundance by a single species. When Saissetia miranda were present, there was a more even composition of a greater number of sooty mould species. This research establishes an understanding of how non-indigenous scale insects are driving changes in sooty mould communities. Future research will help inform how the changes within sooty mould communities identified in this study impact the health of host plants.

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Detection to eradication: a robust decision-making framework for invasive species management programs

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Biography:
Jules Seabright has worked with the Wet Tropics Management Authority since 2021, supporting the delivery of the successful Yellow Crazy Ant Eradication Program.

Abstract:
Invasive alien species (IAS) are significant drivers of biodiversity, agricultural, and economic losses both in Australia and globally, and are frequent targets of local eradication attempts. Eradication projects typically progress from detection of new incursions to delimitation of the extent of infested area, implementation of control measures, and evaluation of success. The final decision is whether to declare the affected area free of the invasive organism or transition it to ongoing management.

One of the greatest challenges in invasive species control is confident decision-making around progression of affected areas through the eradication process, and specifically how decision-makers can be confident that eradication has been achieved.

The absence, presence, and extent of the target species population in the management area may be assessed via a range of detection techniques, which vary in sensitivity. Inaccurate determinations of absence, or incorrect progression decisions, can incur unnecessary costs and risk jeopardising entire projects. IAS also often exhibit different ecological, behavioural, phenological, and other traits in different invaded areas. This further complicates management, as site-specific knowledge and strategies are necessary to optimally target IAS.

There is currently little consensus around what information is required for practitioners to make decisions around progression of infested areas through the management process, and ultimately the criteria under which an area can be conclusively determined to be free of the target species. While many eradication projects have developed decision-making frameworks, few such frameworks have been openly shared, and the information required to rapidly develop an effective, site- and species-specific decision framework and management plan is often not readily available to practitioners. This hinders eradication efforts, as managers and practitioners must divert critical early resources away from effective rapid response.

Here we present “Detection to Eradication” (D2E), a data-driven decision-making framework used by staff of the Wet Tropics Management Authority (the Authority) to implement its successful Yellow Crazy Ant Eradication Program. The Authority administers this program with the goal of eradicating invasive yellow crazy ants (Anoplolepis gracilipes) from within and near the Wet Tropics World Heritage Area, Queensland, a sensitive area of immense conservation value. The D2E process progresses infestation areas from detection and delimitation through treatment, surveillance, and finally eradication stages. Each stage transition is driven by analysis of comprehensive ecological, GIS, and other data.

We outline the key information required to evaluate treatment sites’ suitability for progression through the D2E management process. We detail case studies of site progressions and provide insight into the experiential development of the D2E framework, including targeted research that has substantially informed its development.

The Authority is a leader in innovation, immersion, and inclusivity. The team incorporates emerging technologies to improve efficiencies and detection probability, invests in upskilling the local community to build capacity towards legacy monitoring of potential future incursions, and builds and maintains strong knowledge-sharing and operational partnerships with local industry, local government, Indigenous Ranger groups and other biosecurity organisations.

The Authority's D2E process is adaptable and has broad application and high value to other IAS control programs in Australia and worldwide.

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Regulation of Agvet chemicals: APVMA approval of permits for biosecurity risks

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Biography:
Nisha Sharma is a member of the Permits team at the Australian Pesticides and Veterinary Medicines Authority (APVMA). The Permits team evaluates applications for permits, which allow offences against certain sections of the Agricultural and Veterinary Chemicals Code Act 1994 (The Code). Permits can be issued for minor, emergency, and research use of chemical products, as well as for the export of unregistered products, and other specific offences against The Code.

Abstract:
The Australian Pesticides and Veterinary Medicines Authority (APVMA) is the national regulator responsible for assessing and approving agricultural and veterinary (AgVet) chemical products for supply and use in Australia. In any emergency situation of pest incursion or exotic disease outbreak, the APVMA supports the biosecurity responses by prioritising timely approval of emergency permits. These approvals allow the safe and effective use of registered or unregistered chemical products according to permit conditions.
Timely approval of emergency permits in response to biosecurity risks forms a vital component of Australia's disease prevention, control, and eradication strategies. Appropriate access to chemicals by stakeholders, government agencies, and members of the public is important in controlling the spread of diseases and pests which, in turn, protects human health, environmental safety, animal welfare, and trade. Sometimes emergency permits are also approved prior to pest incursion or disease outbreak for preparedness.
The APVMA considers any written submissions from the relevant State Coordinator or Government authority to the effect that there is a genuine emergency for which the use of a particular product or constituent is needed as strong evidence of that fact.
Emergency permits include authorisation of products that assist in, but are not limited to, the following scenarios:

i. Generating immune responses to pathogens, such as vaccines.
ii. Eliminating the pathogens along with the vectors that amplify and carry them, such as mosquito repellents.
iii. Preventing and reducing risks of transmission by decontamination, such as disinfectants.
iv. Eradication of individuals and populations of exotic pest species.
v. Treatment of goods at the border to prevent outbreaks.

The APVMA is aware that the issuance of a biosecurity preparedness permit to commercial entities may give the impression that a disease or pest is present, or is reasonably likely to occur, in Australia. This could impact Australia's international disease-free status and may subsequently prejudice trade or commerce. To this end, the APVMA has a policy that permits to assist in biosecurity responses to exotic diseases or pests that are not currently present in Australia should be held and managed by government authorities. In the event of an incursion, these permits may potentially be migrated to industry holders as response strategies are established, or if efforts shift from eradication to management.
Some examples of preparedness emergency permits include vaccines approved for use against foot and mouth disease (FMD) and lumpy skin disease (LSD)that can be imported and used in Australia if an outbreak of either disease is declared. During the recent outbreak of FMD in Indonesia, the APVMA authorised products for use in footbaths and decontamination of various materials entering Australia to help prevent the entry and spread of the virus. Permits were also issued prior to, and following, the detection of varroa mites to assist in surveillance, diagnosis, eradication, and control efforts.
This presentation will explore how the APVMA plays an integral role in the protection of the community, food safety, environment, biosecurity and trade.

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Assessment of farm biosecurity practices by sheep and cattle producers in South Australia using an online application

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Biography:
Dr Jarunee Siengsanan-Lamont (Jar) is a veterinarian from Thailand who is experienced in zoonotic disease epidemiology and data analyses. She completed the Master of Veterinary Science (Conservation Medicine) and Doctor of Philosophy in Veterinary Epidemiology at Murdoch University, Western Australia. Jar had worked on a number of academic research and veterinary development projects in Southeast Asia and joined the Department of Primary Industries and Regions South Australia (PIRSA), Animal Health in late 2022. Her role is to provide epidemiological analyses and capacity buildings for animal health-related decision-making.

Abstract:
Verifiable biosecurity practices are essential for maintaining South Australia's (SA) market access and the status of freedom from key animal diseases. The Livestock Production Assurance program provides guidelines on farm management practices and key biosecurity areas that producers must adhere to and undergo audits for compliance. However, information about the farm biosecurity practices implemented by these producers is not publicly available. The Department of Primary Industries and Regions South Australia (PIRSA) One Biosecurity program (1B) addresses this gap by providing SA sheep and cattle producers with a secure online application to develop a biosecurity plan. Data gathered from the application is used to evaluate the effectiveness of biosecurity measures adopted by SA producers and assess the vulnerability of specific sectors assisting PIRSA decision-making in enhancing state biosecurity.

The 1B questionnaire has twenty questions with multiple choices addressing five key components of biosecurity: security of the production area, animal health management, introduction of livestock, other management practices and emergency animal disease (EAD) preparedness. Selections of answer choices indicating the practices required for effective farm biosecurity were used as criteria for minimum standard requirements of the biosecurity components or sub-components.

The following are the results of data collected between February 2018 and January 2023. A total of 831 biosecurity plans (284 cattle and 547 sheep) were completed by 693 properties with a unique property identification code. Five hundred sixty of these properties produced a single species, either cattle or sheep, while 133 properties produced both and/or multiple different production systems. 70.9% of the 831 participating producers classified themselves as commercial enterprises. 83.5% (out of 284) of the cattle producers and 77.9% (out of 547) of the sheep producers were meat and meat/wool enterprises, respectively. Thus, this dataset primarily represents these groups of cattle and sheep producers. The majority of participating producers met the minimum standard for the biosecurity components of the security of production area (including farm security and off-farm vehicle/equipment management), animal health management, the introduction of livestock, other management practices on traceability, feed, effluent and waste, feral animals, and animal welfare. Areas identified for improvement included visitor management practices and the presence of contingency plans for potential EAD outbreaks. An important lesson from the data analysis was that questions with answer choices specifying individual practices made drawing conclusions on biosecurity effectiveness easier.

In conclusion, the 1B application serves as a valuable platform for gathering and analysing farm biosecurity data, enabling assessments of overall biosecurity effectiveness and vulnerability across livestock sectors in a consistent manner. It aids producers in formulating biosecurity plans, helps industries comprehend their biosecurity status, and supports policymakers in implementing policies and programs to enhance state biosecurity and preparedness.

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Modelling workflows for rapid outbreak appraisal, decision- and policy-support

Associate Professor Simon Firestone[1], Dr Chris Baker[1], Dr Sharon Roche[2], Mr. Simin Lee[1], Dr Meryl Theng[1], Dr Emily Sellens[2], Professor Mark Stevenson[1], Dr Robyn Hall[3], Mr Akshay Gohil[1], Dr. Andrew C. Breed[2]
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Biography:
Dr Meryl Theng is a Research Fellow in Biosecurity Modelling at the University of Melbourne. She works on modelling projects on a range of biosecurity, epidemiology, and ecology topics, which include development of decision-support tools for emerging livestock disease outbreaks and impact estimation of novel pests and diseases on Australia's industry and environment.

Abstract:
In the early stages of outbreaks, modelling and other epidemiological analyses can provide vital decision-support. This project aimed to develop decision-support tools including epidemiological models for use during animal disease outbreaks in Australia.

A workshop of experts and stakeholders was convened to reach agreement on national priorities and actions, and to inform the development of modelling tools and workflows for rapid outbreak appraisal and decision-support. Needs were considered within a national framework of key questions, tools and human resources. Based on the outputs of the workshop and further stakeholder consultation, planning and development of tools and a workflow was undertaken and tested on real and simulated outbreak datasets.

Specific questions that modelling could help answer related to outbreak origin, scale, spread, severity, populations at risk, impacts/costs, early disease indicators that warrant policy changes, resource allocation, impacts assessment and cost-benefit analysis of control options. A comprehensive modelling workflow plan was developed including modules for: descriptive/spatiotemporal analyses, dynamic transmission modelling/forecasting, ecological niche modelling (for diseases involving vectors and/or wildlife), phylogenetic modelling and airborne dispersal modelling. The outputs intended to guide rapid appraisal, risk assessment and policy development early in outbreak response.

The descriptive/spatiotemporal and dynamic transmission modelling/forecasting modules have been developed and implemented. Their outputs have been integrated into an interactive user interface and their accuracy and usefulness tested at early stages based on time-slices of datasets from the outbreaks of foot-and-mouth disease in the United Kingdom (2001) and equine influenza in Australia (2007).

This project has identified critical modelling questions to enable decision-support during the early phase of animal disease outbreaks, planned a comprehensive workflow of modelling tools, developed and tested key modules. Further work will involve working on additional outbreak datasets and with the wider network of stakeholders to address critical modelling gaps in preparedness for outbreaks.

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Invasion Alert – using machine learning to identify invasive ants

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Biography:
Associate Professor Melissa Thomas is the Deputy Director of Biosecurity and One Health Research Centre within the Harry Butler Institute at Murdoch University. She is also a member of the Biosecurity Council of Western Australia. Melissa's research encompasses the entire biosecurity continuum from pre-border mitigation strategies, border quarantine procedures, post-border detection, and invasive species management. Before her position at Murdoch University, Melissa was the Biosecurity Scientist at Chevron Australia Pty Ltd.

Abstract:
Invasive ants are one of the most serious biosecurity risks in Australia. Six of seven high priority invasive ants present in Australia are ranked among the most notorious invasive pests globally. Early detection and eradication are crucial for limiting the impact of these ants, however current practices for identifying invasive ants are time and labour intensive and rely on ever shrinking taxonomic expertise. To help non-specialists determine if an ant is likely to be one of seven high priority species, we have developed an ant identification platform. The platform uses a hierarchical deep learning-based machine learning approach to identify seven invasive ant species that pose a high risk to Australia. The machine learning algorithm has been trained on over 200,000 individual ants from 15,000 images collected from across Australia. Our extensive tests show that the algorithm currently provides 90% or greater correct predictions of the seven target species. Citizen scientists will be able to access this tool using a mobile application on both Android and iOS devices.

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Unregulated trade of alien pets in Australia: the emerging challenge of ‘fake’ species

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Biography:
Through Dr Adam Toomes's PhD and postodoctoral research, Adam have over 6 years of experience studying the role of the international pet trade as a source of both biosecurity risks and threats to species conservation. Through a variety of digital and in-person monitoring methods, Adam's research aims to build towards a comprehensive understanding of trade dynamics, including the identification of trade in high-risk alien species. By collaborating with government and biosecurity stakeholders, Adam aims to support the continued improvement of biosecurity & conservation practices in Australia.

Abstract:
The international pet trade is a known and growing pathway for the spread and introduction of invasive alien species. The quantity and diversity of alien pets entering Australia, both legally and illegally, is increasing over time (Toomes et al. 2019; 2023), leading to establishment of alien reptile & freshwater fish populations as well as wild incursions of other vertebrate taxa. Australia’s ability to identify such biosecurity threats, and to subsequently mitigate or prevent biosecurity impacts, is dependent on effective monitoring of trade as well as rigorous species-specific impact assessments. Such information strongly influences the way that State and Commonwealth governments regulate trade, such as prohibition of declared pests.

Our research into Australia’s domestic trade of alien vertebrate pets has identified an alarming number of alien species being traded on readily accessible e-commerce platforms. This includes over 550 species of ornamental fish, of which 179 are illegal to commercially import into Australia. While this trend is highly noteworthy (given that 10 of the last 28 alien fish establishments in Australia originate from the ornamental trade), it is arguably overshadowed by a more concerning trend. There were at least 50 distinct taxa of alien fish traded online in Australia that we could not identify to species level. This includes animals that are not yet described by science (e.g., wild-harvested cichlid fish from Lake Malawi; Msuka et al. 2022) that traders and hobbyists have created their own naming conventions for (fake species names or ‘pseudo taxa’). It also includes animals that are the result of extensive hybridisation or captive breeding to produce new colour and morphology varieties (termed ‘morphs’; Novák et al. 2022). As we cannot associate scientific species identification with the trade of these animals, their invasion risk remains unknowable, though some morphs such as the famous flowerhorn cichlid have become invasive elsewhere in the world and clearly pose a risk to Australia.

The trade of most of these ‘pseudo-taxa’ is almost exclusively exempt from any State-specific controls, and despite the fact that no hybrid animals are permitted for live import, the reality is that many alien pets are being traded online in a functionally unregulated manner; for example, we detected over 18,000 individual alien fish for sale over just a 3-month period. We recommend that Australia adopts a more precautionary approach to its regulation of the alien pet trade, in line with its biosecurity priorities. Specifically, we recommend that the trade of animals not identifiable to species level is either prohibited or subject to a permit system where owners must report which hybrid/morph they possess & trade. This would, at a minimum, allow Australian biosecurity practitioners to understand which pseudo-taxa are most prevalent in their relevant jurisdictions. Additionally, further work is needed to tie pseudo-taxa naming conventions to scientific species or genera (such as the work of Novák et al. 2022), so that appropriate risk assessments can be conducted. Overall, there are multiple feasible management strategies that should be considered before the trade of alien pseudo taxa continues to proliferate.

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Saleyard Surveillance for Foot and Mouth Disease and Lumpy Skin Disease in New South Wales

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Biography:
Alliza Bartley is a Project and Policy Officer in Animal Biosecurity, who works on a variety of projects within the team focusing on data analysis, enhancing data capture methodologies, and utilising Geographic Information Systems (GIS) and Power BI for business intelligence. Alliza has a passion for promoting evidence-based decision-making in animal biosecurity.

Cecily Moore is a Senior Veterinary Policy and Project Officer in the NSW Department of Primary Industries Animal Biosecurity Team. She has interests in Epidemiology and One Health, particularly in emerging diseases.

Abstract:
The Australian meat industry is crucial for both economic stability and food security, domestically and globally. Diseases like Foot and Mouth Disease (FMD) and Lumpy Skin Disease (LSD) pose significant threats to the industry. To mitigate these risks, early detection is essential. A pilot saleyard surveillance program was implemented by the New South Wales (NSW) Department of Primary Industries (DPI) and Local Land Services (LLS) with an aim to; i) identify suspect cases of FMD and LSD requiring further investigation; ii) rapidly conduct FMD and LSD investigations and exclusions; iii) support prompt management of FMD or LSD outbreaks at saleyards, and iv) provide evidence of absence from infection with FMD and LSD. The program inspected cattle for clinical signs consistent with FMD or LSD in saleyards across NSW. Epidemiological analysis demonstrated low sensitivity for early disease detection (4%) but high sensitivity for evidence of absence (98-99%). The program's value lies in providing evidence of disease freedom rather than early detection. Recommendations include optimising resource allocation, considering alternative surveillance methods, and assessing the program's cost-effectiveness compared to other surveillance strategies.

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The Australian Biosecurity Genomic Database

Dr Jana Batovska[1], Dr Peter Mee[1,2], Dr Natasha Brohier[1], Dr William Wong[3], Dr Stacey Lynch[4], Dr Brendan Rodoni[1,2], Dr Fiona Constable[1,2]
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Biography:
Dr Jana Batovska is a Research Scientist with Agriculture Victoria Research specialising in molecular virology. Her role involves the development and implementation of high-throughput sequencing methods to support veterinary biosecurity and one-health surveillance activities. Jana's research includes enhancing arbovirus surveillance using metatranscriptomic techniques and the development of genomic resources to support the detection of nationally notifiable animal diseases. Jana is also experienced in utilising genomic epidemiology to help investigate virus emergence and transmission in response to animal disease outbreaks such as avian influenza and Japanese encephalitis.

Abstract:
High-throughput sequencing (HTS), or next-generation sequencing, is a technology platform enabling us to build smarter, stronger national biosecurity systems for the detection and identification of novel and existing pathogens. However, for HTS users and biosecurity agencies to make informed decisions about reporting viruses of biosecurity concern through HTS data analysis, there is a requirement for a curated database of verified genomic sequences that is efficiently adaptable to new biosecurity risks. Without this curated database, HTS users commonly use publicly available genomic databases that contain vast volumes of sequencing data that encompass all taxa, creating complexities in HTS analysis and impeding rapid pathogen identification. Problematically, these large, non-curated databases also contain many partial and misclassified sequences, leading to incorrect taxonomic identification of pathogens from HTS data.

We present the Australian Biosecurity Genomic Database (ABGD), a curated collection of reference viral genome sequences based on the Australian national notifiable disease lists for both terrestrial and aquatic animals. The database includes a single verified sequence (the exemplar species sequence, where relevant) for each of the 89 virus species across 31 viral families that are associated with or cause these notifiable diseases, as recognised by the World Organisation for Animal Health. The open-source ABGD on GitHub provides usage guidance documents and is intended to support building a culture in Australian HTS communities that promotes the use of quality-assured, standardised, and verified databases for Australia's national biosecurity interests.

Database URL: https://github.com/ausbiopathgenDB/AustralianBiosecurityGenomicDatabase

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Is the NT sentinel cattle program adequate for its purpose?

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Biography:
Dr Vidya Bhardwaj is Director of the Berrimah Veterinary Laboratory, the government lab in the NT focused on surveillance and diagnoses of notifiable diseases. Combining her veterinary degree with a research background in veterinary microbiology, Vidya's passion is the management of infectious diseases in animals. Constantly updating and innovating systems and processes in the lab, Vidya's priority is the rapid and accurate diagnosis of disease and effective and adequate surveillance in the Norther.

Abstract:
Herds of sentinel cattle are maintained in the Northern Territory as part of the National Arbovirus Monitoring program (NAMP). This program, established in 1989, aims to monitor arbovirus and vector activity throughout the year, define geographical limits of selected arboviruses and detect the incursion of new strains of bluetongue virus and its vectors.

The program consists of monthly serological testing of cattle blood samples for bluetongue and bovine ephemeral fever. Alongside, insect traps are set adjacent to the cattle yards every month, to collect Culicoides spp. and identify and quantify them. In addition, cattle in the Middle Point herd are bled weekly for virus isolations and identifications.

To date, the program has been successful in that it provides evidence to define the geographical limits of the bluetongue and bovine ephemeral fever (BEF) viruses. This is vital for Australia's trade and market access. The program has also successfully identified new strains of bluetongue viruses and incursions of new vector species such as Culicoides nudipalpis. As an added benefit, the NT sentinel cattle program has provided assurance to international visitors on the quality of the NT's systems and facilities thus boosting confidence in the NT livestock trade.

However, can we say that the system is watertight? If not, where are the gaps?

The current method of virus isolations is optimal for bluetongue virus and its close relatives. We may need to consider different cell culture systems if we intend to capture other viruses that could be present in Culicoides, such as the LSD virus.

We currently identify the isolated viruses using a combination of immunofluorescence assays and micro virus neutralising titres. These are aimed at five groups of viruses – bluetongue, BEF, Simbu, Palyam and Epizootic Haemorrhagic Disease (EHD). The testing is laborious, time consuming and requires generation of antibodies as these are not commercially available. A better approach would be whole genomic sequencing (WGS). Using WGS, it is likely that viruses unable to be identified using the traditional approach could be identified. A study is underway comparing WGS to traditional methods of virus identification, the results of which should be available in a few months.

A WGS approach could also help understand the epidemiology of the bluetongue virus strains detected each year. It is still unclear as to what happens to the virus at the end of each season and whether the new season viruses are blown in from the north or are re-circulating in the NT ecosystem. Studies are underway to perform genomic studies on selected viruses over two seasons to gain a better understanding of their ecobiology.

For the four species of Culicoides relevant to bluetongue transmission in Australia, an understanding of the hosts that the midges mainly feed on in the NT is relevant to gain a better understanding of the role of each species in Northern Australia. Larger investigative studies are being designed to further elucidate the potential role of each Culicoides species in the transmission of bluetongue in northern Australia.

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Maintaining a critical digital platform for biosecurity surveillance of illegal internet wildlife trade

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Biography:
Professor Phill Cassey is an inaugural Australian Research Council Industry Laureate Fellow and globally renowned for his extensive research contributions in conservation biology and environmental biosecurity. A lead author of the recent Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) global 'Thematic Assessment of Invasive Alien Species and their Control', Phill represents Australia on multiple international stages. Phill is an outspoken champion for scientific inclusivity and cultural intelligence in scientific training and knowledge systems. His world-leading research has provided key tools and adoption for protecting the Australian environment and economy from novel emerging pests, weeds and diseases.

Abstract:
The exotic pet and ornamental plant trades represent multibillion dollar industries, and their trade occurs across complex multinational networks in the increasingly globalised world. Importantly, the exotic pet and ornamental plant trade are some of the largest modern-day contributors to emerging invasive species (and their negative impacts) globally.

The Digital surveillance for Illegal Wildlife Trade website (diwt.org) is an Australian website interface to access the millions of records collected through an ongoing internet surveillance project. DIWT allows practitioners in government and research to access the database of online wildlife trade advertisements from over 150 e-commerce websites. Users of DIWT can search multiple websites and locations, using unlimited search phrases. Users can receive email notifications for new advertisements matching their search parameters.

DIWT was built through funding from the Centre for Invasive Species Solutions and the Commonwealth Department of Agriculture & Fisheries. Research from DIWT has identified key important ongoing risks to Australian Biosecurity – particularly from the exotic plant and ornamental fish trades. DIWT has also helped identify the illegal trade of invasive alien species in near-to real time surveillance.

We will discuss the pivotal role that DIWT has played in Australian Biosecurity and provide recommendations for its' continued use and extension of enhanced surveillance capability.

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Could technology designed for MARS revolutionize animal biosecurity? Exploring outside our sector for step change innovation.

Dr Jing Cui, Dr Bronwyn Darlington[1], Charlotte Wood, Mr Ashley Sweeting, Dr MD Sharoare Hossain
[1]Agscent Pty Ltd, Carwoola, Australia

Biography:
Dr Bronwyn Darlington is the founder of Agscent Pty Ltd. She is an inventor and has published nine patents relating to the collection and analysis of breath in cows, the molecular blueprints for various health states and the technology device designs. She also holds a PhD in Economics relating to consumer psychology and behavioural economics.

Bronwyn has significant business experience as a serial entrepreneur, and is an academic at Sydney University's Business School leading the 'Finding Opportunity in Technology Disruption' on the Global Executive MBA Program.

Abstract:
Introduction: Covid has taught us that breath carries a lot more information beyond mere evidence of life. Agscent has collected and analysed breath from over 5000 cattle since 2018. Leveraging our breath collecting technology, GC-MS analysis, and advanced algorithm, we have crafted volatile organic compound (VOC) blueprints, known as breath prints, to identify an expanding array of health conditions in cattle, including pregnancy and Bovine Respiratory Disease (BRD).

Over the course of three years, Agscent has worked with NASA to optimise the nano-fibre e-nose sensors originally developed for human disease identification in Space Stations and MARS mission for the analysis of cattle breath. By functionalising the nano-fibres recipes (NASA IP) to known molecular categories (Agscent IP) and mapping the sensor responses employing neural network algorithms (Agscent IP), point of care (POC) diagnostics has now become possible.

Following our initial field study, Agscent, in collaboration with DPI NSW, characterized VOCs originating from specific bacterial and viral cultures linked to the BRD complex. To reconfirm this finding, Agscent is embarking on a series of field and comparison studies.
Aims: While this has been a breakthrough scientifically, the aim of the research has been to transform this science by functionalising the NASA e-nose sensors to the VOC's, enabling point of care (POC) diagnostics. We are currently commercialising this technology and broadening its capability to provide fast, non-invasive, and repeatable screening capabilities around biosecurity threats.

Methods: Following a brief field study, our experimental design began with bacterial and viral culture trials conducted in association with the NSW Department of Primary Industries where the five individual bacteria and four viruses were cultured and the VOC's which eluted were mapped using GC-MS to identify individual molecular blueprints.

Findings: Each BRD bacterium and virus have their own molecular signature, some are upregulated, others downregulated, and a few distinct to a particular pathogen. They can broadly be catagorized as exotoxins, immune response molecules, and components of their metabolic processes. Currently, we are undertaking breath analysis field trials using qPCR analysis as a reference against our functionalised NASA and Macquarie University e-nose sensors on sick and healthy cattle.

Conclusions: We will share how individual molecular VOC blueprints for BRD are 'read' by these new generation e-nose sensors and how they may be able to be adapted for remote sensing of various diseases or biosecurity threats in animals specifically and agriculture generally.

Agscent has both invented its own technology and paired it with technologies not normally associated with livestock or agriculture to create a platform for much wider application. The future of this technology is wide

open and needs to be grounded in specific and selective research to assess and demonstrate the level to which this technology can transform biosecurity in practice. We propose to use our research and product development to spark a conversation about where new technologies from outside of agriculture can truly transform the safe production of food.

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Next-generation spore trapping: exploring opportunities and overcoming challenges

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Biography:
Dr Michelle Demers has a PhD in plant pathology and bioinformatics and is a seasoned expert in agricultural systems. As a former company founder, she adeptly navigates innovation and research translation to implement cutting-edge technology in the field. At BioScout, she leads scientific strategies, researching plant disease epidemiology, managing teams, forging partnerships, and executing projects applying novel technological innovations to agriculture. Her dynamic expertise integrates research, innovation, and commercialisation, which are vital for advancing new technologies for disease surveillance.

Abstract:
Fungal diseases represent a formidable challenge to global agricultural productivity and food security. The timely detection of pathogens through airborne spore counts is pivotal for effective disease management (Carisse et al., 2014; Fall et al., 2015; Van der Heyden et al., 2021). However, conventional manual sampling methods prove labour-intensive and often fail to deliver prompt data, impeding early intervention efforts. Recent strides in automated fungal spore trapping technologies offer promising avenues for addressing these challenges, revolutionising disease surveillance in agricultural contexts. This presentation comprehensively examines the opportunities and challenges inherent in automated fungal spore trapping technology.

This talk will delve into the transformative potential of technologies such as artificial intelligence, machine learning, and automated microscopy in enhancing the detection of airborne fungal diseases. Through illustrative case studies, we will underscore the practical implementation of this technology, highlighting its capacity to furnish aerobiological and environmental data in near real-time across commercial farming operations. We will highlight the advantages conferred by early warning systems facilitated by automated surveillance mechanisms, enabling precision interventions by farmers and facilitating the real-time tracking of disease spread. We will also describe our first foray into tracking airborne pathogen spread on a large scale through installing Australia's first nationwide automated airborne disease surveillance network tailored to the grains industry, slated for launch in May 2024.

We will also address the multifaceted challenges of the successful deployment of automated fungal spore trapping that could affect the agricultural and biosecurity sectors. These challenges encompass the intricacies of diverse environmental conditions, the imperative of evaluating the accuracy of machine-learning models, the constraints posed by detection resolution thresholds, and the ramifications of surveillance data on in-field pest management strategies. By fostering interdisciplinary collaboration and facilitating knowledge exchange, we endeavour to harness the transformative potential of automation to elevate disease monitoring and management paradigms. Our endeavours aim to provide solutions for a more sustainable and resilient future amidst the backdrop of rapid global change.

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One lump or two? – having capacity is the sweet spot for general surveillance

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Biography:
Teagan Fitzwater is a Senior Veterinary Officer in the Northern Australia Quarantine Strategy. She has worked in the NAQS animal health team for the past 18 months and leads the team to conduct surveillance activities in northern Australia. She also oversees the Northern Australia Biosecurity Surveillance Network (NABSnet), a network of private veterinarians who conduct vital surveillance for Australia in northern livestock.

Abstract:
People capacity is the key to general surveillance. Finding incursions quickly and demonstrating evidence of absence depends on having people in the right place at the right time looking for the right things and responding in the right ways. Many surveillance programs aim to achieve this in their particular domains by involving community or specific stakeholder groups. The development of the Northern Australia Biosecurity Surveillance Network (NABSnet) of private veterinary practitioners provides a great example of this type of capacity building in a region as challenging as northern Australia.

NABSnet was established in 2018 to increase private veterinarians' skills and willingness to carry out laboratory confirmed investigations of significant disease events. It utilises the geographic coverage, expertise and good will of private vets located from Broome to Townsville to improve general surveillance for animal pest and diseases of biosecurity concern.

When Lumpy Skin Disease (LSD) emerged as a live export trade issue in July 2023, this network of private veterinarians was already submitting samples from cattle with skin conditions which they observed during their routine work.

The network had initiated a 'Cattle Skin Survey' in May 2023 with NABSnet vets encouraged to submit skin biopsies, blood samples and photos from any cattle that had skin lesions. The samples were sent to laboratories for histological diagnosis and LSD exclusion. While having a portfolio of common skin conditions in northern Australian was going to be an important resource in itself, the real value of the Cattle Skin Survey was realised a few months later when the results provided evidence to support Australia's LSD-free status required by our export trading partners.

This particularly timely example demonstrates how important it is to invest in building the capacity of a network of skilled veterinarians who are actively engaged and prepared for a response in the region.
Our presentation will provide an overview of how the NABSnet program has been developed and showcase the results of the Cattle Skin Survey to date.

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A non-destructive multiplex PCR for detection of Chrysomya bezziana and Cochliomyia hominivorax

Mr Luke Driver[1], Ms Leanne Nelson[1], Dr Natalie Leo[1], Dr Verna Hearne[1], Dr Pablo Fresia[2], Mr Anderson Saravia[3], Dr Cath Covacin[1], Dr Darren Underwood[1]
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Abstract:
Myiasis causing screwworm flies (SWF) are responsible for large numbers of animal stock losses in endemic areas of the world. While not present in Australia, Old World SWF (Chrysomya bezziana) is endemic to neighbouring regions, including Papua New Guinea and the Indonesian archipelago, and is the target of surveillance programs throughout Northern Australia. New World SWF (Cochliomyia hominivorax) is also not present in Australia and has a distribution focussed throughout the central and southern Americas; however, an incursion could still be possible via travellers and transport vessels originating from these areas. Surveillance methods for SWF collect many thousands of flies per trap, and although methods exist for molecular detection of Old World SWF from these samples these methods all require the samples to be destroyed. Any positive or suspect results must be confirmed by examining further samples using labour-intensive screening by microscopy. This method developed at Queensland's Biosecurity Sciences Laboratory, is the first non-destructive multiplex real-time PCR for simultaneous detection of New World and Old World SWF in a single reaction tube. Validation of the test confirms specificity when tested on 13 species of Diptera across multiple families, provides evidence of detection of one SWF in 14 grams of flies (approximately 1000 flies), and allows for non-negative samples to be subsequently screened via traditional morphological identification methods to confirm the presence of SWF in trap samples.

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AUSPestCheck®: supporting data-partnerships and developing integrated digital biosecurity systems

Mr Adam Hurrell, Sharon Taylor
[1]Plant Health Australia, Deakin, Australia

Biography:
Adam Hurrell, a seasoned digital professional with 15+ years in Australian Public Service, is dedicated to enhancing citizen access to government services through digital innovation. He has a passion for driving digital uptake and spearheading "digital first" approaches. As Director of Operations for the myGov portal and later as General Manager of Operations at the Australian Digital Health Agency, Adam optimized system performance and led critical digital health initiatives, including the national rollout of My Health Record. Now as National Manager of Digital Systems at Plant Health Australia, he's focused on leveraging technology to strengthen biosecurity efforts nationwide.

Abstract:
AUSPestCheck® is the national system for plant health surveillance data, and facilitates the collation, visualisation and sharing of both government and industry datasets. Developed and maintained by Plant Health Australia, AUSPestCheck® enhances the value of surveillance to improve decisions on pest and disease risks and threats, and assists in supporting proof of freedom claims for market access and for ensuring our detection network is robust. While originally built and endorsed to support the needs of plant biosecurity, the system continues to evolve and expand, and now supports two additional tenancies, collating national surveillance data for both terrestrial and aquatic animal health.

As the system increases overall capture of biosecurity surveillance data, Plant Health Australia continues to develop AUSPestCheck® in response to a dynamic biosecurity landscape, advancing the system to better underpin important data partnerships, and further integration with other national digital systems.

Data partnerships speak to the value of data beyond simple collation, through using AUSPestCheck® as the mechanism to identify and address gaps in surveillance coverage, develop standards that can be recognised across different partners, and form agreements that enhance national biosecurity outcomes. To this extent, PHA has facilitated the development of “Data Sharing Container” functionality, a key technological enhancement that allows users to implement their own data sharing agreements and share data with complete control.

As more tools and technologies become available to biosecurity practitioners, integration becomes a critical component of an efficient and comprehensive decision makers toolbox. AUSPestCheck® is developed alongside other national digital systems at PHA. Each of these digital systems facilitate sharing and build secure connections for biosecurity information and data. As these applications are aligned, there is an opportunity to bring functions and features together as integrated digital biosecurity systems that create national efficiencies.

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openFMD: A data sharing and decision-support portal to enhance genomic and epidemiological surveillance of FMD

Dr Uli Muellner[1,2], Dr Antonello Di Nardo[3], Dr Uli Muellner[1], Dr Melissa McLaws[4], Dr Chandana Tennakoon[3], Dr Liang Yang[1], Dr Nick J Knowles[3], Mrs Shanna Tervoort-McLeod[1], Dr Donald King[3], Donal Sammin, Fabrizio Rosso
[1]Epi-interactive, Miramar, New Zealand, [2]Massey University, Palmerston North, New Zealand, [3]The Pirbright Institute, Woking, Surrey, UK, [4]Food and Agricultural Organisation of the United Nations, Rome, Italy

Biography:
Uli Muellner's broad experience around system architecture, data and reporting, coupled with a keen sense for quality execution, makes him one-of-a-kind in the information technology universe.
As the operational engine of our team he helps our clients navigate the technology jungle while overseeing our design and production pipelines. Uli ensures that our projects run like clockwork and our outputs are both precise and beautiful. He is also in charge of our Posit partnership programme; helping our clients getting the most out of R and Posit products.

Abstract:
The rapid and open dissemination of genomic and epidemiological data provide critical support to trace Food and Mouth Disease Virus (FMD) lineages circulating globally. We present an open-access portal maintained by the FAO World Reference Laboratory for Foot and Mouth Disease Virus (WRLFMD) / The Pirbright Institute, UK, to support pathogen surveillance and stimulate the real-time exchange of data between laboratories and disease control initiatives. Users can interactively query and visualise historical and recent FMD trends and generate customised epidemiological and genotyping reports through the portal interface. Further it includes the PRAGMATIST tool to prioritise antigens held in vaccine banks for FMD. Vaccine bank holdings may be crucial to enable a swift and effective response to an incursion of FMD into a free country, such as Australia and New Zealand, and can also be useful for FMD-endemic countries in planning both preventive and emergency vaccination strategies. The PRAGMATIST tool was developed to support vaccine bank managers in this critical decision-making process, which is likely to have different outcomes depending on the geographical location as well as the ever-changing dynamics of FMD virus circulation in endemic areas. The openFMD initiative will not only promote the vital role of the WOAH/FAO Reference Laboratory Network for FMD as leading the global surveillance of FMD, but it will further improve timely analysis and communication of FMD data, identification of surveillance gaps and emerging disease trends to support evidence-based decision-making for FMD control. Recent EuFMD funding will see the portal's functionality be further extended.

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Environmental DNA for sensitive detection of Varroa destructor in honey bee (Apis mellifera) hives

Dr John Roberts[2], Dr Richard Hall[5], Dr Francisco Encinas-Viso[2], Ms Florence Bravo[2], Ms Jennifer A Soroka[1], Dr Foyez Shams[1], Dr Liz Milla[2], Dr Natale Snape[4], Dr Francisco Martoni[3], Ms Antonette Walford[3], Dr Alejandro Trujillo-Gonzalez[1]
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Abstract:
Varroa destructor is a major pest of the European honey bee (Apis mellifera L.) with significant impact on global apiculture and provision of managed pollination services. These obligate ectoparasitic mites weaken honey bee colonies by feeding and reproducing on the developing brood as well as vectoring and exacerbating pathogenic viruses. Until very recently, Australia was one of the last few countries still free of V. destructor, however in June 2022, V. destructor was detected in biosecurity sentinel hives at the port of Newcastle on Australia's east coast. Despite early success in supressing the incursion, eradication efforts were ultimately unsuccessful, and beekeepers will need to manage this new pest. Nonetheless, effective tools for early detection of V. destructor are still needed as Varroa-free areas remain that are separated by large geographical barriers both in Australia and abroad. Here, we present a novel, optimised, and fully validated species-specific qPCR assay for the detection of V. destructor using two eDNA sampling methods: swabbing hive surfaces (hive entrance and brood chambers) and collecting honey from inside hives. Preliminary assessments were conducted during Australia's incursion of V. destructor on several hives at the invasion front followed by further assessments in New Zealand where V. destructor is endemic. We also conducted longitudinal eDNA sampling on Varroa-naïve hives relocated from the Chatham Islands to Wellington (New Zealand).

Results show that the validated assay can reliably detect down to 3.6 DNA copies/µL and has a detection sensitivity of 1.8, 2.2 and 10.2 copies/sample for brood chamber, hive entrance and honey collection methods respectively with a 95% confidence. Results show that amplification of V. destructor eDNA was significantly greater in honey compared to swabs (ANOVA, $F_{291,2}=19.788$, $p<0.001$), wherein Cq values significantly decreased with increasing varroa mite infestation load categories. Lastly, we demonstrate that for hives with confirmed V. destructor infestations, sampling from brood chambers using swabs would require an estimated mean number of DNA copies (± S.D.) of 12 ± 20.08, 21.2 ± 3 and 15.3 ± 18.66 for hives with <10, 10-20, and >20 mites/300 bees to achieve detection in at least one sample with 95% confidence. In comparison, collecting samples from hive entrances with swabs or honey would require significantly lower DNA copies, wherein swabbing hive entrances would require 3.5 ± 5.39, 6.9 ± 13.57, and 6.50 ± 8.39, while collecting honey would require 9.89 ± 4.65, 11.14 ± 5.83, and 16.77 ± 1.46 DNA copies/sample in hives with <10, 10-20, and >20 mites/300 bees. Our results demonstrate that V. destructor eDNA can be used for sensitive detection of varroa and provides a promising approach for improved early-detection of varroa in areas that are free from the mite. The method we report may also have utility in monitoring varroa infestation levels in areas where the mite is endemic, for the purposes of ongoing pest management.

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MicroRNA biomarkers for improved detection of infectious diseases

Dr Ryan Farr, Carlos Miranda Rodrigues, Annaleise Wilson, Jenny Su, Christina Rootes, Christopher Cowled, Nagendra Singanallur, Marina Alexander, Dr Cameron Stewart[1]
[1]CSIRO, Geelong, Australia

Biography:
Dr Cameron Stewart is a Research Team Leader for CSIRO's Health & Biosecurity Business Unit. Based at the Australian Centre for Disease Preparedness (ACDP), Cameron's team investigates host-pathogen interaction to develop novel intervention strategies. Cameron's team has particular expertise in the study of host-encoded microRNAs as biomarkers for improved detection of infection and forecasting disease severity. The team were the first to comprehensively profile microRNA responses to COVID-19 (Farr et al., 2021) and manage several large-scale biomarker studies. More information about the Host Response team can be found at https://research.csiro.au/hostresponse/.

Abstract:
The diagnosis of infectious diseases is sometimes hampered by lengthy incubation periods, unreliable pathogen shedding or poor antibody responses. For example, the incubation period for paratuberculosis (Johne's disease (JD)), a chronic enteritis of ruminants caused by Mycobacterium avium susp paratuberculosis (MAP), can extend for several years. This causes poor test sensitivity for histopathology, culture, PCR and serology, particularly during early disease stages. Similarly, early detection of Mycoplasma bovis (M. bovis) is not always achievable through serology or molecular diagnostics.

Having recognised these limitations, our team has built a biomarker discovery platform to improve diagnostic test sensitivity for select infectious diseases. Our approach involves the measurement of host-encoded microRNAs (miRNAs), which have emerged as key regulators in both innate and adaptive immune responses to infection. Our platform employs artificial intelligence and machine learning (AI/ML) to identify specific miRNA signatures associated with disease status. The current test format involves PCR assays coupled to software that translates PCR data into a test result (i.e. probability of infection). We recently identified differential miRNA expression patterns in COVID-19 patients (1), showing the potential of miRNAs as predictors for infection severity and patient stratification.

Our team has received support from the Australian Government Department of Agriculture, Fisheries and Forestry (DAFF) and the New Zealand Ministry of Primary Industries (MPI) to develop miRNA-based diagnostics for JD and M. bovis, respectively. Both activities include milestones for test validation according to World Organisation for Animal Health (WOAH) guidelines. Results to date suggest miRNAs detect these diseases with >95% sensitivity and specificity, with early indications suggesting successful detection of asymptomatic cases.

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Novel eDNA and genetic information analysis tool

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[1]NGB Innovation, Sydney NSW, Australia, Australia

Biography:
Bioengineer, biomedical engineer, specialising genetic information analysis, material and engineering

Abstract:
Water is essential for our health and agriculture. Microbes and pathogens thrive in water with the influence of pH, temperature, etc, meanwhile constantly evolving under stress. Therefore, monitoring the microbes' genetic data in water, such as wastewater, ponds, ballast water, etc, for biosecurity purposes is meaningful.

Traditional devices are only tracking and providing data from chemistry perspective. NGB products focus on preserving and analysing genetic information essential for biology research.

Existing products need very complex and time-consuming processes to analyse microbes in the water. NGC offers a fast and straightforward way to analyse eDNA.

Compared to conventional methods, NGB reagents are environmentally friendly; the NGB main device is simple to use, fast and easily integrated into underwater robots, providing a unique way to monitor environmental DNA,RNA, and harmful pathogens.

Detecting pathogens within wastewater to monitor health data and pathogens' genetic data has been adopted since the middle of the pandemic, but this data collection method is costly. NGC provides an efficient and low-cost way for this process.

To sum up, NGC is a novel and better tool for biosecurity surveillance, meanwhile providing accurate and rich data for AI support decision-making.
References
Data from the NGC device is available for further request.

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Reflecting on 25 years of bee pest surveillance

Ms Kathryn Pagler[1]
[1]Plant Health Australia, Deakin, Australia

Biography:
Kathryn Pagler is PHA's Bee Biosecurity Project Officer, working on the National Bee Biosecurity Program and the National Bee Pest Surveillance Program. Previously Kathryn completed an Honours of Applied Science from the University of Canberra, during which she studied the nature of European honey bee gut microbes and their relationship with bee diseases. She has also completed a Bachelor of Biomedical Science, majoring in molecular and cellular biology, with a major research component on the effects of immunoglobulin A on chronic obstructive pulmonary disease. Kathryn has also worked as an administration officer at RehabCo, a workplace rehabilitation company.

Abstract:
For over 25 years the importance of honey bee health has been recognised through coordinated national surveillance and strong partnerships between governments and industry.

Since 2012, Plant Health Australia (PHA) has coordinated the National Bee Pest Surveillance Program (NBPSP), an early warning system that uses a range of surveillance methods at high-risk port locations throughout Australia. In its current iteration, the program is funded through Hort Innovation using levies of 14 horticultural industries and contributions from the Australian Honey Bee Industry Levies, Grain Producers Australia, the Australian Government, and delivered by state and territory governments.

In the late 1990s the threat of exotic mites such as varroa mites, tropilaelaps mites, tracheal mites were becoming known and contributed to the establishment of a National Sentinel Hive Program in 2000. The program, initially coordinated by the Australian Government, and later by Animal Health Australia, operated 34 sentinel hives across 27 ports inspected once every 12 weeks.

In 2012 management was transferred to PHA in recognition of the importance of honey bees to plant industries, and so the NBPSP was born. The program:

- is a risk-based delivered at seaports in each state and territory which pose the highest risk for the entry of Asian honey bees or European honey bees and the exotic pests they carry
- increased the number of target pests from 4 to 13, including 9 high risk exotic bee pests
- increased sentinel hives deployed across the highest-risk ports from 26 in 2012, to 159 in 2023
- refined the time between inspections from 12 weeks to 6 weeks, improving the likelihood of detecting exotic external mites within 12-months to at least 95%
- included highly sensitive and tested surveillance techniques such as rainbow bee-eater pellet diagnostics and aerial pheromone ballooning for the detection of Asian honey bees.

With funding for the current program concluding in December 2024, it is timely to reflect on the value and importance of, and the need to continue, national bee pest surveillance.

The success of years of surveillance came to fruition with two detections within sentinel hives. In June 2022, Varroa destructor was detected in Newcastle, NSW and in February 2024 a single Varroa jacobsoni mite was detected in Port Brisbane, Qld. This highlights years of dedicated work by government agencies and the ongoing investment by industries and government in supporting early detection projects.

Now is not the time to become complacent - surveillance is continuing for new incursions of varroa mite in addition to eight other exotic bee pests and pest bees. This is crucial in keeping Australia free from viruses,

and other species of mites such as tracheal and tropilaelaps, that could enter with new introductions of varroa mite.

Ensuring the longevity and continued success of the program is pivotal in safeguarding the Australian honey bee industry from exotic pest threats and those industries that benefit from honey bee pollination. Consultations are underway on future program design and to secure support for the program beyond December 2024.

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Wireless Sensor Networks for Biosecurity, Collaboration and Engagement

Mr Simon Croft[1]
[1]Encounter Solutions, Mt Eden, New Zealand

Biography:
Simon Croft is Managing Director of Encounter Solutions Ltd. Prior to 2015 Simon spent nearly two decades as a professional Civil engineer working on a variety of engineering projects. Simon has a passion for innovation and has co-authored peer reviewed papers on diverse topics such as fish pass design, seismic enhancement of water storage reservoirs and wireless technology for vertebrate pest control.

Abstract:
There is a clear and pressing need for innovative solutions to ensure the continual efficacy and scalability of biosecurity systems. This presentation showcases some of the potential of technology to address pest management and surveillance challenges, particularly when used collaboratively to facilitate industry as well as community engagement and action.

Technology solutions will undoubtedly form a key component of many biosecurity strategies if they are to be successful and enduring. In addition, they are likely to require community engagement and participation to be effective long term. Therefore, technology platforms that harness the power of sensors, automation and advanced digital tools, like artificial intelligence, as well as foster collaboration and engagement, have the potential to enable a paradigm shift in surveillance and management initiatives.

Celium™ wireless sensor networks are being used to enhance surveillance and pest management efforts across New Zealand, Australia, and beyond. Deployments of this technology extend across diverse regions, encompassing the Galapagos archipelago, the Marquesas Islands, Kangaroo Island, arid Australia, and the New Zealand Southern Alps. This expansive reach underscores the versatility and adaptability of this particular platform to diverse biosecurity project landscapes.

Landscape scale wireless sensor networks have broad applicability, including the primary production, extractive, energy, and construction sectors. Examples will be shared as to how Celium is being leveraged to encourage industry players to facilitate improved biodiversity outcomes, and how collaboration between technology providers to blend sympathetic technologies can result in win win win situations.

The delivery of near real time data is a must for early incursion response in that it enables early detection, as well as more timely decision making and resource allocation. Importantly, at the same time it can improve welfare outcomes, reduce impacts to off target species and build relationships.

Thoughts on key scalability considerations are also covered. Perhaps foremost is cost effectiveness. However, versatility is important, so too is being able to democratise rollout, having good support systems, and fostering a network of informed and mutually supportive individuals and organisations.

In summary, technology on its own is not a solution. However, by harnessing the power of technology tools, timely delivered data, collaboration, and community engagement, biosecurity systems can be more adaptive, effective, and resilient.

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ionIQ® - a rapid, adaptable, mobile sensing platform for an increasingly challenging biosecurity threat environment

Dr Ross Farrell[1], Dr Karolina Skraskova[1], Mr Alastair Farrell[1]
[1]Iugotec Pty Ltd, Kenmore, Australia

Biography:
Dr Ross Farrell has more than 15 years of international experience working across industry and academic roles in the fields of Analytical Chemistry, Wood Science, Optimisation and Software Development. Ross has worked with world leading Scientists in real-time sensing technology including the Swiss Federal Institute of Technology, ETH-Zurich. Ross founded IUGOTEC in 2016 in light of the immense need & opportunity for powerful sensing systems combining leading edge real-time chemical detection technology. Ross is passionate about developing technology solutions that will solve big challenges and have immediate and positive, real-world impact.

Abstract:
Mass spectrometry is a leading analytical technology providing comprehensive chemical analysis due to its high chemical specificity and sensitivity. Whilst traditional benchtop mass spectrometry is a lab-based, expert driven technique that requires time-consuming sample preparation and chromatography protocols, technology advances provide exciting opportunities to harness mass spectrometry as a powerful sensor in field-deployable, easy-to-use, real-time sensing platforms. This presentation describes the challenges and opportunities associated with the development of a flexible and powerful chemical sensing platform applicable to a wide variety of biosecurity threat detection applications.

The two core components of the sensing platform are; (i) the signal detector and (ii) the control and analysis software. In addition, there are modular (interchangeable) sampling and ionisation sub-systems, allowing the platform to be configured for (i) gas / air sampling or (ii) sampling liquids or solids. Samples enter the sensor, are ionised and the chemical components of the sample separated according to their molecular mass to charge ratio (m/z), creating a “chemical fingerprint”. The chemical fingerprints are analysed using machine learning algorithms, to determine if the sample belongs to an existing threat category. Results are instantaneously displayed on the local system and available via a web-based dashboard if the system is connected to the internet via a mobile or satellite network connection.

Trials have demonstrated air sensing capabilities with low parts-per-trillion levels of sensitivity, approximately equal to the odour sensitivity of sniffer dogs. Furthermore, unlike sniffer dogs the platform can analyse "chemical fingerprints" from non-volatile samples, greatly increasing the utility and adaptability of the sensor platform. Developments regarding non-volatile sampling capabilities are discussed in addition to a number of possible biosecurity threat detection applications. The sensor platform has the potential to provide a universal, future proof biosecurity threat detection tool that can be adapted to changing biosecurity needs through interchangeable front-end modules and programmable threat detection algorithms.

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WeedScan: Australia's first computer vision weed identification and communication system: early experience, issues and responses

Mr Andreas Glanznig[1], Dr Hanwen Wu[2], Dr Alexander Schmidt-Lebuhn[3], Mr Tomas Mitchell-Storey[1], Mr Richie Southerton[1], Ms Kate Blood[4], Dr Andrew Turley[5]
[1]Centre for Invasive Species Solutions, Canberra, Australia, [2]NSW Department of Primary Industries, , Australia, [3]CSIRO, Canberra, Australia, [4]VIC Department of Energy, Environment and Climate Action, , Australia, [5]Atlas of Living Australia (CSIRO), Canberra, Australia

Biography:
Andreas Glanznig is the CEO of the Centre for Invasive Species Solutions (CISS). CISS is the successor to the Invasive Animals Cooperative Research Centre, also led by Mr Glanznig between 2010 and 2017, Australia's largest integrated invasive animals research and innovation collaboration.

Over its 12-year life, the IA CRC developed a suite of new pest control products including rabbit and carp biocontrol agents, new genetic surveillance techniques, new wild dog, fox and feral pig toxic baits, and strategic knowledge and planning tools to strengthen collaborative regional scale integrated pest management.

Andreas' 30 year career has traversed executive science management, policy analysis and advocacy, and strategic communications. Former roles include leading the World Wildlife Fund's advocacy team on invasive species legislative and policy reform, and an Australian Government policy analyst.
Andreas has also served as a Director of the Weeds Cooperative Research Centre and the Global Invasive Species Program. He has degrees in Science and Letters, and a Masters of Business Administration.

Abstract:
Citizen identification of new, emerging and other priority weeds is already integral to general biosecurity surveillance systems, and will become more dominant in the future aided by easy to use computer vision identification tools.

Launched in December 2023, WeedScan 1.0 is Australia's first computer vision weed identification and communication product and system. It is a Minimum Viable Product whose AI model has been trained on over 120,000 images to identify 272 priority and 220 other weeds, and once identified links users to State government or Centre weed management information. It also includes a WeedScan Groups feature to enable members within a group to share occurrence data and export their data to assist group weed management planning, as well as a Notification feature for State and local weed/biosecurity officers where image records of their selected High Priority Weeds are forwarded to them.

WeedScan was developed through a national CISS consortium led by NSW Department of Primary Industries and CSIRO, partnering with the Queensland, Victoria and South Australian State governments, and the Atlas of Living Australia. Its implementation is also supported by NT and Tas government agencies, and Meat and Livestock Australia.

By the end of March. the app has seen solid adoption with over 10,000 downloads, over 1,500 registered users, and 3,000 weed records reported. A number of WeedScan Groups have also been established ranging from groups targeting individual weeds such as buffel grass to groups with a broader scope such as "Aquatic Weeds in Drinking Water Catchment NSW".

The WeedScan system has been harmonised with project partner – the Atlas of Living Australia – through a data management protocol that includes a stipulation that only records with an AI Recognition Score of over 90% are considered for uploading to their national occurrence map, and alignment with the ALA Biosecurity Alert System.

Our experience to date is that there is:

- Strong demand for WeedScan and the addition of new weeds to extend the AI model.
- Weed records with AI Recognition Scores above 90% had very good accuracy.
- False positives being generated by the AI model (based on poor user images or erroneous AI results, especially when using the app on plants outside the current model) indicates that some human validation of records will be needed, akin to iNaturalist's community verification system.
- A wide variety weed specific and/or regional based WeedScan Groups being established, which is coinciding with additional features to be added to WeedScan groups to encourage growth.

A State Coordinators Committee has been established to bed down the WeedScan system, particularly its High Priority Weed notification system, and identify further features and fixes to improve WeedScan function.

This presentation will outline the experience and improvements made since WeedScan's launch.

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Biosecurity Innovation: future-ready focused

Ms Jessica May[1]
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Biography:
Jessica May has been with DAFF since 2019, with experience in both the Australian Public Service and private enterprise as the CEO of her start-up Enabled Employment.

Jessica is a leader in strategic innovation, change management and reform and has a wealth of experience, currently studying an Executive Masters of Public Administration at the ANU. Jessica has received several awards throughout her career including 2017 Global Stevie Awards Entrepreneur of the Year, Asia, Australia or New Zealand, the National Telstra Business 2015 Woman of the Year - Startup category and a 2011 Prime Minister's Award for Excellence in Public Sector Management.

Abstract:
The Department of Agriculture, Fisheries and Forestry's Biosecurity Research and Innovation teams are leading the way as advocates of innovation through collaboration, supporting the department in its priority of developing a future-ready biosecurity system. The teams are implementing priority areas of the National Biosecurity Strategy through stronger partnerships with governments, industry and the community, highlighting the important role this plays in the successful testing and implementation of innovative research, technology and data.

Through our Biosecurity Innovation Hub, Catalysing Australia's Biosecurity Initiative and Innovation Pilots we are investing in and rolling out transformative technologies to digitise and automate, encouraging the uptake of existing and emerging technologies, systems and processes as well as increasing the use of citizen science, Indigenous knowledge and on the ground insights.

This presentation will provide an overview of these projects and pilots and showcase some of the endeavours that are shaping change across the biosecurity system including our Varroa Mite detection pilot in collaboration with the CSIRO and State and Territory governments, Stable Wizard which will digitise our equine record keeping at Post Entry Quarantine, Ethyl Formate - a potential safe, cheap and greener alternative to Methyl Bromide and transporting fruit fly samples across the Torres Strait in a drone.

A visit from the department's very own robot dog, Spot and an invitation to see other innovative technologies at the (proposed) innovation showcase will round out the presentation.

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Farm Location Image Processing: Teaching computers to identify livestock farm types from aerial imagery

Dr Caitlin Pfeiffer[1], Dr Kathryn Sheffield[2], Miss Alliza Bartley[3], Dr Jonathan Garber[4], Dr Sabah Sabaghy[2], Associate Professor Simon Firestone[1], Mr Akshay Gohil[1,4], Dr Ofir Schlosberg[5], Dr. Andrew C. Breed[6], Dr Emily Sellens[6], Mr Zaher Joukhadar[4], Professor Mark Stevenson[1], Dr Jaimie Hunnam[5]
[1]Melbourne Veterinary School, The University Of Melbourne, Parkville, Australia, [2]Agriculture Victoria, Victorian Department of Energy, Environment and Climate Action, Bundoora, Australia, [3]Department of Regional NSW, Animal Biosecurity, Orange, Australia, [4]Melbourne Data Analytics Platform, The University of Melbourne, Parkville, Australia, [5]AusVet Pty Ltd, Bruce, Australia, [6]Department of Agriculture, Fisheries and Forestry, Animal Health Policy Branch, Canberra, Australia

Biography:
Dr Caitlin Pfeiffer is a Senior Lecturer in Veterinary Epidemiology (One Health) at The University of Melbourne. She is a veterinarian with clinical experience in small animal practice and livestock consultancy, and her PhD investigated passive and syndromic disease surveillance in Australia's sheep industry. Her current research focuses on spatial epidemiology, disease risk mapping, the effects of bushfire on livestock, and teaching and training for capacity building in Australia, New Zealand and South-East Asia. In her teaching, Caitlin co-ordinates a multi-disciplinary One Health subject for undergraduate students and teaches epidemiology and research skills in the Doctor of Veterinary Medicine.

Abstract:
Introduction
In an emergency animal disease incursion, such as an outbreak of African swine fever or avian influenza, it is critical that farms keeping livestock of susceptible species can be rapidly identified. An effective response needs to be informed by accurate spatial data describing livestock populations of different species. Discrepancies and omissions in key land use and property identification datasets limit their effective use during a biosecurity response.

Aims
This project aims to predict the livestock species on individual Australian farms, including commercial poultry, commercial pig and dairy farms, based on farm infrastructure visible in aerial imagery of rural Australia. The objective is to achieve this using 'computer vision' deep learning methods (convolutional neural networks, CNNs).

Methods
Building on a prototype algorithm developed in 2021, an ESRI ArcPro toolbox was developed to extract target image tiles from aerial imagery, classify the most likely livestock farm type in each tile, and return a spatial dataset of classified locations. The underlying CNN algorithm leverages transfer learning and image augmentation to allow it to be trained on a modest dataset (hundreds, rather than thousands, of example farms). Toolbox inputs are a vector shapefile of polygon boundaries delineating areas to be classified (land parcels or farms), a grid identifying farm infrastructure or building footprints, and an RGB image with a spatial resolution of ≤ 50cm.
Results
This presentation will showcase the toolbox in action through case studies and discuss next steps for its development and implementation. The CNN classifier successfully differentiates poultry, commercial pig and dairy farms, with recall (the proportion of correct predictions) above 70%. Testing within the Agriculture Victoria IT ecosystem identified software and installation requirements, and use cases to support future implementation of the toolbox in various systems. Case studies with spatial data in both Victoria and New South Wales found classification accuracy was greatly impacted by (a) which part(s) of the farm were targeted and (b) inherent variability in farm infrastructure configuration between farms.

Conclusions

This project aims to provide a tool for use by government departments, leveraging existing datasets to rapidly classify farm types before or during an emergency disease response. Its application depends on careful preparation and understanding of the input data, as well as thoughtful interpretation of the results. Ongoing development of the algorithm and its software integration will support its future operational implementation, where it can inform risk assessments and outbreak containment and control activities. This will help governments know where livestock animal populations under threat are located, saving time and allocating limited resources effectively to protect Australia's valuable disease-free status.

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Enhancing Border Security: Utilizing X-ray Imaging for Pest Detection in Agricultural Produce

Dr Jiasheng Su[1], Dr Maryam Yazdani[1], Dr Rieks D. van Klinken[1], Dr Ben James[2], Dr Yi Liu[2]
[1]CSIRO-HEALTH & BIOSECURITY, Dutton Park, Australia, [2]CSIRO-MINERAL RESOURCES, Sydney, Australia

Biography:
Dr Jiasheng Su is a postdoctoral fellow in the Pest Detection & Management Technologies under the Pest Management system group, and in the Autonomous Sensors Future Science Platform project in CSIRO. His research interest lies in the development of innovative techniques for autonomous detection of pest infestations in fresh produce, which includes but is not limited to X-ray, computed tomography (CT), optical imaging, and magnetic resonance imaging.
Currently, his research focuses on understanding how changes in infected fruit influences CT signals/images to identify biomarkers for pest infestation, development of algorithms, machine learning, and Edge AI for automatic pest detection.

Abstract:
Introduction
The impact of invasive insect pests on international trade is significant, given the expanding global trade network. To mitigate economic and ecological losses caused by these pests, governments are implementing more rigorous quarantine measures. Currently, biosecurity inspections rely on visual inspection by authorized officers, which is laborious, expensive, and time-consuming. Here, we report on new research aimed at developing an automatic pest quarantine system utilizing X-ray imaging combined with AI to efficiently ensure biosecurity safety for the fruit market at the border. X-ray imaging technology is already one of the most commonly implemented commercial technologies for border security, used to detect prohibited items such as weapons, explosives, and other concealed illicit substances. Our work aims to extend the use of X-Ray technology to the detection of pests within boxes of consigned fruit.

Methods
We built a high-resolution cone beam X-ray system to acquire 2D and 3D images, systematically exploring its ability to detect codling moth (CM) in apples at various stages. We then infested fruit in the laboratory for scanning. Fruits were scanned on different days to represent various stages, with larval stage estimated based on infestation time. Some fruits were dissected post-scanning to validate image accuracy. In addition, Queensland Fruit fly (QFF), a storage pest, and mango weevil were also tested in their representative hosts using a similar methodology.

Results
Our results indicate that 2D imaging can detect infestations from CM only when there are large damaged regions, such as long tunnels and big larvae. However, accuracy is affected by scanning angles, and decreases notably with smaller damage/larvae size. In contrast, 3D imaging detected all CM infestations and larvae. Furthermore, it also generated detailed structures and shapes of larvae and their damage, albeit with a slower scanning speed.
X-ray imaging demonstrated consistent results in other case studies. While 2D imaging can detect weevils and infestations in mangos, and storage pest infestations in almonds due to their size, it struggled with small QFF larvae and their infestation. However, the 3D imaging technique successfully identified tiny QFF larvae infesting cherry, blueberry and nectarine.

Conclusion
Our results show that X-ray imaging can be used to non-destructively detect various internal pests in fruits, nuts and stored product with high accuracy. 2D imaging can effectively capture large pests or infestations at a rapid speed. Conversely, 3D imaging offers higher accuracy in detecting tiny pests and infestations and can be implemented with bulk scanning. The slower imaging speed for 3D imaging techniques is a disadvantage but this can be mitigated through the use of advanced algorithms, and hardware devices. With the integration of AI techniques, X-ray imaging can evolve into a real-time automatic pest quarantine system.

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Leveraging biodiversity infrastructure to enhance Australia' biosecurity through the Atlas of Living Australia's Biosecurity Alerts Service

Dr Andrew Turley[1], Dr Erin Roger[2]
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Biography:
Dr Andrew Turley is an analyst with the Atlas of Living Australia, where he leads the development and implementation of the ALA's biosecurity project portfolio. His diverse career has included management of scientific and public sector programs with the National Fire Ant Eradication Program, the World Mosquito Program and the Queensland Museum. Andrew holds a PhD in Medical Entomology from the University of Queensland and is an active member of the Entomological Society of Queensland.

Abstract:
Early detection of new incursions of species of biosecurity concern is crucial to protecting Australia's environment, agriculture, and cultural heritage. As Australia's largest open-source biodiversity data repository, the Atlas of Living Australia (ALA) is often the first platform where new species incursions are recorded. The ALA holds records of more than 2,380 exotic species and over 1.9 million occurrences of pests, weeds, and diseases; many of which are reported though citizen science. However, until recently there has been no systematic mechanism for notifying biosecurity managers of potential biosecurity threats. To address this, the ALA has partnered with the Commonwealth Department of Agriculture, Fisheries and Forestry and CSIRO through the Catalysing Australia's Biosecurity initiative to develop the Biosecurity Alerts Service. Three years on, the project has demonstrated the benefits of ALA's alerts service, but significant barriers exist as we now work to expand this system to other biosecurity managers and seek additional sources of biosecurity data. Here we discuss the development of the Biosecurity Alerts Service, its performance in reporting invasive species, and how we are approaching issues with taxonomy and sensitivities in aggregating biosecurity data. We conclude by detailing our progress in expanding the alerts service and tackling systemic issues to help elevate Australia's biosecurity system.

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Advances in Non-Destructive Detection Methods for Assessing Fruit Fly Oviposition Damage in Fresh Fruits

Dr Maryam Yazdani[1]
[1]CSIRO, Brisbane/Dutton Park , Australia, [2]University of Adelaide, Adelaide , Australia

Biography:
Dr Maryam Yazdani, an Entomologist and Applied Research Scientist, spearheads innovative approaches to understanding insect pest biology in agriculture. Her expertise lies in cost-effective, eco-conscious pest management. Since joining CSIRO in 2021, she established the "Pest Detection & Management Technologies" division in 2022. Using advanced imaging like X-ray, optical scanning, and electrochemical sensors, along with e-DNA techniques, Maryam pioneers automated non-destructive pest detection for biosecurity. Her research has resulted in patented innovations and successful commercialization, enhancing our ability to manage pest threats sustainably in the agricultural sector.

Abstract:
The impact of invasive insect pests on international trade is significant due to the expanding global trade network. Using non-destructive imaging technologies to detect pests in fresh produce before they enter the supply chain is an exciting option for reducing those risks. Here we report on new research aimed at developing an automated non-destructive pest-detection system that combines imaging technology using near-infrared (NIR) wavelengths with Artificial Intelligence.
Our initial focus was on Queensland fruit fly or “Q-fly” (Bactrocera tryoni), a generalist pest of fruit and vegetables in eastern, mainland Australia. It is also an important quarantine pest for many markets. We used hyperspectral imaging and spectral analysis to pinpoint the most discriminatory wavelength within the visible to NIR spectrum for detecting Q-fly infestation, initially in fresh cherries. This wavelength needed to be able to discriminate Q-fly oviposition damage on the surface of fruit from natural pigmentations, and other damage types that could potentially result in false positives. Once the wavelength was identified we created an image library for training and testing the detection model. The distinctive Q-fly oviposition pattern was visually described and utilized to manually label infested areas on captured images. We then trained a deep neural network-based model for object detection against labelled images. These spot-level outcomes were further used to train an image-level infestation detection model.
A single NIR wavelength proved to be best at identifying oviposition damage. When the algorithm was applied to infested fruit, it achieved an accuracy rate of over 90% in detecting fruit fly oviposition damage. This oviposition damage was very difficult to detect with the human eye, especially without magnification. Importantly, oviposition damages could be detected immediately after oviposition occur and even long after eggs had hatched, as long as fruit turgor remained high. Initial investigations into other fruits such as blueberries, sugar plums, apricots, and various fruit fly species, including the Mediterranean fruit fly (Ceratitis capitata), indicate that comparable levels of accuracy can be attained.
Integrating these imaging technologies into a grading system holds significant potential for enhancing biosecurity measures within horticultural industries. It may also have valuable research applications, accelerating disinfestation studies and allowing pest infestation rates in commercial settings to be more easily quantified. We are now expanding our research to include a broader range of pests and commodities. We are also collaborating with commercial partners to make this technology available to industry, government and researchers. Our aim is to seamlessly incorporate our detection system into the existing optical grading technologies used in packhouses. This will enable the industry to detect and remove fruits infested with fruit flies before they reach domestic or international markets, ensuring a superior standard of produce quality and safety.

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Yellow crazy ant (Anoplolepis gracilipes) environmental DNA degrades rapidly in water

Dr Samantha Tol[1,2,4], Dr Cecilia Villacorta-Rath[2,3], Mr Carl Shuetrim[2,4], Professor Lori Lach[2,4]
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Biography:
Dr Samantha J Tol is a postdoctoral fellow with the College of Science and Engineering, and a Senior Research Officer for the Centre for Tropical Water and Aquatic Ecosystem Research (TropWATER), at James Cook University. Samantha has been running laboratory-based experiments to understand the persistence and degradation of eDNA for Yellow Crazy Ants, to assist in the creation of an eDNA toolkit for government and industry eradication programs. Her postdoctoral research is providing the data on the boundaries of which eDNA can be used in detection and eradication programs for terrestrial invasive invertebrates.

Abstract:
Environmental DNA (eDNA) is currently used as a complementary early detection method for several invasive species around the world. Recent research has shown that this tool can be used to detect terrestrial invertebrate species in water after rainfall events since the runoff aggregates eDNA into an adjacent waterbody (Villacorta-Rath et al. 2023). However, the variables behind eDNA detectability of terrestrial invertebrates in water are still poorly understood. Two of the main variables hypothesized to drive eDNA detectability are amount of rainfall and eDNA degradation, since they both interact to add and remove eDNA from the system.
To understand the effects of these two variables, we used yellow crazy ants (Anoplolepis gracilipes) as a model species. We ran laboratory-based rainfall simulation experiments on soil exposed to yellow crazy ant colonies to assess run-off of eDNA from soil and the degradation rate of the eDNA in the run-off. We simulated rainfall by spraying distilled water over 10 petri dishes which had been exposed to yellow crazy ants a total of 10 times over two days – rainfall events started off at 60 mm for the first two events, followed by 4 mm for the remaining events. We found that eDNA detection was possible in as little as one 4 mm simulated rainfall event. In the run-off, eDNA concentration (measured as DNA copy number per mL) initially increased over the first two to four rainfall events, and then rapidly decreased. After the fifth simulated rainfall event, concentration decreased rapidly and reached undetectable levels by rainfall event nine. We propose that the initial increase in eDNA concentration after rainfall is due to the water enabling the DNA to unbind from the soil, and when the DNA is freely floating it rapidly decays.
We kept the run-off from the first two rainfall flushes for a total of five days to determine the degradation rate of yellow crazy ant eDNA in standing water. We found that by 72 hours eDNA decreased to undetectable concentrations for 80% of replicates. The results varied between flush event one and two. For flush event one an initial sharp increase in eDNA concentration on day two occurred, most likely due to DNA unbinding. While flush event two had no spike in eDNA and had degraded to undetectable levels by only day two. It is suspected that the DNA in flush event two was already unbound as this sample had already undergone a previous flush event before collection.
These results provide insight into eDNA detection windows in water bodies for yellow crazy ant detection. This data will help inform and develop an eDNA toolkit for use in the fight against yellow crazy ant invasions.

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Villacorta-Rath, C., L. Lach, N. Andrade-Rodriguez, D. Burrows, D. Gleeson, and A. Trujillo-González (2023). "Invasive terrestrial invertebrate detection in water and soil using a targeted eDNA approach." NeoBiota 83: 71-89.

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Using environmental DNA methods (eDNA) for early detection of invasive terrestrial invertebrates in water and soil

Dr Cecilia Villacorta-Rath[1,2], Mrs Johanna Karam[3], Dr Samantha Tol[4], Mr Carl Shuetrim[4], Professor Lori Lach[2,4]
[1]Centre for Tropical Water and Aquatic Ecosystem Research (TropWATER), James Cook University, Townsville, Australia, [2]Centre for Tropical Biosecurity, James Cook University, Cairns and Townsville, Australia, [3]Department of Environment, Science and Innovation, Cairns, Australia, [4]College of Science and Engineering, James Cook University, Cairns, Australia

Biography:
Dr Cecilia Villacorta-Rath is a Senior Research Officer at the Centre for Tropical Water and Aquatic Ecosystem Research (TropWATER), James Cook University. She is trialling field methods and conducting laboratory experiments testing the persistence and detectability of eDNA of an array of species of management concern, in freshwater, marine and terrestrial ecosystems. Her work focuses on providing stakeholders with more "tools in the box" for detection and management of invasive species. Dr. Villacorta-Rath is leading multiple eDNA projects in northern Australia and her main interest is to develop user-friendly methods for non-specialist engagement.

Abstract:
Environmental DNA (eDNA) methods are revolutionising how we survey and monitor aquatic organisms. The technique is now recognised and used as a valid biodiversity assessment tool by managing authorities worldwide. Despite that, applications to terrestrial environments have been limited to mammals and other semi-aquatic organisms that come into contact with water, where they deposit eDNA directly.

Invasive invertebrates are a risk to industry, social well-being, and lifestyle. Because eradicating or managing large populations is quite costly, early detection may prevent high economic and environmental impacts. Environmental DNA has the potential to become an important tool in the box to combat terrestrial invaders through early detection. However, as for any other detection method, having an appropriate sampling design will maximise species detectability. For eDNA detection of terrestrial invertebrates, the main questions arising are where and how to sample. When dealing with a terrestrial organism that does not need to come in contact with water to hydrate, the first point of sampling will be soil. However, we have demonstrated that terrestrial invertebrate eDNA can be detected in water after rainfall events (Villacorta-Rath et al. 2023).

This talk will present the results of two projects aimed at detecting yellow crazy ants (Anoplolepis gracilipes) in both soil and water at sites in northern Queensland with known and unknown infestations. We collected soil samples at 22 sites in an infestation area in Shutte Harbour during April and September 2023. In 77% of the sites where live yellow crazy ants were seen during sampling, eDNA methods also detected the species. On the other hand, yellow crazy ant eDNA was detected at two sites where the ants had not been sighted. Ant presence was subsequently confirmed via traditional methods. For water eDNA detection, samples were collected at 11 creeks within the Townsville region adjacent or downstream from known yellow crazy ant infestations. Since Townsville has marked dry and wet seasons corresponding to winter and summer, respectively, sample collection was mostly carried out during the wet seasons 2023 and 2024, except for one sampling event in July 2023 after an unusual rainfall event. Two of those sites consistently showed eDNA detections, however, at one of those sites, the percentage of positive detections varied across sampling events possibly due to rainfall history and ant activity.

These examples can show the advantages and shortcomings of the technique for ant detection. Furthermore, I will show how the technique can be easily used in the field by Indigenous rangers, government staff and citizen scientists.

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Villacorta-Rath, C., L. Lach, N. Andrade-Rodriguez, D. Burrows, D. Gleeson, and A. Trujillo-González (2023). "Invasive terrestrial invertebrate detection in water and soil using a targeted eDNA approach." NeoBiota 83: 71-89.

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A rapid presumptive Loop Mediated Isothermal Amplification (LAMP) assay for detecting the invasive corn snake (Pantherophis guttatus)

Mr Nathan Deliveyne[1], A/Prof Jeremy Austin, A/Prof Kate Sanders, Prof Phill Cassey
[1]The University Of Adelaide, Adelaide, Australia

Biography:
Nathan Deliveyne is a PhD candidate at the University of Adelaide in the final stages of his candidature. He has focussed his PhD research on developing rapid presumptive molecular detection methods for key incursion reptiles, including those on Australia's vertebrate pest priority list. His main aim is exploring the application of isothermal amplification methods to environmental biosecurity, with a particular emphasis on assessing field ready capacity of methods and techniques for high-risk reptiles. This has included Boa constrictor and Pantherophis guttatus.

Abstract:
Introduction
The international exotic pet trade is a major pathway for the introduction of novel invasive alien species. Reptiles are common in the exotic pet trade and are prominent invasive alien vertebrate species globally with documented negative impacts on biodiversity, agriculture and health when allowed to establish. The North American corn snake (Pantherophis guttatus) is particularly common in the international pet trade and has been identified as a vertebrate pest priority species in Australia due to widespread climate suitability and prevalence in pre- and post-border seizure records. Compliance efforts are essential to preventing establishment and spread.

Aims
Corn snakes can be variable in appearance due to a plethora of captive bred morphs making identification difficult. Trade is often elusive with pathways restricted to illegal networks. We aimed to develop a novel detection assay based on Loop Mediated Isothermal Amplification (LAMP) for rapid and portable detections of corn snake DNA in compliance contexts for a range of scenarios and sample types including:
(i) Species identification for difficult to identify morphs,
(ii) Detection of DNA in the absence of a physical specimen from shed skin,
(iii) Detection of corn snake touch DNA from holdings used for illicit trade.

Methods
Loop Mediated Isothermal Amplification (LAMP) is an emerging biosecurity tool that has shown promise for rapid detection of several high-risk environmental biosecurity species. We developed our LAMP assay for the detection of a 208 bp section of the P. guttatus ND4 gene region. We validated our assay against: (i) synthetic DNA; (ii) DNA extracted from snap-frozen tissue and shed skins; (iii) and trace DNA collected from swab samples from various pet keeping scenarios. We also included lab optimisation for multiple extraction protocols (rapid and traditional) and assessed two mobile devices for in-field integration (Franklin Real-Time PCR Thermocycler (Biomeme) and Genie III (Optigene)). In this presentation we will discuss our work on tools suited to biosecurity detection for a species of highest vertebrate pest priority in Australia.

Results
Our corn snake LAMP assay successfully detected target DNA with appropriate sensitivity. Additionally, we did not observe cross amplification for non-target species common in the legal domestic reptile pet trade. Our detection assay performed well against all the sample types we tested against, and we found infield technologies provided viable options for detections outside of the laboratory.

Conclusions

We developed trace DNA detection tools for the management of a key vertebrate pest in a biosecurity and wildlife compliance context. This innovative assay can provide practical solutions to environmental biosecurity issues and drive further research into field applications of DNA technologies.

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Securing Borders: eDNA Integration Imperative for Government Biosecurity Policies

Dr Dianne Gleeson[1]
[1]University Of Canberra, Bruce, Australia

Biography:
Dr Dianne Gleeson is a geneticist, with 27yrs of research experience in the application of DNA technologies for biodiversity conservation and biosecurity in both New Zealand and Australia. Her career focus has been facilitating the translation of fundamental research into applied outcomes, working closely with stakeholders to ensure uptake. She leads the EcoDNA team, is Director of the National eDNA Reference Laboratory at the Faculty of Science and Technology, University of Canberra, and is Deputy-Director of the ARC Plant Biosecurity Training Centre.

Abstract:
In a recent review conducted by the Inspector-General of Biosecurity that assessed DAFF's biosecurity group regarding strategy, governance, and planning, the strategic importance or potential of eDNA technology for surveillance and diagnostics was outlined (1). However, the review also highlighted the lack of any clear policy that is required to support its use and adoption for biosecurity risk management. As eDNA continues to be used in a range of programs including State and Industry for the purposes of biosecurity, there is an urgent need for policy development for how eDNA is most effectively used to manage biosecurity risks.

To date, there has been an exponential increase in eDNA methods and assays for both targeted species detection (e.g. Khapra beetle, Red Imported Fire Ant, Brown Marmorated Stink Bug, Varroa mites, Myrtle rust) and for the use of metabarcoding in general surveillance (e.g. insects & plants). Alongside the technology advances, DAFF has facilitated the development of national eDNA test validation and protocol standards, establishment of a National eDNA Reference Centre and eDNA Collaboration Centre Network, a National eDNA Proficiency Testing Program, and a new Memorandum of Understanding with NATA under schedule 5 for eDNA testing facilities in Australia to achieve accreditation. However, a national scale coordinated eDNA surveillance programme has yet to eventuate, potentially missing critical opportunities to monitor spread and enable preparedness in regions at risk of high priority incursions. There is now a pressing need for the delivery of a policy framework that accommodates the best available technology as eDNA innovations continue.

This presentation will address how we can trust eDNA results and what is required to accept a detection and to interpret non-detections. Examples from recent biosecurity operations will be discussed giving examples of how robust validation is critical for reliability and credibility of eDNA results in biosecurity decision-making. Ongoing support for capacity building along with innovation and technology adoption is needed to keep pace with advances in eDNA science. Ultimately, fostering a culture of collaboration, transparency, and evidence-based decision-making is essential for ensuring the successful integration of eDNA into Australia's biosecurity policy framework.

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Genetic provenance analysis of Khapra beetle populations using Diversity Arrays Technology sequencing (DArTseq) technology

Dr Foyez Shams[1,2], Dr Uday Divi[3], Prof Lifat Rahi[4], Dr Dianne Gleeson[1,2], Dr Alejandro Trujillo-Gonzalez[1,2]
[1]National eDNA Reference Centre, University of Canberra, Bruce, Canberra, Australia, [2]Centre for Conservation Ecology and Genomics, University of Canberra, Canberra, Australia, [3]Biosecurity Plant and Science Services Division, Department of Agriculture, Fisheries and Forestry, Canberra, Australia, [4]Fisheries and Marine Resource Technology Discipline, Khulna University, Khulna, Bangladesh

Biography:
Dr Foyez Shams is a molecular geneticist with knowledge of bioinformatics, comparative genomics, population genetics, and cytogenetics. Upon finishing his PhD dissertation focusing on molecular method development for non-invasive sexing of Murray cod and Golden perch and assessment for the effectiveness of stocking these fishes in the Lachlan River, Foyez joined the EcoDNA team at the University of Canberra as a Research Fellow. Since then, Foyez has used both environmental DNA and RNA to aid Australian biosecurity through early detection of invasive insect species.

Abstract:
Global trade poses a significant threat to Australian biosecurity as a recognized pathway of important exotic pests and diseases. Molecular technologies have been demonstrated to provide accurate and sensitive tools to detect high-priority pest hitchhikers during border surveillance. For instance, recent testing of environmental samples for the presence of DNA/RNA of pest insect species showed that molecular testing gave officers time-sensitive evidence to detect high-priority insect species contaminating imported goods in shipping containers. However, the origin of these exotic species infestation is almost impossible, given that we lack reliable methods to identify potential sources of such contamination. To overcome this challenge, the first and foremost step is to identify the global genetic structure of the species of interest. In this study, we performed a genetic analysis of the Khapra beetle (Trogoderma granarium) using Diversity Arrays Technology sequencing (DArTseq) data to identify genetic structures corresponding to different geographic locations. Specimens collected from Thailand and Bangladesh were initially tested using a species-specific real-time PCR assay to confirm species identification. Samples that showed positive amplification in the PCR and ≥99% sequence similarity to the Khapra beetle were used for DArTseq analysis. Genomic DNA of 13 specimens from Thailand and 30 specimens from two geographic locations in Bangladesh were sent to DArTseq for sequencing. Genetic structure analysis using DArTseq generated Single Nucleotide Polymorphism (SNP) data revealed a significant genetic differentiation between Thailand and Bangladesh samples. Furthermore, distinct genetic clusters were evident within the two ecoregions of Bangladesh. The outcome of this study provides insight into the potential use of genetic data to identify the origin of Khapra beetle infestation detected during border surveillance. However, a large-scale genetic analysis covering samples from the species' current distribution range will require identifying this invasive species' global genetic structure before implementing genetic provenance analysis in border surveillance.

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A real-time PCR assay to detect Solenopsis invicta environmental DNA and RNA for biosecurity applications

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Biography:
Dr Foyez Shams is a molecular geneticist with knowledge of bioinformatics, comparative genomics, population genetics, and cytogenetics. Upon finishing his PhD dissertation focusing on molecular method development for non-invasive sexing of Murray cod and Golden perch and assessment for the effectiveness of stocking these fishes in the Lachlan River, Foyez joined the EcoDNA team at the University of Canberra as a Research Fellow. Since then, Foyez has used both environmental DNA and RNA to aid Australian biosecurity through early detection of invasive insect species.

Abstract:
Red imported fire ant (Solenopsis invicta), also known as RIFA, is one of the world's worst invasive species. RIFA can significantly impact Australian agriculture directly by destroying seeds and feeding on plants, as well as indirectly by competing with the local flora and fauna. Since 2001, multiple incursion events of this invader have occurred in Australia, some of which eradication is still ongoing. Early detection is essential for both in-border and post-border biosecurity. Environmental DNA (eDNA)-based methods provide a significant advantage in the early detection of invasive species, offering highly sensitive molecular options for biosecurity management. However, Solenopsis species show little genetic differentiation within gene regions that are commonly used in insect species-specific assay development for eDNA-based approaches. We designed a next-generation sequencing (NGS) data-based approach to overcome this challenge and developed a species-specific real-time PCR assay to detect DNA and RNA from RIFA. The assay showed 100% specificity to RIFA while testing against genomic DNA from 15 abundant ant species in Australia (including Australian native Solenopsis species). The assay can detect down to 0.12 copies and quantify 12 copies of gDNA per reaction with 98% efficiency (R2 = 0.99). For RNA, the limit of detection and the limit of quantification of the assay was 1.28×10-2 ng/µL with a 106% efficiency (R2 = 0.98). The field testing of the assay was performed on dust samples collected from four shipping containers (inside) located in an empty container park at the port of Brisbane (Qube Logistics) and soil samples collected from three RIFA nests near Brisbane that are presumed to be active. The assay was successful in detecting RIFA eDNA in 4 out of 4 Shipping containers with 75% detection success (9/12 qPCR replicates) and RIFA eRNA in 3 out of 4 Shipping containers with 58% detection success (7/12 qPCR replicates). From the nest samples, the assay detected RIFA eDNA in 2 out of 3 nests with 11% detection success (3/27 qPCR replicates). Nest samples were not tested for eRNA, considering the collection method and storage conditions during shipment from the collection site to the trace DNA laboratory at the University of Canberra. Using a Bayesian hierarchical model-based approach and a gDNA spike test, we identified that the low detection success rate in the nest samples was an influence of the collection method, sample size, and presence of inhibition in the site rather than the amplification capability of the assay. This research provides a molecular method for early detection of RIFA that can be used in Australian biosecurity for at-border and post-border applications.

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Utilizing Survival Analysis to Develop Models for Estimating Detection Size of Invasive Species under Surveillance

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Biography:
Dr Kuo-Szu Chiang currently holds a professorship at the Division of Biometrics within the Department of Agronomy at National Chung Hsing University in Taichung, Taiwan. His research primarily explores the application of statistical methods to plant epidemiology and biosecurity. He has collaborated with several plant pathologists from the USDA to develop standards for assessing plant diseases through the analysis of disease severity data. More recently, he is actively involved in biosecurity surveillance, focusing particularly on the risk assessment and management of invasive plant species.

Abstract:
The widespread damage caused by invasive alien species, such as exotic weeds, pests, and diseases, is well-recognized. A crucial factor influencing the impact of invasive species is the size of the outbreak at the time of detection, which is unpredictable in advance. Our goal is to estimate the actual size of a population at the initial detection point, to better predict the potential impact of a pest before it arrives.

We draw parallels between the concepts of surveillance and detection and the notions of survival or death in medical science. Consequently, survival analysis in statistics emerges as an effective method to address this challenge. This analysis allows us to link the distribution of infestation size at detection time with the probability of detecting an incursion, assuming it has not been detected earlier. This is represented by the hazard function, which describes the instantaneous rate of detection.

Previous studies (Garrard et al., 2008; McCarthy et al., 2013) have introduced a failure-time analysis model focusing on the time until the first detection of a species. They propose an exponential detection-time model that defines the time to events occurring in a constant detection rate Poisson process. Parnell et al. (2012, 2015) also applied an exponential distribution to estimate the incidence of an epidemic at its initial detection. However, the approaches have limitations, especially that the constant hazard function of the exponential distribution does not align with the intuition that the detection rate should increase with the size of the species. Additionally, the exponential distribution suggests an unrealistic scenario where the maximum detection probability occurs at a size of zero.

To overcome these limitations, we advance previous efforts by incorporating a survival-based model to gauge the size of an incursion at the point of detection. By adopting the Weibull distribution for approximation, we demonstrate that its probability density functions more accurately reflect reality, indicating that the detection rate indeed increases with size, similar to a nonhomogeneous Poisson process. Our findings reveal that the highest probability of detection doesn't occur immediately but increases with size and then decreases after reaching a certain threshold. This model is more consistent with real-world expectations and provides a more accurate depiction of detection probabilities.

Our research offers valuable insights for optimizing surveillance resource allocation in plant health management and could potentially apply to broader invasive species management strategies.

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Unlocking the Potential of MicroRNA Biomarkers to Diagnose Vector-Borne Diseases: A Systematic Review and Implications for Australian Biosecurity

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Biography:
Tilini De Silva is a postgraduate researcher at the Department of Veterinary Biosciences at the University of Melbourne. She completed her undergraduate studies at the University of Peradeniya, Sri Lanka majoring in Zoology and Applied Parasitology. Her areas of expertise include infectious diseases, molecular biology, molecular phylogeny, parasitology, and zoology. Her PhD research focuses on investigating the potential of using microRNA (miRNA) biomarkers to improve the diagnosis and management of various vector-borne infectious diseases that are of great importance to Australian biosecurity such as Chikungunya virus infection, Dengue, Flavivirus infection, Japanese encephalitis virus infection, and Malaria.

Abstract:
Vector-borne diseases, disseminated by vectors such as mosquitoes, ticks, and other arthropods, present a substantial worldwide health dilemma with the threats of a changing climate. Timely and precise detection of such diseases is imperative for efficient disease control and prevention. In recent years, microRNAs (miRNAs) have emerged as promising biomarkers for the diagnosis and prognosis of various infectious diseases, including those transmitted by vectors.
This systematic review aimed to synthesize the existing evidence regarding the utilization of miRNA biomarkers in the detection of vector-borne diseases in human populations, with a specific emphasis on their possible implementation within the framework of Australian biosecurity.
Four electronic databases namely, Cab Direct, PubMed, Scopus and Web of Science were searched to retrieve peer-reviewed articles published in English. A total of 935 references obtained from all databases were exported to a reference management tool (Covidence) from which 508 duplicate records were eliminated. This left 427 studies that underwent initial screening by evaluating their titles and abstracts, from which 320 were eliminated due to irrelevancy and 89 full-text articles were assessed for eligibility. Subsequently, 61 articles were identified that met the inclusion criteria; including being published between 2010 to 2024.
The systematic review identified articles focussing on the application of miRNAs for detection of several vector borne diseases, including Chikungunya virus (CHIKV) infection, Dengue, Flavivirus infection, Japanese encephalitis virus (JEV) infection, and Malaria which pose a significant threat to Australian biosecurity due to their potential to cause widespread health issues and economic impacts. Key findings included: the significant upregulation of miR-21-5p and significant downregulation of miR-155 associated with patients infected with Japanese encephalitis virus, differential expression of miR-122-5p, miR-3158-3p, and miR-4497 associated with severe malaria symptoms, decreased circulating miR-126-3p levels in dengue-infected patients which has shown potential as an early biomarker for dengue infection, and the detection of mir-3937 and mir-4327 as potential markers for dengue infection severity, with mir-4327 showing promise for future studies on dengue haemorrhagic fever. The review also revealed some key insights on diverse disease vectors and infectious agents that are crucial to Australian biosecurity such as; a) specific miRNAs such as miR-2944b-5p and miR-2b regulate CHIKV replication in Aedes aegypti mosquitoes, b) miRNAs such as aga-miR-8-3p and aga-miR-34-5p are involved in Anopheles spp. mosquito immune response to Plasmodium virus and c) Ixodes scapularis ticks show differential expression miR-X1b and miR-210 during the flavivirus infection of Powassan virus. These results emphasize the potential of miRNAs for serving as diagnostic biomarkers for diverse vector-borne diseases that raise substantial biosecurity apprehensions.
Australia's unique ecosystem and diverse vector populations, such as mosquitoes and ticks, pose a continuous risk of causing vector-borne disease outbreaks. Developing rapid, accurate, and specialized diagnostic tools based on miRNA biomarkers could enhance early detection and surveillance of these infections, enabling timely intervention and disease management. These findings have significant implications for advancing

innovative diagnostic tools and strategies to bolster biosecurity and disease surveillance in Australia, ultimately contributing to enhancing public health preparedness against emerging threats from vector-borne diseases.

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Harnessing the Power of Micro RNA Biomarkers: Innovative Diagnostics to Strengthen Australia's Biosecurity Defences

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Biography:
Tilini De Silva is a postgraduate researcher at the Department of Veterinary Biosciences at the University of Melbourne. She completed her undergraduate studies at the University of Peradeniya, Sri Lanka majoring in Zoology and Applied Parasitology. Her areas of expertise include infectious diseases, molecular biology, molecular phylogeny, parasitology, and zoology. Her PhD research focuses on investigating the potential of using microRNA (miRNA) biomarkers to improve the diagnosis and management of various vector-borne infectious diseases that are of great importance to Australian biosecurity such as Chikungunya virus infection, Dengue, Flavivirus infection, Japanese encephalitis virus infection, and Malaria.

Abstract:
Vector-borne diseases such as malaria, dengue, lumpy skin disease, Bluetongue disease, Japanese encephalitis virus and flavivirus infections pose a significant threat to global public and/or animal health, especially in areas with limited access to diagnostic tools, surveillance and response resources. Developing accurate, rapid, and affordable diagnostic instruments is crucial for early disease detection, efficient treatment, and effective disease management. In this context, the application of microRNA (miRNA) biomarkers has emerged as a promising approach for the identification of such diseases.
Currently available diagnostic tests for infectious diseases in Australia face several challenges, including lack of sensitivity and specificity, delayed detection, and unavailability of tests for certain emerging pathogens. These restrictions reduce Australia's ability to prevent the introduction and spread of vector-borne illnesses and compromise the efficacy of the nation's biosecurity protocols. With a potentially useful application in the context of Australian biosecurity, this study aimed to investigate the possibilities of miRNA-based diagnostics for vector-borne diseases, with a focus on developing diagnostic platforms that can accurately identify and quantify these biomarkers, as well as validating specific miRNA signatures linked to different vector-borne infections. MiRNAs possess several unique properties that make them well-suited for diagnostic applications, such as their rapid response to infections and presence in various biological fluids. This presentation outlines the plan of a series of commencing studies aiming to develop novel diagnostics for vector-borne diseases utilising miRNA technologies. The findings of these studies will be reported on in the presentation.
In a time-course experiment, the stability of miRNA was investigated across different storage temperatures and durations. We expected to observe a stable miRNA level at 4°C for 24 hours and significant degradation after 72 hours incubation at 4°C. Through determining how pre-analytical variables such as temperature impact miRNA biomarkers, researchers can outline optimal repeatable protocols for such novel diagnostics and ensure their validity and dependability so that they can underpin biosecurity surveillance initiatives. Subsequently, a set of differentially expressed miRNAs for an array of vector-borne diseases will be identified using Reverse Transcription Quantitative Polymerase Chain Reaction (RT-qPCR). These miRNA biomarkers will be further validated through extensive testing and cross-validation with traditional diagnostic methods, such as PCR and Next Generation Sequencing (NGS). Next, the NGS data will be used to further identify the differentially expressed miRNAs, which will then undergo Artificial Intelligence (AI) analysis and machine learning. By utilizing AI-powered analysis on extensive miRNA datasets, distinct signatures that signal the presence of pathogens can be swiftly recognized, thus circumventing the constraints associated with conventional, time-intensive approaches.
The successful implementation of miRNA-based diagnostics has the potential to revolutionize Australia's biodefense system. These pioneering technologies possess the capability to offer timelier, more precise, and more flexible identification of diseases transmitted by vectors, facilitating a more pre-emptive and efficient countermeasure against emerging risks. Additionally, the versatility of miRNA biomarkers for various

purposes, including forecasting disease intensity and assessing the effectiveness of treatments, further enhances their applicability in the context of Australian biosecurity.

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Using Wildlife as an Approach to Animal Disease Surveillance

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Abstract:
The Northern Territory covers a vast area and is home to a variety of arthropod species. This coupled with its proximity to Asia makes it a well-known region for exotic animal disease incursions. Historically, surveillance activities have largely been reactive to human cases or detections in other jurisdictions, targeted to reservoir hosts and insect vectors. Currently, the role of wildlife in transmission and circulation of viruses of pathogenic concern is unclear.

Using a high throughput sequencing approach, in collaboration with the Australian Centre for Disease Preparedness (ACDP Geelong, Victoria), we constructed a metagenomics pipeline giving us the capability to identify novel viruses as well as new detections of existing viruses of pathogenic concern. This not only provides means for an early detection system for surveillance activities, but also investigates the competence of Australian wildlife as potential reservoir hosts.

We have opportunistically collected the lung tissues of wildlife submitted to the Berrimah Veterinary Laboratory for the detection of microorganisms present in the respiratory tract. Identifying the viruses present will help to lay a foundation for understanding wildlife-host virus epidemiology and inform surveillance strategies for future emergency animal disease incursions.

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The Terrestrial Invertebrate Trade: Implications for Biosecurity in Australia

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Biography:
Charlotte Lassaline is a second year PhD candidate at the University of Adelaide. Within the School of Biological Sciences, she is a member of the Invasion Science and Wildlife Ecology Lab, and the Invertebrate Systematics and Biodiversity Lab. She currently researches the trade of terrestrial invertebrates, and associated conservation and biosecurity risks. Charlotte has a range of experience with web-scraping technology, social media data collection, and wildlife trade research. She is interested in invertebrate conservation, biosecurity risk assessments, and wildlife trade networks.

Abstract:
The demand for exotic pets is increasing globally, fuelled by social media and the shift towards online marketplaces over traditional physical stores (Lockwood et. al 2019). While the trade of vertebrates has received considerable attention, the trade of terrestrial invertebrates remains relatively unexplored within Australia. This trade presents serious implications for Australia's biosecurity, giving rise to a multitude of adverse consequences, including introduction of non-native species, the overexploitation of wild populations, and the spread of disease (Lassaline et. al 2023). Compounding these issues is the inherent difficulty associated with monitoring the trade across various layers of the internet (Stringham et. al 2021). As this facet of wildlife trade continues to grow and evolve, so must our measures to ensure the resilience and efficacy of our biosecurity systems.

In a novel one-year snap-shot study, we investigated the online trade of terrestrial invertebrates in Australia (Lassaline et. al 2023). Using web-scrapers and manual collection methods, we collected data from a public classifieds website and 23 Australian online pet stores. We identified 264 species of traded invertebrates, including tarantulas, ants, snails, stick insects, and beetles. While 87% of traded species are native, 14 are non-native to Australia, with three are identified as invasive: the Mediterranean white garden snail (Theba pisana), the African big-headed ant (Pheidole megacephala), and the Asian tramp snail (Bradybaena similaris). Our one-year study revealed no saturation in the number of traded species, exemplifying the need for large scale monitoring and risk assessments for Australia's terrestrial invertebrate trade.

Ongoing research is investigating additional trade pathways including physical pet stores, social media platforms, wildlife trade expos and the interception of intentional invertebrate imports by Australian Border Force. Innovative data-driven analyses and risk assessments are now crucial for exploring the information collected and enhancing regulatory strategies for the invertebrate trade.

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Applying Australian biosecurity policies to Antarctica: mitigating the risk of vessel biofouling introducing non-native species

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Biography:
Frances Perry is a PhD student at the University of Adelaide investigating the potential for marine invasive species to arrive in Antarctica through biofouling on vessels and aims to identify the most effective biosecurity practices to prevent their arrival. Her work is supported by Securing Antarctica's Environmental Future (SAEF).

Abstract:
Biofouling is recognised as the main pathway for the introduction of non-native marine species worldwide, with 55% of invasive marine species associated with biofouling globally; compared to 30% associated with ballast water. Antarctica is the only remaining area without any known established populations of non-native marine species. Scientific, fishing, and cruise vessel activity, alongside rapidly changing environmental conditions are increasing the risk posed to Antarctica by non-native marine species. Ballast water is regulated globally by the IMO convention whereas biofouling is not subject to international regulations.

Australia has a large presence in Antarctica, with three permanent research stations in East Antarctica, a base on the sub-Antarctic Macquarie Island, and a purpose-built icebreaker, the RSV Nuyina. Effective biosecurity practices are needed to prevent introductions of non-native marine species into Antarctica, such as biosecurity protocols for vessels travelling to and from Antarctica. Only three countries have developed their own biofouling policies, including Australia, with vessels required to demonstrate proactive biofouling management before they are permitted entry into Australian waters.

A framework for the management of biofouling in Antarctica has been developed. Gaps in the management of vessel biofouling were identified, both internationally and within the Australian program, highlighting that diverse communities are likely already present in the biofouling communities travelling to Antarctica. The application of the 2023 Australian biofouling management requirements to the Antarctic environment has been examined, finding that international collaboration on the implementation of similar policies across countries with Antarctic bound vessels is required to protect Antarctica’s unique marine environment.

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Translating shared responsibility in biosecurity into action

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Biography:
Lyndal Reading has worked for Agriculture Victoria for the past five years, mostly in working in biosecurity, including projects around African swine fever, foot-and-mouth disease, Queensland fruit fly, avian influenza and khapra beetle. Lyndal has been involved in behavioural insights research since the avian influenza outbreak in Victoria in 2020.

Before joining Agriculture Victoria Lyndal was a reporter and business editor for rural newspaper The Weekly Times and a reporter for ABC rural. While completing her Bachelor of Arts degree Lyndal worked in behavioural insights research as an interviewer for quantitative surveys.

Abstract:
Introduction
Victoria's Biosecurity Statement 2022 articulated a vision for shared responsibility in biosecurity across industry, government and community, where our biosecurity system protects what we value most. It outlines a vision where everyone understands the threats posed by harmful pests and diseases and acts to protect and enhance the environment around them.
The statement communicates shared purpose and ambition for biosecurity. There's broad support for strengthening the biosecurity system, but we need to be clear about what shared responsibility means for different sectors.
The statement was the foundation for the 2023 Victorian Biosecurity Strategy.

Aim
The objective of behavioural insights research by Kantar Research last year was to find out whether farmers and the wider population supported the idea of shared responsibility in biosecurity.
Methods
Kantar reviewed biosecurity research undertaken in 2021 by Victoria which included a large-scale survey of farms, related businesses, small holdings, interest groups and government.
Kantar then conducted 10 qualitative case studies with producers, eight focus groups with the general public, a quantitative telephone survey of 212 producers and an online survey of more than 1000 Victorians.

Results
Producers and Victorians generally do not understand a collective approach to biosecurity. Rather, they see responsibility lying primarily with government and producers.
However, both cohorts welcomed the of shared responsibility when it was presented to them. Both groups need some guidance on what biosecurity is and why it matters to embrace the concept of collective biosecurity action.
The research found when producers were asked who was responsible for managing biosecurity risks, 91 per cent said the federal government and 84 per cent said the state government. Only 41 per cent agreed the whole community was responsible.
The results were similar for the general population where 81 per cent said it was the federal government's responsibility to manage biosecurity risks, 80 per cent agreed it was the state government's responsibility and only 40 per cent said with was the wide community's responsibility.
However, when asked if they agreed that biosecurity was everyone's responsibility, 94 per cent of farmers and 78 per cent of Victorians agree or strongly agreed.
The notion of collective biosecurity will resonate with producers and the wider public. But for many it does not resonate without guidance.
The first step in introducing the concept of biosecurity as everyone's responsibility is an engagement plan spearheaded by an advertising campaign.

The Make A Difference in Biosecurity advertising campaign shows the simple steps people are taking to protect what matters to them – the environment, their garden, their business, their industry.
It is underpinned by a series of eight short videos with people talking about what biosecurity activities they do and why.
The Kantar research showed that people prefer to hear biosecurity messages from industry and community leaders, not the government. This advertising campaign uses people outside of government – gardeners, farmers, Landcare leaders, Aboriginal elders – to share biosecurity messages.
Further comms includes providing articles about biosecurity to industry publications – a preferred channel for producers.

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Rethinking biosecurity of shipping containers in Australia: Inferring on the risk of insect pest hitchhikers using molecular data

Dr Alejandro Trujillo-Gonzalez[1], Dr Foyez Shams[1], Dr Roger Huerlimann[2], Professor Richard Duncan[1], Ms Jennifer A Soroka[1], Ms Kymberly Crockett[1], Dr Dianne Gleeson[1]
[1]University Of Canberra, Bruce, Australia, [2]Okinawa Institute of Science and Technology, Okinawa, Japan

Biography:
Dr Alejandro Trujillo-González is a molecular ecologist with 10 years of experience in parasitology, parasite host interactions, molecular assay development, environmental DNA-based testing, and biosecurity. Alejandro is the Principal Scientist of the Australian National eDNA Reference Centre at the University of Canberra.

Abstract:
Exotic insects pose important biosecurity risks to Australia, where widespread incursions could cost the country billions of dollars to manage and minimize. The international trade of commodities and produce is the most important pathway associated to the translocation of invasive exotic species. Shipping containers for example, carry approximately 90% of global trade and have been repeatedly reported to translocate invasive insects. Australia has biosecurity measures to prevent and manage insect incursions at ports of entry, however, measures are mostly reactive and surveillance methods rely heavily on manual inspection by biosecurity officers, which is time consuming and results in only a fraction of risks being assessed at the Australian border. The Australian Government Department of Agriculture, Fisheries and Forestry's Hitchhiker pest program has invested in a 4-year project (2021-2025) exploring the use of Environmental DNA (eDNA) and RNA (eRNA)-based methods as sensitive surveillance methods to complement biosecurity assessment on the presence of high-risk pests associated to the shipping container trade. A total of 2119 dust samples were collected from shipping containers arriving at an empty shipping container park in Brisbane during May-August of 2021. A total of 2112 dust samples were tested for eDNA/RNA using both species-specific and metabarcoding methods to estimate detection sensitivity of eDNA/RNA surveillance. Most importantly, we use Bayesian inference on risk differences by using multivariate posterior of probabilities to develop a risk estimation framework suitable for shipping container assessments. Posterior probabilities were based on assessment of shipping container histories (e.g. country of origin, country of loading and container contents) and diagnostic entomological assessments of insect in dust samples and container visual inspections confirming the presence of insect pests to train the Bayesian model.

Results show that detection sensitivity of high priority species (Trogoderma granarium (Coleoptera), Halyomorpha halys and Lycorma delicatula (Hemiptera), Lymantria dispar (Lepidoptera), Wasmannia auropunctata (Hymenoptera) increases with detection congruency of eDNA and eRNA across all species. A total of 229 samples (10.08 %) showed positive detection for T. granarium eDNA, of which 16 (0.75 %) tested positive for RNA. Similarly, a total of 17 samples (0.8 %) showed positive detection for H. halys eDNA, of which 8 (0.4 %) tested positive for RNA. A total of 40 samples (1.89 %) showed positive detection for W. auropunctata eDNA, of which 4 (0.2 %) tested positive for RNA and 31 samples (1.46 %) showed positive detection for L. dispar asiatica eDNA, of which 3 (0.14 %) tested positive for RNA. A total of 3,459,189,038 reads passed quality control and assurances for metabarcoding analysis, which resulted in eDNA detection of approximately 150 insect species, including over 14 different high priority pest species. Risk inference was strongly influenced by molecular detections, and probability of detection of insects by visual inspections. Here, we discuss how risk can be estimated using Bayesian risk difference models and how it can provide risk decision frameworks greater reliability and predictive value when integrated with molecular detection data.

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eDNA based detection as a tool in biosecurity monitoring and surveillance to enhance early detection and management of invasive pests

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Biography:
Antonette Walford has been a biosecurity entomologist for over 16 years, beginning her career in the Department of Fisheries and Forestry before moving to the Chief Plant Health Officer Branch within Agriculture Victoria in 2019. Her current role involves the triage and assessment of public reports of suspect plant pests as well as providing technical and policy advice on pest risks pathways and also responds to exotic pest detections. In the last few years, she has had involvement and interest in the emergence of environmental DNA in biosecurity settings and is passionate about driving its application in biosecurity surveillance.

Abstract:
The rapid development of environmental DNA (eDNA) technologies to enable environmental, human and animal health monitoring has seen eDNA-based surveillance used alongside traditional methods to detect pests in marine ecosystems, infectious pathogens in wastewater, and monitoring biodiversity in Australia. Most recently, research done by the University of Canberra and funded by the Department of Fisheries and Forestry demonstrated the capacity of eDNA to inform biosecurity on the presence of > 21 species of biosecurity concern by extracting eDNA from air, dust, water and soil collected from a wide range of samples from across the biosecurity continuum. Most importantly, these tests were conducted following ISO/IEC testing standards as well as diagnostic guidelines for assay development from the World Organisation for Animal Health, providing a backbone of high quality standards to support federal and state biosecurity applications.

Research-to-date indicates that eDNA holds promising potential as a complimentary tool to existing surveillance methods for early detection of exotic pests and diseases. Robust frameworks are needed to enable the adoption of this tool, facilitating the assessment of efficacy and feasibility. Research is currently being developed to examine the implementation of eDNA sampling as a complementary tool alongside traditional biosecurity surveillance methods. This will involve exploring potential applications of eDNA sampling in various contexts, including apiary surveillance for varroa mite, phylloxera monitoring to track movement, and khapra beetle proof-of-freedom surveillance in grains. The aim is to enhance surveillance data and establish an early detection system for exotic pests. The project will entail collecting and analysing eDNA sampling data to provide proof of concept for the use of eDNA as a surveillance tool for the early detection of invasive pests. eDNA data sets will be compared against existing standard surveillance methods to evaluate their effectiveness for use in early detection of exotic pests, with the goal of facilitating expanded implementation. This will assist in eradication and management programs, while also providing valuable data on the spread and movement of newly introduced pests, such as the varroa mite, to improve management plans.

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Corruption, a hidden plague affecting biosecurity and sustainable development

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[1]Ministry of Agriculture and Livestock of the Federative Republic of Brazil, Brasília, Brazil

Biography:
Lawyer with a postgraduate degree in constitutional limits of investigation, Torbi Rech has been a federal civil servant since 2006. He has worked in various states across Brazil, including the Amazon region. His experience includes anti-corruption investigations, auditing, and matters related to integrity. Between 2018 and 2022, he served as an attaché at the Brazilian Embassy in Canberra. Since 2022, he has worked at the Ministry of Agriculture and Livestock of the Federative Republic of Brazil. In this role, he has had the opportunity to collaborate with law enforcement agencies, national security organizations, and the federal prosecution office.

Abstract:
Corruption is present in every aspect of society, including agribusiness. It disrupts entire supply chains, endangers biosecurity, hampers measures towards achieving sustainable goals. The United Nations Convention Against Corruption (UNCAC) has recognised that tackling corruption requires concerted efforts from both public and private sectors and engagement from civil society. As such, incentives to the agribusiness to adopt and implement effective integrity measures are necessary to safeguard economic activity and biosecurity and promote sustainable development.

Government action against corruption is increasingly visible. In Brazil, many police operations have been carried out since 2017 to investigate corrupt conduct by agribusiness companies and public officials. The largest mobilized 1,100 agents and issued 309 judicial warrants. In total, 21 slaughterhouses were investigated. Additionally, the Ministry of Agriculture suspended 33 inspectors from their duties and Brazilian meat exports to 14 countries and the European Union were suspended due to quality concerns.

Corruption can compromise regulatory inspections. When officials charged with enforcing biosecurity regulations are bribed or influenced, they may overlook violations or approve unsafe practices, threatening public health, biosecurity, and the environment. Such is the case with agriculture products being illegally brought into a country to benefit from lower exports tariffs, exposing farmers to biosecurity threats and their consequences.

In both Brazil and Australia, agribusiness occupies a significant portion of the trade balance, which results in strong public and private investment. Thus, any factor that disrupts agribusiness production chain can cause immeasurable losses and deteriorate public trust in governmental institutions and regulatory agencies tasked with ensuring biosecurity and sustainability. It can also negatively impact the credibility of their products in global markets, potentially leading to the temporary closure of markets.

To address these issues, government action alone has not been enough. As a result, various international organisations have increasingly proposed initiatives to encourage private sector to adopt integrity measures to prevent and detect corruption. This is the case with the OECD project “Galvanizing the Private Sector as a Partner in the Fight Against Corruption", that incentivises collective action and strengthens public-private sector cooperation against corruption.

Such initiatives are crucial to disseminate an integrity culture among businesses and reduce corruption and its harmful consequences. Furthermore, giving the importance of the sector for the economy, farmers must step up and report cases of corruption to avoid increasing costs of production, the closure of markets and loss of competitiveness, and to protect biosecurity and sustainable development.

In addition to incentivising the adoption of integrity measures by the industry, governments can support farmers by redirecting fines generated by corporate corruption towards improving agribusiness infrastructure,

the environment, and biosecurity. Sectors of agribusiness advocate this initiative as an educational measure and a response to society.

Legal sanctions and punishments are one hand of the fight against corruption. The other is prevention which depends on actions to educate and engage non-government actors against hidden threats brought by corruption to a fair, safe and sustainable economic environment.

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Eradicating fire ants by 2032: The National Fire Ant Eradication Program response plan

Mr Ash Bacon[1]
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Biography:
Ashley Bacon is Executive Program Director for the National Fire Ant Eradication Program and is a passionate and innovative leader. Ashley is determined to eradicate fire ants from Australia. Drawing on his background in leadership roles across the agriculture, energy, mining, tourism and justice sectors, Ashley is transforming the approach to fire ant eradication and building a new and contemporary purpose-drive biosecurity program.

Abstract:
The National Fire Ant Eradication Program (the Program) is one of the largest and most complex biosecurity eradication programs in Australia and the world.
The new fire ant response plan outlines an ambitious, yet achievable, roadmap to eradicate fire ants from Australia by 2032.
To be successful the program must innovate. The program has the backing of all state and territory governments and the Australian Government, and is investing heavily in science, technology, equipment, its people, and new ways of doing things.
The new fire ant response plan focuses on strengthening containment and compliance, and intensifying program-led and community treatment.

Key areas for innovation include:
1. A new shared responsibility model activating local councils, state and federal government agencies, industry, and the community to manage fire ants on land they own or manage. This work is being led by the Queensland Government's Fire Ant Suppression Taskforce (FAST).

2. New fire ant bait types, including exploring mRNA gene silencing, and wettable baits to reduce downtime when it rains.

3. New bait application approaches including introducing the use of drones, fixed wing aircraft and extending our treatment season into the winter months in warmer areas to enable the Program to double the annual treatment area to around 299,000 (unique) Ha per year.

4. New surveillance approaches to build a more accurate and complete understanding of fire ant population through research into eDNA, citizen science and the expansion of our odour detection dog team.

5. A new compliance and enforcement strategy to keep our strategy on track including increasing our compliance team eight-fold and development of industry guidelines to make our expectations clear.

6. A new fit for purpose governance model that brings the right people to the table at the right time to make critical strategic decisions and ensure transparency and accountability.

7. New behavioural research to enable the program to adjust its service delivery approach to enhance customer experience, build community support, and improve operational performance.

Fire ant eradication is the only option to protect Australia from fire ants.
The United States offers a live example of an uncontrolled fire ant infestation, where it is estimated fire ant control costs their economy around $9 billion annually. Australia will follow a similar path if the Program isn't successful.
The new fire ant response plan builds on the success and learnings from the Program over the last 20 years and innovation is the central pillar that will enable the program stop fire ant once and for all.

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How Extended Reality (XR) is being used to address biosecurity challenges across the Australian agriculture industry

Ms Kat Bidstrup, Tim Gentle
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Biography:
Kat Bidstrup is the CEO of Think Digital and South Australia's Emerging Entrepreneur 2022.
Kat grew up on a farm and has worked in PR, media and corporate affairs across private and public sectors. She draws on this unique background to direct Think Digital to elevate agriculture through innovative and engaging experiences using immersive technology and AI. Think Digital works across several sectors, with projects ranging from national biosecurity training for remote workers to educational programs teaching kids where their food comes from. Kat believes the work of Think Digital will help solve some of the more complex problems in agriculture.

Founder and Director of Think Digital. Tim Gentle uses XR and AI to tackle agricultural challenges, from workforce training to educating about food origins and biosecurity. FarmVR, CattleVR, and FarmAR Apps teach kids about how food is grown. Tim's 14-metre mobile VR classroom travels across Australia, offering VR experiences at agricultural events. With 20 years of experience, he has conducted over 2000 workshops and believes in an "all boats rise" philosophy. Ultimately, Tim aims to leave the planet better than he found it.

Abstract:
The Australian agriculture industry faces unique biosecurity challenges owing to the geography of our island continent. Working with various industry and government organisations, Think Digital™ is showing how XR technology can be leveraged to address some of these challenges.

Most Australian producers have never experienced first hand how diseases like Foot and Mouth present in their livestock, and current preparedness training relies heavily on static visual tools such as posters and powerpoint, or written descriptions.

Animal Health Australia engaged Think Digital to develop a range of innovative tools to help engage producers and front line animal workers on effective biosecurity practices and how to recognise emergency animal diseases in their livestock.

Importantly, these tools have been developed to be cutting edge, taking advantage of the latest technology yet also be available on standard mobile devices and computers. This means a wider reach and engagement for audiences across the sector.

The tools we will be discussing in our presentation include:

- Biosecurity Virtual Tour developed as part of the NB2 Indigenous program to provide peer to peer learning about best practice biosecurity for workers in some of our most remote regions.
- Sheep carcass tool - a 3D tool that shows producers the impact common conditions can have on the carcass viability at the processor. This encourages producers to make changes in the way they manage their livestock back on the farm.
- Virtual Reality Cattle Handling simulator - this VR experience teaches people about flight zones and how to safely move around cattle, with future modules including animal health checks and fit to load.
- Emergency Animal Diseases Augmented Reality Tool - a cutting edge tool developed for use on the Microsoft Hololens2 as well as via a mobile application, this allows producers to visualise how an emergency animal disease such as foot and mouth disease might present in their livestock, how to identify the symptoms and the steps they need to take.
- RemoteVet.ai - a tool developed by Think Digital with support from industry that uses machine learning technology to calculate the probability that a cow is presenting symptoms of diseases based on image recognition. Specifically designed for use with FMD and LSD, the application is now being expanded to include endemic conditions such as Buffalo Fly. This will allow producers and front line

workers to receive real time predictive information, enabling rapid decisions about isolating animals and calling in the experts for testing and diagnosis - before the condition spreads more broadly.

We will use a presentation deck with images, short video clips and demonstrations to discuss these tools. Attendees will have links to download and access the tools for future engagement.

Expect a Think Digital presentation to be thought provoking and interactive, with the opportunity for attendees to experience the technology during the session if time allows, and certainly afterwards.

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A structured approach to biosecurity decision-making in the Antarctic

Dr Zach Carter[1], Prof Phill Cassey, Dr Jacinta Holloway-Brown, Dr Melissa Humphries, Dr Isabelle Onley, Dr Michael Runge, Dr Justine Shaw
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Biography:
Dr Zachary Carter is a research fellow at The University of Adelaide and is part of Securing Antarctica's Environmental Future (SAEF). His research is focused on providing solutions to difficult ecological problems with themes centered on biodiversity conservation, decision-making, and invasive species management.

Abstract:
The Antarctic region has been relatively unaffected by invasive species from an due to its extreme climate and geographical isolation. However, these barriers are now breaking down due to pressures from anthropogenic climate change and human activities. Effective Biosecurity is therefore paramount to prevent unintended introductions of non-native species in the near future. Despite this need, the Antarctic Treaty System's governing body (through the Committee for Environmental Protection; CEP) provides only general recommendations to thwart the movement of non-native species, which are potentially inadequate considering the growing scale and magnitude of activities occurring in the region. Our study sought to build upon and expand these recommendations by providing Antarctic Treaty Parties with a decision-support tool to guide the implementation of biosecurity actions in the Antarctic region. We specifically address the CEP's primary concerns regarding preventative biosecurity measures to identify suites of actions that balance (i) efficacy, (ii) cost efficiency, and (iii) time investment at each stage of the logistics supply chain. Moreover, these action suites are tailored based upon the transferral of different biosecurity risks (vertebrates, invertebrates, plant material, soils). Our decision-support tool was constructed using Bayesian decision networks and was parameterised through structured elicitation of Antarctic scientists, logistics experts, and policymakers. We use the Australian Antarctic Division's 2023-24 Denman Terrestrial Campaign as a case study to demonstrate the utility of our approach. This work is ongoing and so we present on the construction of our decision network and our process for eliciting Antarctic experts.

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Shining a Light on Australia's Bachelor's Degree Veterinary Paraprofessionals: Strengthening Our National Animal Biosecurity Defences

Dr Patricia Clarke[1], Dr Esther Callcott[2]
[1]The University Of Queensland, Gatton, Australia, [2]Charles Sturt University, Wagga Wagga, Australia

Biography:
Dr Patricia Clarke was a veterinary practitioner for 15 years, then taught veterinary nursing in TAFE for 10 years. As the inaugural coordinator and lecturer of the Bachelor of Veterinary Technology, at UQ's School of Veterinary Science, her PhD thesis examined the role of higher education in the advancement of veterinary technology in Australasia. Trish is Chair of the 'Educators for the Allied Veterinary Health Professionals in Higher Education (Australia)', a member of the National Industry Advisory Group for Veterinary Nursing, the Australian Veterinary Nurse and Technician Registration Scheme Regulatory Council, and the Animal Care and Management Industry Reference Group (Queensland).

Abstract:
The bachelor's degree qualified veterinary technologist/technician and veterinary nurse have an emerging and powerful role to play in the defence of Australia's animal biosecurity. With the current veterinary workforce shortage, veterinary paraprofessionals with a university science-based education, clinical nursing skills, and in-depth animal health knowledge complementing the role of veterinarians, have great potential to expand our national biosecurity defences. At present, Australia has three veterinary technology degrees delivered by The University of Queensland, Charles Sturt University, and The University of Adeliade. These programs include foundational scientific courses in addition to clinical veterinary nursing. Similarly, Melbourne Polytechnic in partnership with La Trobe University offer a Bachelor of Veterinary Nursing.

As yet, the role of the veterinary technologist has not been defined in Australia. Consequently, it is timely for new ways of thinking about Australia's animal biosecurity defences and veterinary technologists' potential for alleviating the pressures on veterinarians and enhancing animal biosecurity.

The World Organisation for Animal Health recognises the critical role of veterinary paraprofessionals working with veterinarians in a country's animal disease surveillance, prevention, and control programs. Concurring with this view, the World Veterinary Association's recently published position statement focused on the vital role of veterinary paraprofessionals in supporting veterinary services and the need for their regulation by Veterinary Statutory Boards. At present, Western Australia is the only jurisdiction in Australia that registers veterinary paraprofessionals such as veterinary nurses. However, the Australasian Veterinary Boards Council and the Veterinary Nurses Council of Australia are collaborating on establishing a national veterinary nurse and technologist registration scheme. This will provide accountability for professional practice and conduct, increase protection to animal health and welfare, align us with international standards and safeguard the public interest and protect the public health. It will also provide an opportunity for the veterinary technologist role to be clearly defined and introduce regulatory measures to ensure they are providing high-quality evidence-based services.

In addition to their clinical expertise, veterinary technologists can engage with clinical research, through their understanding of scientific principles and research methods. As well as their capability in the field, veterinary technologists have prime opportunity to perform/assist with data collection and field trials. At present, veterinary technology graduates have completed postgraduate studies in biosecurity with a focus on veterinary parasitology across a range of species, going on to complete post-doctoral positions in biosecurity. Those with postgraduate qualifications can enhance and disseminate Australia's biosecurity knowledge as well as boost our biosecurity performance. Veterinary technology graduates have also made their mark in animal biosecurity field roles in Queensland, New South Wales, and Victoria, with some working at management level.

By working together veterinarians and veterinary technologists can reform the Australian veterinary industry, including animal biosecurity. Expanding the veterinary workforce can alleviate current industry pressures and help keep our country safe from emerging threats such as foot and mouth disease or African swine fever.

Now is the time to be innovative and progressive by utilising veterinary technologists to their full potential, to the benefit of the veterinary profession and Australia's animal biosecurity.

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Challenges to eradicating the electric ant Wasmannia auropunctata from tropical Queensland

Nastassja Cox[1]
[1]Department of Agriculture And Fisheries (Queensland), Portsmith, Australia

Biography:
In 2010 Nastassja Cox joined the National Electric Ant Eradication Program (NEAEP) as a biosecurity field officer and became the Program scientist in 2012. Over the following 12 years, Tash garnered respect within the Program, its collaborators, and the invasive ant management community as a subject expert on Wasmannia auropunctata. The scientific work she and her team undertake underpins the operational activities of the Program through scientific rigour, innovation, and continual development. The NEAEP were awarded the DAF Achievement Award for Fostering Innovation in 2015 and are recognised as one of the most successful Australian ant eradication programs.

Abstract:
The National Electric Ant Eradication Program have been managing electric ants, Wasmannia auropunctata, since their detection in 2006, and has eradicated over 66% of all known infestations. Native to South America, this highly adaptable species pose significant threats to our way of life, health, and biodiversity.
W. auropunctata are primarily spread via humans moving infested carriers, and once established will spread at a rate of up-to 50 metres per year, blanketing the ground and colonising trees and vegetation. In general, these established populations can be effectively treated with granular baits, and subsequently eradicated. However, being in the tropical environment of north Queensland brings its own unique environmental and habitat challenges to eradicating W. auropunctata.
Heavy rain, prolonged wet seasons, and unpredictable localised rainstorms undermine granular bait treatments as bait grains disintegrate in water, making collection and consumption by W. auropunctata impossible. It isn't possible to accurately predict or cost-effectively monitor the locations of isolated localised rainfall, so our first challenge has been to develop a waterproof bait.
Our hydrogel waterproof bait was created using polyacrylamide absorbent jelly with 0.01% Fipronil and was trialled with promising results. The trial was conducted during the wet season and effectively reduced the W. auropunctata population by <99.4%. Further development has not been prioritised because of the potential approval timeframe and production registration cost relative to the planned duration of the Program. We see the potential for further development with alternative insecticides and finding a clean and efficient deployment tool.
Other than undermining bait treatments, heavy rainfall also causes infested debris to be washed into creeks and stormwater drains then carried downstream. Flooding in low lying areas further exacerbates spread by carrying infested debris across landscapes. Debris deposits in low-flow areas and collect on semi-submerged structures. As a result, we have found several infestations in coastal mangrove systems.
The program effectively manages wash-down populations by baiting the dry land surrounding creeks, drains, and waterways, but at infested mangrove sites there are minimal periods of dry land because of tidal inundation. There are additional hazards (e.g. crocodiles and deep mud) in W. auropunctata infested mangroves making the deployment of field staff to conduct standard eradication activities problematic and resource intensive. Our second challenge was to develop a tool to treat infested mangroves.
The program has developed and implemented gel baits which have been re-formulated to pass through an agricultural applicator to target arboreal baiting of large high resource holding trees. One version of the re-formulated gel contains s-methoprene, an insect growth regulator, that can be used close to waterways. The program recently adopted the use of drones to deploy granular baits and we are currently in discussions with a local company to develop a drone-based agricultural applicator to target gel bait treatments onto mangrove trees.
Despite our developments and innovations, we are always looking for emerging tools and resources which the Program can adopt. Wettable granular baits, low-cost wireless rain sensors, and new drone hardware are a few tools we hope the future will bring.

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Toolkit for Eradication - 18 years of adapting resources to control the electric ant, Wasmannia auropunctata

Nastassja Cox[1]
[1]Department Of Agriculture And Fisheries (Queensland), Portsmith, Australia

Biography:
In 2010 Nastassja Cox joined the National Electric Ant Eradication Program (NEAEP) as a biosecurity field officer and became the Program scientist in 2012. Over the following 12 years, Tash garnered respect within the Program, its collaborators, and the invasive ant management community as a subject expert on Wasmannia auropunctata. The scientific work she and her team undertake underpins the operational activities of the Program through scientific rigour, innovation, and continual development. The NEAEP were awarded the DAF Achievement Award for Fostering Innovation in 2015 and are recognised as one of the most successful Australian ant eradication programs.

Abstract:
Nationally cost shared and temporary eradication programs are subject to frequent review and changes to funding which require such programs to be flexible and innovative to meet eradication targets.
As a relatively small program, the National Electric Ant Eradication Program resource fluctuations have had a significant impact - at one point the number of staff reduced to nine, with only 3 field officers. To maintain momentum with eradication activities, the program had to find efficiencies within our current strategies and explore and develop new tools.
The biggest obstacles for eradication that the program faces are baiting during the wet season, baiting in chemically sensitive landscapes (e.g. mangroves), and targeted baiting and surveillance of electric ant populations in large trees.
My poster shows the progression and development of tools and technology successfully implemented by the program team over the past 18 years including new tools currently being explored. There are four developments which have significantly contributed to surveillance and eradication goals:

- improving granular bait uptake through the addition of a protein to the bait formulation.
- refining GPS mapping to improve analysis of on-ground eradication work.
- the development of an odour detection dogs program.
- the development of several formulations of gel bait for targeted baiting in chemically sensitive landscapes and large trees.

Additionally, to assist in the surveillance of arboreal populations of electric ant the science team developed a ‘canopy trap’. My poster presents an abstract from the manuscript published in the Journal of Australian Entomology: Novel reusable canopy trap for sampling arboreal populations of electric ant, Wasmannia auropunctata (Hymenoptera: Formicidae).
The National Electric Ant Eradication Program has been managing electric ants, Wasmannia auropunctata, since their detection in 2006, and has eradicated over 66% of all known infestations.
Join our session ‘Challenges to eradicating the electric ant Wasmannia auropunctata from tropical Queensland’ or visit the poster and have a talk to Tash to learn more!

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Benchmarking farm biosecurity to enhance disease preparedness and resilience of the South Australian pig industry

Ms Chelsea Dossett[1], Cleopas Bamhare[1], Dr Andrew Pointon[2], Dr Kirsty Richards[2,3], Dr Emma Rooke[1], Dr Charley Macnamara[1]
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Biography:
Chelsea Dossett is a Biosecurity Officer with the Department of Primary Industries and Regions South Australia (PIRSA) as part of a co-funded initiative between PIRSA and Pork SA to strengthen on-farm biosecurity and emergency animal disease (EAD) preparedness. With farm-level preparedness a key focus, Chelsea has developed systems to assess and verify farm biosecurity and increase adoption of enhanced biosecurity practices to ensure the pig industry is well placed to support supply chain continuity and meet regulatory requirements in an EAD outbreak.

Abstract:
The Department of Primary Industries and Regions South Australia (PIRSA) and Pork SA undertook a survey to benchmark existing farm biosecurity against enhanced biosecurity requirements, to identify opportunities to strengthen emergency animal disease (EAD) preparedness and resilience of the South Australian (SA) pig industry. Disease risks are managed by the industry through existing farm biosecurity and verified by quality assurance programs, however the extent to which current biosecurity practices meet the enhanced requirements to mitigate transmission and provide assurance to regulators to support business continuity in an EAD outbreak was unknown.

Enhanced biosecurity includes practices such as vehicle decontamination, that when implemented before an EAD outbreak, contribute to minimising the risk of disease transmission. During an EAD response, assurance of verified enhanced biosecurity will assist risk-based government decision-making to support supply chain continuity.
The survey focussed on biosecurity practices that contribute to disease transmission and the information that may be required by government in an outbreak.

The survey was the first of its kind nationally, to provide data on the conformance of existing industry biosecurity practices against enhanced requirements to mitigate risks associated with pig EADs. The survey was open to piggeries that processed pigs in SA and maintained a relationship with a veterinarian. This approach fostered partnerships with pig veterinarians locally and nationally, who supported their clients to participate and provided external oversight of the assessment of existing biosecurity. A total of 69 from 107 eligible commercial pig production sites across three state jurisdictions participated in the survey, resulting in a 64% response rate. Participants represented 79% of pigs reared and processed in SA, 76% of the SA sow herd and 23% of the national sow herd. All participating sites were accredited with the industry's national quality assurance program, APIQ.

The survey identified areas where existing farm practices meet enhanced biosecurity requirements as well as areas where interventions would strengthen EAD preparedness. Areas of high biosecurity conformance included health, husbandry and reproductive practices that support mitigation of common transmission pathways and early disease detection. For example, the management of sick pigs. High conformance in these areas may be attributable to effective client-veterinary relationships, veterinary oversight of biosecurity, and APIQ requirements. Opportunities to improve existing biosecurity to meet enhanced requirements included aspects of farm management, controlled entry and transport biosecurity practices. For example, through the development of contingency plans, improved record-keeping and documentation such as waste records, and decontamination of equipment prior to entry.

The survey generated valuable, operational biosecurity insights to support PIRSA and Pork SA in making informed decisions about industry EAD preparedness and to verify conformance in key areas. It identified

opportunities where existing farm biosecurity practices can be enhanced to minimise the adverse impacts of an EAD outbreak and to support business continuity and industry resilience. The opportunities identified are being strategically addressed through co-funded activities to optimise industry preparedness, and better position the industry to support the assurances required by government for supply chain continuity in an EAD outbreak.

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Bridging human, animal, plant and ecosystem health in aquatic environments through One Biosecurity

Dr Jonathan Bray[1], Dist. Prof Philip Hulme[1], Dr Cassandra Edmunds[1]
[1]Lincoln University, Lincoln, New Zealand

Biography:
Dr Cassandra Edmunds is an entomologist working in the Centre for One Biosecurity Research Analysis and Synthesis (COBRAS) at Lincoln University, New Zealand. Her research interests include the intersection of people and insects as it applies to biosecurity, nuisance biting and forensic entomology. Previous research has focused on the biocontrol of haematophagous insects with entomopathogenic nematodes. Prior to joining COBRAS, she was Programme Leader for Forensic Biology at Bournemouth University (U.K.) and has a background in government policy analysis and development.

Abstract:
Predicting and assessing aquatic biosecurity risks with ever increasing trade and new trade routes, amid global change drivers and ongoing biodiversity loss is increasingly complex and pressing. One Biosecurity is a holistic, interdisciplinary approach to minimise biosecurity risks across human, animal, plant/algal and ecosystem health. Fragmented biosecurity approaches, focussing on high-risk taxa and within sector issues, fail to recognise similarities in problems and processes underpinning biological invasions across sectors and ecosystems. A holistic, interdisciplinary, cross-sectorial approach is critical to properly understand potential linkages, synergies, common problems and improvements within science, policy and management. For example, the treatment of pathogens and diseases in various production systems, including aquaculture, has driven the evolution of novel, antimicrobial strains, but the broad implications of these outcomes lack cross-sectoral guidance. One Biosecurity aims to reduce redundancy, minimise gaps, increase cross-sectorial cohesion and interdisciplinarity, improving policy, management and scientific focus in global aquatic biosecurity.

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One Biosecurity approach to research prioritization

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Biography:
Dr Cassandra Edmunds is an entomologist working in the Centre for One Biosecurity Research Analysis and Synthesis (COBRAS) at Lincoln University, New Zealand. Her research interests include the intersection of people and insects as it applies to biosecurity, nuisance biting and forensic entomology. Previous research has focused on the biocontrol of haematophagous insects with entomopathogenic nematodes. Prior to joining COBRAS, she was Programme Leader for Forensic Biology at Bournemouth University (U.K.) and has a background in government policy analysis and development.

Abstract:
Biosecurity 2025 is a partnership between people, organisations, Māori, and government in New Zealand, with the aim of making our biosecurity system more resilient and future-focused. One of the major outputs of Biosecurity 2025 was the production of a stocktake of desired outcomes. Stocktake of Biosecurity Research, Science and Technology Priorities was published by Ministry for Primary Industries Manatu Ahu Matua in 2021. This collated the existing priorities identified in other documents and processes. The stocktake was designed to support investment choices in research, inform science capability and capacity planning, and support local and international research collaborations. The stocktake identified over 60 priority areas that require further research. A list of this length would be challenging if not unrealistic to fund in New Zealand. The Centre for One Biosecurity Research Analysis and Synthesis (COBRAS), based at Lincoln University, aimed to address this disparity between resource and intent by identifying the most crucial priorities from the original stocktake. Aiming to gain a consensus-driven shortlist through breaking down the traditional biosecurity sectoral siloes of Industry, Science and Policy, COBRAS has surveyed widely the New Zealand biosecurity community asking which of the stocktake priorities they consider to be among the top 10 most important. The purpose of the survey was to ascertain if policymakers, biosecurity practitioners, people working in industry, scientists and other stakeholders share similar views on the strategic priorities identified as underpinning the New Zealand biosecurity system.

Results of the national survey will be presented and will highlight the extent to which different sectors prioritise similar biosecurity issues and the extent to which it is possible to develop a homogenous short-list of national priorities. In addition, at a broader scale, the results point to where in the biosecurity system future investment is most expected particularly in relation the following aspects: emerging future risks, risk pathways, detection and diagnostics, pest management, impact assessment, system resilience, indigenous culture, and biosecurity governance. This research will contribute to improving global biosecurity prevention and management through breaking down silo working and fostering a single approach across the main stakeholder groups and driving future research in directions that are beneficial to achieving ‘One Biosecurity’ aims.

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Driving behaviour change in the pork and red meat industries to support traceable biosecurity and reduce biosecurity risks

Lynne Hayes[1,2], Dr Jennifer Manyweathers[1,2], Dr Jen Bond[1,2], Professor Marta Hernandez-Jover[1,2]
[1]Charles Sturt University, Wagga Wagga, Australia, [2]Gulbali Institute, Wagga Wagga, Australia

Biography:
Lynne Hayes is a research assistant who has over 12 years of experience in biosecurity-related research. Prior to this, she was a registered psychologist. Her interest is in understanding the behaviour of individuals and groups and the factors that influence behaviour change within the area of biosecurity. She has contributed to over 20 research articles in peer-reviewed scientific journals.

Abstract:
Livestock production involves multiple supply chain players; all of whom contribute to the management of biosecurity. Technology is increasingly playing a role in communication within this space. This study aimed to investigate current biosecurity attitudes and practices within the feedlot and livestock transport industries and to explore the use, motivations, and barriers to the uptake of technology. This allows for a clearer understanding of methods to drive behaviour change in the pork and red meat industries to support traceability and reduce biosecurity risks.

The COM-B model of behaviour change that looks at the capabilities (C), opportunities (O), and motivations (M) that influence behaviour (B) was used to inform the data collection tools (Michie et al., 2014). The main area of investigation was an assessment of current biosecurity related practices and perceptions, including preferences for communication of biosecurity information. Semi-structured interviews and cross-sectional studies were conducted with two target populations: beef feedlots and livestock transporters (cattle and pigs). Interview data were analysed using NVIVO, with survey data analysed descriptively through IBM SPSS.

A total of 27 transporters (10 interview, 17 survey) and 14 feedlots (nine interview and five survey) participated. Overall, engagement with biosecurity was higher among feedlots, with key biosecurity risks identified were in relation to truck washing, visitors, clothing/footwear, effluent management, load mixing and lack of access to specific and relevant biosecurity and preparedness and response information. Several of the identified biosecurity behaviour risks for transporters in particular, were driven by external factors, such as the lack of wash down facilities and insufficient animal curfewing impacting the management of effluent.

The COM-B model identified that overall, there was a reasonable perception of physical and psychological capability around biosecurity, and most respondents identified that there was room for improvement with biosecurity uptake which could be used as a motivation for change.

In relation to communication, there was general satisfaction with how communication was managed within and across enterprises, with scope for developing a mobile application to communicate non urgent biosecurity information.

The study demonstrated that the uptake of best practice biosecurity could be improved across both study populations. Mobile applications can support current strategies for communicating biosecurity risks and sharing biosecurity information. Insights into biosecurity risks, risk communication preferences and behaviour change drivers of livestock transporters and feedlots were gained. There is future scope for these to be used to support decision making for improving biosecurity engagement and minimising biosecurity risks in the pork and beef supply chains.

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BIOSECURITY FOR BIODIVERSITY: a five-year retrospective with Australia's Chief Environmental Biosecurity Officer

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[1]Department Of Agriculture, Fisheries and Forestry, Canberra, Australia

Biography:
Dr Bertie Hennecke started as the Australian Chief Environmental Biosecurity Officer (ACEBO) in February 2023. Dr Hennecke joined the Department of Agriculture, Fisheries and Forestry in 2010. Before being appointed as the ACEBO, he held senior leadership roles in the Australian Bureau of Agricultural and Resource Economics and Sciences (ABARES) and in several of the department's plant biosecurity areas.
Dr Hennecke's background is in natural resource management, invasive species, and agricultural sciences with nearly 30 years of experience in the public service and academia in Australia. He holds a PhD in Botany and a Master of International Agriculture.

Abstract:
Australia's first Chief Environmental Biosecurity Officer was first appointed in October 2018, after the 2017 report Priorities for Australia's biosecurity system: an independent review of the national biosecurity system and its underpinning intergovernmental agreement (IGAB review) made a number of recommendations aimed at strengthening the national biosecurity system, including a need for greater effort and focus on environmental biosecurity.

A long title, shortened to ACEBO (and pronounced 'Ah-chi-bo') they collaborate, partner and influence across the Australian Government, Department of Agriculture, Fisheries and Forestry, as well as with state and territory governments, industry, non-government organisations, individuals and the community to strengthen environmental biosecurity outcomes and raise awareness of environmental biosecurity issues.

By participating in and driving several key national biosecurity committees, this position advocates for the consideration and mitigation of serious biosecurity risks to preserve and protect Australia's unique ecosystems, culture and way of life. In the five years since the commencement of the role, the Chief Environmental Biosecurity Officer and the Environmental Biosecurity Office have instigated, implemented and achieved a number of environmental biosecurity initiatives, programs and risk management protocols. From responding to exotic outbreaks, increasing surveillance capabilities, developing the National Priority List of Exotic Environmental Pests, Weeds, and Diseases, managing the Environmental Biosecurity Project Fund, reducing the impacts of established invasive species and investing in the coordination of environmental biosecurity research. The role is a good reminder that biosecurity is not just for the protection of our economy but for our environment too.

This presentation will give retrospective insights into the achievements of the Australian Chief Environmental Biosecurity Officer and the Environmental Biosecurity Office. It will also highlight the challenges and goals for environmental biosecurity on a national level.

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Reducing biofouling risks through policies that create behaviour change

Gary Stoneham[1], Professor Arthur Campbell[2], Dr Rui Zhou[3], Ms Runze Li[3], Professor David Pitt[3], Peter Wilkinson[4], Dr Dan Kluza[5], Dr Susan Hester[6,7]
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Biography:
Associate Professor Susie Hester is a Chief Investigator and Deputy CEO with the Centre of Excellence for Biosecurity Risk Analysis — a multidisciplinary group of researchers at the University of Melbourne who work with biosecurity agencies and stakeholders to improve biosecurity policy and process. She is an applied economist and has extensive experience in issues related to invasive-species management. Recent research projects include designing incentive-compatible biosecurity policies, modelling the biological control of European wasp and understanding the value of passive surveillance and shared responsibility.

Abstract:
The niche areas of ocean-going vessels are known vectors of non-indigenous marine species. Currently, vessels that pose biofouling risks do not have to deal with the financial losses of an incursion caused by their activities. Rather, domestic taxpayers and those affected by biosecurity risks, including the environment, bear the consequences of biofouling. This poster will discuss a policy approach that creates incentives for behaviour change. Specifically, policies are designed to create incentives for vessel owners to undertake biofouling risk mitigation activities, thus reducing the workload of biosecurity agencies in regulating biofouling risks. The principles of this policy approach have wider implications, offering significant advancements in managing various biosecurity risks, including those related to general imports.

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Development of an integrated island biosecurity framework

Dr Yang Liu[1]
[1]Murdoch University, Murdoch, Australia

Biography:
Dr Yang Liu's PhD research direction is mainly focused on the cost-effective management of invasive species. She uses info-gap decision theory to better tackle the Knightian uncertainty prevalent in bio-economic modelling, thereby enabling robust decision making.

Yang has multidisciplinary background. She received her Master's degree in Financial Management in University of HULL in UK, and Bachelor's degree in Computer Science, and Economy in Shandong University of Finance and Economics in China. She also has comprehensive background in programming languages (C++, Java, MATLAB, R programming) and analytical methodologies.

Abstract:
Due to the geographic isolation, islands are often the last refuge for many threatened and endemic species. Human activities such as tourism, fishery and industrial development, along with climate change, facilitate the introduction of invasive alien species and disease (hereafter, IAS). Over the last decades, there has been an increasing number of biosecurity plans developed, with the aim of protecting the interests of agriculture, production, and fisheries converted to the inclusion of environmental and socio-cultural concerns. These plans encompass biosecurity activities (pre-border, border, and post-border) to varying degree and types of related strategies employed. They further differ in the targeted ecosystems (terrestrial and marine), taxonomic groups, methods implemented for risk assessments (quantitative and qualitative). Such diversity could ensure that the limited resources are applied cost-effectively and efficiently, while resulting in unintentional gaps in the development of plans. Currently, there exists no objective biosecurity framework to guide the development of island biosecurity plans. The new plans tend to be a sub-set of existing plans developed through neighboring states or foreign aid. The omission of island-specific biosecurity considerations may cause inadvertent introduction of IAS and waste of limited resources.

We undertook a systematic review and meta-analysis of the island biosecurity management plans (e.g. plans/strategies/policies/programs) from across the globe. Through the contribution of knowledge from, and collaboration among, global biosecurity experts and managers from government, academia, and industry, we identified gaps in island biosecurity knowledge (e.g. area-specific and industry-specific) and isolated key areas for further research and capacity building. We found that the country in which the island resides was the most important factor in explaining differences in island biosecurity management plans. However, economic activities were also important. The size of the island, and whether it is permanently inhabited or not, played a role in influencing the diversity and content of biosecurity plans, although this role was not significant. A heat map will be further developed to enable us to understand usage patterns of the different biosecurity categories and visualize the research outcomes. By the end of this project, an integrated, objective and systematic island biosecurity framework, that incorporates all island biosecurity elements, will have been developed to facilitate consistency and transparency in creating island-specific plans.

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The importance of re-training to keep the high standard of Feedlot Biosecurity practices

Mrs Neny Santy Jelita Lumbantoruan[1], Ms Neni Eviyanti Togatorop[1]
[1]Pt. Juang Jaya Abdi Alam, South Lampung, Indonesia

Biography:
Neny Santy Jelita Lumbantoruan was born on November 22,1980, Indonesia. She is a veterinarian that works for PT. Juang Jaya Abdi Alam (PT. JJAA), who also was a Chairwoman of Forum Animal Welfare Officer Indonesia. Neny received her postsecondary education at the Veterinary Medicine Faculty of the Gadjah Mada University in Yogyakarta, Indonesia.

Her passion to work with cattle brought her to joined with PT. JJAA in 2007, as animal health program Supervisor. Now she held a position as Animal Welfare and Health Manager. She took short courses in Australia on 2008 about Low Stress Cattle Handling and Feedlot management. In 2017, Neny was elected to receive a short course scholarship from Australian Award Scholarship program, on Animal Husbandry and Cattle Production. And in 2018 she was granted again with scholarship on Total Business Leadership Short Course. Last year she became one participants on Principal and Practice of Biosecurity Measures for Human and Animals. These informal educations along with many others taken in the country, equipped her to face challenges at work. Her leadership made her as a leader in establishing on farm biosecurity since her workplace faced the challenges of FMD and LSD.

Neni Eviyanti Togatorop was born on June 16, 1994, Indonesia. She graduated from the Faculty of Veterinary Medicine IPB University in 2018. She has worked at PT. Juang Jaya Abdi Alam (PT.JJAA) since 2021 as a veterinarian. She was involved as a member of the early pioneer team for biosecurity property development and its work system at PT. JJAA in early 2022 when FMD and LSD entered Indonesia. Now she still works as one of the veterinarian members supervising biosecurity operational activities run by the Health, Safety and Environment team (HSE).

Abstract:
PT. Juang Jaya Abdi Alam (PT.JJAA), one of the feedlot in Indonesia, has created good biosecurity procedures to protect its livestock from the threat of FMD and LSD since 2022 based on to National Biosecurity Manual for Beef Cattle Feedlot (2013).This procedure has proven to be quite effective so that currently PT. JJAA managed to be free from both diseases.

As it goes by biosecurity procedures until now, then the question is whether the procedures carried out are the most appropriate and most effective? And how to measure it? Another issue is that there is a gap between the written procedures and on farm practices after more than a year operated. A project was made to address these issue. This project became a follow-up project for Short Course Principal and Practice of Biosecurity Measures for Human and Animals (2023). This project aims to evaluate the knowledge and practices gap in biosecurity officers, workers, and visitors involved. The tools used in this evaluation activities are questionnaires. The results showed sub optimal level of knowledge of the respondents.

An action plan were created to eliminate the gap. Serial re-training is still ongoing based on the workers group and visitors group. Since the re-training will involved at least about 250 people divided into multi groups, it will take period of time to finish. After the re-training process is finish, we plan to evaluate the result using the same questionnaires, and analyze the impact of the re-training to the knowledge of the respondents.

In this presentation we will present the result of our project and discuss the challenges faced by the biosecurity team in the process of behaviour change towards better knowledge and better application of on farm biosecurity (Michie et al.2023). Certain time lapse between training will also be determined to provide on farm recommendation. A broader impact will be achieved if this presentation become an example of how on farm biosecurity in Indonesian feedlot can be operated and maintain.

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Evaluating epidemiology capacity and surveillance: leveraging FAO tools in New South Wales, 2023

Dr Laura Macfarlane-Berry[1,2], Dr Rebecca Forsythe[1], Dominique Marendy[1], Peter Black[3], Jane Bennett[1], Assocociate Professor Tambri Housen[2], Dr Roger Paskin[4], Dr Emily Doyle[1]
[1]New South Wales Department of Primary Industries, Orange, Australia, [2]Australian National University, Canberra, Australia, [3]Essential Foresight, Mount Coolum, Australia, [4]OMNI Animal Health Consultancy, Mount Barker, Australia

Biography:
Dr Laura Macfarlane-Berry is veterinarian and epidemiologist who has over 15 years experience in animal and public health in Australia, Asia and the Pacific. Currently working as a Senior Veterinary Policy and Project Officer at the New South Wales Department of Primary Industries. In 2022, Laura completed a Churchill Fellowship Investigating Field Epidemiology Training Programs for improved animal and public health. The work she is presenting today is one of the recommendations from her report and forms part of her PhD at on Strengthening Australia's applied veterinary epidemiology workforce to manage current and future biosecurity threats effectively at the ANU.

Abstract:
Introduction: Effective and efficient surveillance systems and epidemiological capacity to prevent, prepare, detect, and respond to biosecurity threats are key components of New South Wales's (NSW) animal health system. Their importance have been highlighted by recent emergency animal disease outbreaks within New South Wales (NSW) and the spread of transboundary animal diseases across Asia and the Pacific. Evaluations are a valuable tool for providing evidence about system performance and identifying recommendations for improvement. With NSW facing increasing threats and incursions, the need for targeted evaluations of epidemiology capacity and surveillance performance was identified, with a preference for a replicable methodology to facilitate ongoing monitoring.

Aims: This study aimed to adapt and pilot the Food and Agricultural Organization of the United Nation's (FAO) Epidemiology Mapping Tool (EMT) and Surveillance Evaluation Tool (SET) to assess surveillance and epidemiology capacity, respectively, and to provide recommendations in the form of an action plan and strategy to address identified capacity gaps.

Methods: The EMT and SET were adapted by a four-person evaluation team to facilitate their use in a high-income sub-national setting and included additional indicators for emergency preparedness and data management. The evaluation team collated over 250 documents and conducted 60 semi-structured interviews with stakeholders from the NSW animal health system, both internal and external to government. Using the evidence collected, the evaluation team assessed the 42 EMT and 98 SET indicators. Results were then used as a basis to describe the existing system and identify areas for improvement. Action plans were then developed through a stakeholder workshop.

Results: Strengths identified included the laboratory infrastructure coupled with a skilled and trained workforce, capable and well-distributed government field staff, cross-agency partnerships and relationships, and the use of risk assessment to support decision making in emergencies. Areas for improvement included the need to formalise external partnerships, insufficient access to in-service training opportunities in epidemiology, limited interoperability between information systems, delayed data dissemination, and inconsistencies in surveillance approaches between NSW regions. These areas for improvement were then used to form the basis of animal health surveillance and epidemiology capacity action plans.

Conclusion: The surveillance performance and epidemiology capacity evaluations provided valuable insights into the current capacity in NSW. Using FAO tools supported an objective and systematic approach for evaluation and provide a methodology which can be repeated to track progress over time.

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Improving traceability through behavioural science

Mr Sam Moore[1], Mrs Trudy Marriott
[1]Evidn, Fortitude Valley, Australia

Biography:
Sam Moore is a Senior Behavioural Scientist at Evidn and leads the Australian agri-environmental portfolio of the company. Sam currently manages multiple agricultural projects across Australia and has worked across numerous agricultural settings to design and deliver behaviour change programs to increase the adoption of best management practices. Sam has a strong research and analytical background and brings forward specialist skills in delivering behavioural analyses and identifying targets for change across communities.

Trudy Marriott, a University of New England graduate in Agriculture, is a pivotal figure in improving livestock traceability in New South Wales (NSW). At the forefront of animal biosecurity, she integrates initiatives like property-to-property traceability and National Vendor Declarations (NVDs). Her work extends into social and behavioural research to shape future strategies. Deeply invested in livestock, Trudy's efforts focus on bridging gaps in NSW's traceability performance. Driven by a strong belief in positive industry change and bolstered by stakeholder support, she is a key player in steering transformative change in the traceability landscape.

Abstract:
Despite significant investments in policy, educational, and technological solutions, the livestock sector continues to face challenges to the accurate and timely recording of livestock movements. Effective livestock traceability comprises a series of interconnected behaviours and attitudes and implicates multiple stakeholder groups including producers, agents, and government representatives. In other words, improving livestock traceability involves shifting the attitudes and behaviours of people.

This presentation will highlight the important role of behavioural science for supporting improvements to livestock traceability. The presentation will take a case study approach by describing a large body of work conducted in partnership between Evidn, a national behavioural science company, and the New South Wales Department of Primary Industries (DPI). The presentation will describe the methodology of the project, interim results, and future considerations to further strengthen biosecurity through behavioural science.

This initiative employed Evidn's Behavioural Systems Analysis (BSA) methodology to gain a comprehensive understanding of the major 'driving' and 'restraining' forces influencing livestock traceability throughout NSW. The BSA includes (1) a literature review to understand what is currently known about traceability behaviour, (2) a project and policy audit to understand success factors and learnings from previous initiatives, (3) stakeholder mapping to identify key groups and individuals implicated and their potential points of linkage, (4) stakeholder engagements to understand individual perspectives to improve traceability, and (5) co-designing behaviour change strategies to improve traceability outcomes.

The BSA reviewed 135 pieces of evidence including academic literature, government reports, and policy. A total of 148 stakeholders were engaged throughout individual interviews and group co-design sessions. The analysis revealed 8 driving forces and 15 restraining forces influencing livestock traceability. Then, recommendations were developed which spanned the spectrum of voluntary to assisted methods of behaviour change. These included: (1) developing a call to action to increase saliency and collective action, (2) supporting industry ownership to improve coordination and consistency of traceability information, (3) building workforce capacity to support stakeholders' ability to effectively promote traceability outcomes, (4) enhancing messaging to enhance saliency and consistency of traceability information, and (5) introducing evidence-based compliance contingencies.

The presentation will provide an overview of how insights have been implemented on-ground as part of a large-scale behaviour change program. The presentation will summarise learnings, alongside opportunities to further scale behavioural science to support biosecurity outcomes.

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One health approach to biosecurity

Ms. Jovana Mitich[1], Ms. Penny Lawlis[1]
[1]MSVS, Guelph, Canada, [2]Professional Livestock Auditing Inc. , London, Canada

Biography:
Jovana Mitich has gained experience as an consultant, auditor, technical expert and certifier in the agricultural industry. Having experience with all aspects of the audit process allows her to identify gaps and key performance initiatives.

Ms. Mitich has worked with operations to implement audit programs in the food safety, animal welfare, and biosecurity sectors. Jovana has experience from farm to fork and can speak to the viability of a program throughout the supply chain.

Jovana holds a MSc. in Food Science from the University of Guelph and maintains lead auditor status for a variety of programs.

Abstract:
Biosecurity is a critical aspect of maintaining the health and productivity of agricultural systems. Effective biosecurity measures are essential to prevent disease outbreaks and safeguard both animal and human health. In this review, we explore various facets of farm biosecurity, focusing on current practices, innovative approaches, and external factors that impact success.

Farm biosecurity encompasses a range of practices aimed at minimizing the introduction and spread of pathogens. These measures include strict hygiene protocols, robust quarantine procedures, and vigilant disease surveillance. By implementing these strategies, farmers can mitigate risks and protect their livestock, crops, and workers.

The ONE Health framework emphasizes the interconnectedness of human, animal, and environmental health. By adopting this holistic approach, fur farmers have successfully integrated biosecurity practices that consider not only the well-being of their animals but also the health of farm workers and nearby communities. Collaboration between veterinary professionals, public health experts, and environmental scientists is crucial for effective ONE Health implementation.

Fur farming stands out as a model for comprehensive biosecurity. These farmers recognize the interplay between animal and human health, leading to innovative solutions. Their practices include:
Zoonotic Disease Surveillance: Regular monitoring for zoonotic diseases ensures early detection and containment.
Strict Isolation Protocols: Fur farms implement rigorous isolation measures for new animals to prevent disease introduction.
Biocontainment Measures: Proper waste management, controlled access, and biosecure facilities minimize disease transmission.
Education and Training: Farmers and workers receive training on biosecurity best practices.
Beyond farm boundaries, external factors significantly influence biosecurity outcomes. These include:
Climate: Extreme weather events can disrupt biosecurity measures (e.g., flooding affecting waste management).
Wildlife Interactions: Wild animals can introduce pathogens to farms.
Neighboring Land Use: Proximity to other farms, wildlife habitats, or urban areas impacts disease spread.
Understanding these dynamics is crucial for sustainable and resilient farming systems. By fostering collaboration among stakeholders, we can enhance biosecurity practices and promote healthier agricultural ecosystems.

In summary, this abstract sheds light on the evolving landscape of farm biosecurity, emphasizing the ONE Health approach and the need to consider external influences. By integrating science, policy, and community engagement, we can build a safer and more resilient food production system.

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New control tools for tackling pest animals in South Australia

Dr Brad Page[1], Ms Lindell Andrews[1], Mr Steve Bourne[3], Mr Martin Bower[1], Professor Corey Bradshaw[4], Dr Tarnya Cox[2], Ms Kate Fielder[1], Mr Theo Goldsworthy-Hess[1], Mr Peter Hamnett[4], Mr Nick Heath[1], Mr David Jirman[1], Ms Bianca Jones[1], Mr Matt Korcz[1], Dr Jane McKenzie[1], Mr Ash Rees[1], Dr Giverny Rodgers[1], Dr Annette Scanlon[1], Dr Annette Scanlon[1], Mr James Stevens[1], Mr Michael Stevens[3], Dr Myall Tarran[1]
[1]Department of Primary Industries and Regions, South Australia, Urrbrae, Australia, [2]Vertebrate Pest Research Unit, New South Wales Department of Primary Industries, Orange, Australia, [3]Limestone Coast Landscape Board, Mount Gambier, Australia, [4]Global Ecology, Flinders University, Adelaide, Australia

Biography:
Brad Page leads a team who are focused on preventing new pest incursions through regulatory reforms, programs to manage established pests animals and research and development into new control tools for pest animals. Flagship programs include the eradication of wild dogs and feral deer from SA and feral pigs from Kangaroo Island and the rebuild of 1,600 kilometres of the Dog Fence. New research is looking into eDNA programs to detect feral pigs and deer and new ways to deliver calici virus to rabbits and new bait for pest birds (corellas, starlings, pigeons, silver gulls) of the grains industry.

Abstract:
Despite the growing impacts of pest animals on our conservation, agricultural, and social values, many pest animals remain elusive and challenging to control. More tools and strategies are needed to make pest control more effective, humane, and cheaper.

The Invasive Species Unit of the Department of Primary Industries and Regions, South Australia, in partnership with the Limestone Coast Landscape Boards, Hills and Fleurieu Landscape Board, Flinders University, and the NSW Vertebrate Pest Research Unit, is developing, adopting, and collaborating on research into the effectiveness of new control tools. The purpose is to overcome the barriers faced by land managers and agencies to implementing effective landscape-scale control programs for feral deer, pigs, wild dogs, and foxes.

We highlight new tools and strategies being developed and adopted to control the worst pest animals in South Australia. These new tools are enabling large-scale programs to detect and eradicate feral deer and pigs in dense vegetation using thermal technology, deliver baits selectively to target species using artificial intelligence, monitor for incursions using eDNA, and scare wild dogs from road crossings in the SA Dog Fence.

This presentation will outline results from trials of new tools, including their effectiveness and future potential. We also highlight how we built on from existing knowledge and approaches, by integrating tools like baiting, detector dogs, and artificial intelligence into these innovative programs and ensuring a high standard of welfare.

While creating nationwide adoption of new pest-control tools will take years, incremental adoption in South Australia is enabling state-wide eradication programs to meet their goals. This approach is helping build social licence and participation by the community in local, on-ground management and is driving a renewed enthusiasm to tackle pest problems.

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Optimal Approaches to Fungal Metabarcoding in Northern Australia: Designing Experiments for Effective Results

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[1]Northern Territory Government, Darwin , Australia

Biography:
Dr Elnaz Saki, a PhD graduate of Charles Darwin University with experience in molecular science and biotechnology, is currently an employee for the Department of Industry, Tourism, and Trade's Northern Territory Government Biosecurity Unit. Elnaz has over fifteen years of experience in microbiology, molecular biology, chemistry, bioprocessing and natural products. She has honed her skills in effective communication and seamless coordination through her role, making her a valuable asset capable of identifying, assessing, and mitigating potential biological risks to Northern Australia's ecosystems, agriculture, human health, and biosecurity infrastructure.

Abstract:
Emerging biosecurity threats are detected using advanced screening methods. High-throughput sequencing and bioinformatics have improved plant pathogen identification. Environmental DNA (eDNA) technology is now the top choice for surveillance. This study aims to develop a soil metabarcoding protocol to study fungal diversity in northern Australia across spatial and temporal scales. Soil samples were collected from various locations with the collaboration of local stakeholders, including rangers in central Australia, police officers in East Arnhem, and colleagues across the NT, covering the Top End. Comprehensive soil sampling occurred year-round across four quarterly periods, spanning different seasons. After collection, soil samples were transported to the laboratory in double-sealed bags, subsequently divided into multiple subsamples, and cold-stored until further processing. The collected soil types included black, brown, red sandy soils, clay soils, calcarosol, and loamy soils. Soil properties such as pH, nitrogen, phosphorus, and potash levels were examined to study their impact on soil microbiome composition across diverse soil types. For DNA extraction, a lysis-based approach utilising the DNeasy PowerSoil kit, and a lysis-independent phosphate buffer protocol was used. We sequenced the internal transcribed spacer (ITS) gene region as a fungal barcode. Preliminary results showed that soil types have depleted nitrogen and phosphorus levels, adequate potash levels, and have pH levels ranging from average 5.5 to 7. Preliminary extraction results showed a higher average DNA concentration for the lysis-based method than the lysis-independent method. A higher DNA quantity was obtained from soil samples collected from hot and humid top-end environments than from soil samples from the hot and dry central Australian environment. Similarly, the PCR success rate for the ITS region is higher for soils from the top-end region. Our results demonstrate that a customized "fit-for-purpose" laboratory protocol is required for metabarcoding and assessing soil microbial diversity in tropical, grassland, and arid environments. A broad-scale spatial collection with temporal replicates will capture seasonal variation and provide insights into eDNA methods' sensitivity for detecting species variation in space and time. Our multifaceted approach will offer a comprehensive understanding of the interactions between soil composition, vegetation, environment, and the microbial world. The study will provide valuable methodological insights to enhance the application of eDNA metabarcoding techniques in the biosecurity of tropical and arid bioregions.

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Animalplan 2022-27: Australia's first national action plan for production animal health

Dr Jarrad Sanderson[1], Dr Kylie Hewson
[1]Department of Agriculture, Fisheries and Forestry, Canberra , Australia

Biography:
Dr Jarrad Sanderson is a veterinarian with the Australian Government, working for the Department of Agriculture, Fisheries and Forestry. Based in Victoria Jarrad has a background in genetics, biochemistry, production animal welfare and emergency animal disease preparedness and response activities. As the acting Director of the Strategic and Technical Engagement team he oversees reporting against government priorities including Animalplan and the National Lumpy Skin Disease Action Plan.

Abstract:
Animalplan 2022-2027 (Animalplan) is Australian's first national action plan to strengthen our production animal health system. Animalplan was developed through collaboration between government, industry organisations, animal health experts and other stakeholders and it consolidates agreed animal health activities across Australia's production industries. Co-investment between industry and government parties is essential to ensure the success of Animalplan into the future.

Animalplan sets a longer-term vision and is approaching the second half of its implementation period and this session will focus on key achievements since Animalplan's inception in 2022.

It will emphasise the overarching objectives and how it is working towards :

- Improving Australia's preparedness and ability to respond to emergency animal diseases
- Improving Australia's surveillance and diagnostic capacity for animal pests and diseases
- Improving the adoption and implementation of biosecurity practices throughout the terrestrial animal industry supply chains.
- Managing the risk of antimicrobial resistance
- Improving animal welfare outcomes relevant to emergency scenarios
- Implementing industry sustainability frameworks and plans
- Improving the integrity of animal health systems

An overview of the types of projects which Animalplan supports and how stakeholders can best connect with Animalplan will be provided.

This session will also focus on how Animalplan's diverse stakeholders can find more ways to better collaborate, invest and increase information sharing in alignment with these identified national objectives. A continued focus on innovation, collaboration and sharing of national experiences and opportunities will promote engagement and further progress towards realising enduring outcomes across the sector.

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Understanding sentiment of emergency animal disease control measures to inform communications in an outbreak

Dr Nicole Schembri[1], Assoc Prof Chris Degeling[2], Ms Ann-Louise Brockelsby[3], Ms Liz Watkinson[3], Ms Nicole Cairns[4], Ms Olivia Gardner[5], Dr Emily Doyle[1]
[1]NSW Department of Primary Industries, Orange, Australia, [2]The University of Wollongong, Wollongong, Australia, [3]Faster Horses Consulting, Ultimo, Australia, [4]Department of Energy, Environment and Climate Action, Ballarat, Australia, [5]Biosecurity Queensland, Department of Agriculture and Fisheries, Brisbane, Australia

Biography:
Dr Nicole Schembri has a special interest in understanding the human influences of applied animal biosecurity and emergency animal disease (EAD) prevention and preparedness, having a completed a PhD in the field of social veterinary epidemiology. She has worked in the agricultural industry, servicing NSW producers and communities for over 15 years in roles at the University of Sydney, NSW Local Land Services and more recently at NSW DPI. Her current focus is on EAD preparedness and prevention, capacity building and behaviour change through engagement.

Abstract:
Public perceptions impact successful management of emergency animal disease (EAD) responses. Understanding the producer, industry and public's perception of control methods is critical in developing targeted messaging to maintain confidence, address potential barriers and progress disease management control in an outbreak situation.

The cross-jurisdictional project team sought to:

- understand the attitudes of a range of stakeholders to animal destruction, disposal and vaccination from across eastern Australia;
- identify potential communications barriers and risks that could impact effective and successful disease management; and
- develop a cross-jurisdictional, nationally consistent communications framework for implementation in an EAD event.

A systematic literature review and media content analysis and framing analysis of sources from 2003-2023 was conducted. A cross-sectional mixed-methods study was conducted with participants from 3 states: Queensland (QLD), New South Wales (NSW) and Victoria (Vic). Qualitative focus groups (N=11) were undertaken with commercial producers, livestock industry and the public; and in-depth interviews (N=26) with non-commercial producers and animal welfare and rights representatives were undertaken with a quantitative public-specific online survey (N=2,000). To conclude, a co-design workshop was conducted with SMEs and communications experts from participating jurisdictions to inform the application of the research findings. A subgroup of the National Biosecurity Communications and Engagement Network (NBCEN) has come together to develop a framework to provide national consistency on how best to communicate destruction, disposal and vaccination preparation of and during an EAD response.

Some 31 scientific journal papers and 303 media articles from across Australia, the UK, USA and Canada were extracted and interrogated. Key insights highlighted the importance of two-way communication in maintaining trust, valuing people and place, working with community and procedural transparency. Key research findings from 2,107 participants indicate that factors critical to effective engagement are: the involvement of local partnerships, supporting citizen knowledge, allowing flexibility to adjust control measures to suit local conditions, respecting the livestock-human relationship, and recognising people's connection to place and identity. Our actions and communications need to reflect a broad sense of social responsibility and be ethically justifiable. A NBCEN sub-group was formed to progress the development of a communications framework to address negative public perceptions and barriers considering current prescribed and specified EAD eradication response actions relating to animal destruction, disposal and vaccination. Preferred language and animal welfare and ethical concerns form the foundation of the framework to ensure, as a whole of government-

industry we're understanding and meeting our communities' engagement needs proactively during our preparedness activities and through to a response.

Understanding the sentiments of a range of stakeholders on specific EAD response actions – animal destruction, disposal and vaccination has enabled the formation of informed and targeted communication and engagement planning in the event of a serious EAD event and could be used to inform response procedures.

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Dive into the EEPL: a big exotic species list of "no thanks."

Shalan Scholfield[1], Dr Andrew Pearce[1], Dr Tory Ludowici[1], Minky Faber[1]
[1]Department Of Agriculture, Fisheries and Forestry, Canberra, Australia

Biography:
As the Principal Director of the Environmental Biosecurity Office (DAFF), Shalan's work focuses on reducing the impact of exotic and established pests, diseases and weeds, strengthening environmental biosecurity outcomes, responding to incursions, building community understanding and supporting research, development and extension. She works closely with state and territory jurisdictions, non-government organisations and stakeholders on a range of shared priorities. A graduate of the Australian Institute of Company Directors and with an honours degree in marine science, Shalan joined the department in 2010, having worked as a research scientist, and with the Australian Fisheries Management Authority prior.

Abstract:
The National Priority List of Exotic Environmental Pests, Weeds, and Diseases – referred to as the 'Exotic Environmental Pest List' (EEPL) identifies 168 exotic species that pose a risk to Australia's natural environment and further identifies a subset list containing 42 higher-risk species that pose the greatest risk to Australia's environmental biosecurity.

If any of these exotic species became established, they could cause significant damage to our environment including our unique native plants, animals, First Nations culture, and our way of life.

The hypothetical scenarios and opportunities for preparedness and mitigation are vast. What could happen to a freshwater ecosystem if Didymo (aka Rock Snot!) or the Chinese/Japanese mystery snail established in our rivers? Could some of Australia's most endangered parrot species survive if Parrot bornavirus was here? What would happen to our oysters and dining culture if an aquatic disease like Bonamiosis spread in our region? African pygmy hedgehogs are pets elsewhere so what's the concern for them here in Australia?

Published in 2020, the EEPL delivers on a key recommendation of the 2017 'Priorities for Australia's biosecurity system' report, to strengthen environmental biosecurity and develop a national approach to address biosecurity risks to Australia's environment. Several EEPL species can also be found in other priority lists that primarily focus on production and economic risks.

The Department of Agriculture, Fisheries and Forestry is developing an action plan to prioritise activities to prepare for exotic environmental pest incursions. The EEPL is also due to be reviewed later this year.

This presentation will give a broad overview of the EEPL; exploring detections and case studies; delving into species profiles; the dangers on the geographical doorstep; trends at the border; and will provide an update on the next phase of priority actions and research being undertaken to reassess and update the EEPL.

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Biosecurity Queensland New Innovations developed during Varroa mite Response Strategy

Mr Robert Stephens[1], Miss Tania MacDonald[1], Mrs Jo Martin[2], Dean Stephen
[1]Biosecurity Queensland, Department of Agriculture and Fisheries., Garbutt, Australia, [2]Queensland Beekeepers Association, ,

Biography:
Following the detection of varroa mites (Varroa destructor) in the Central Coast region of New South Wales in 2022, DAF commenced a significant prevention and preparedness effort aimed at preventing varroa mite from becoming established in Queensland. Dean has been involved in various iterations of this effort within Biosecurity Queensland. During this time he has led policy design and implementation, particularly around the design and issuing of Biosecurity Instrument Permits for interstate movement of varroa mite carriers into Queensland from New South Wales.

Dean has been the main contact for beekeepers seeking permits for entry, and explaining the conditions that need to be followed to allow the entry of varroa mite carriers into Queensland. These permits were an essential part of maintaining business continuity for not only Queensland beekeepers operating in New South Wales but also for New South Wales beekeepers needing to access floral resources and irradiation processes within Qld.

Abstract:
The Queensland beekeeping industry comprises a diverse mix of commercial and recreational beekeepers. This diversity of stakeholder perspectives, coupled with varying levels of trust in the role of government, introduces unique risks for maintaining biosecurity within the industry. The rapid spread of varroa mite has highlighted industry-wide issues in low compliance and underreporting by beekeepers, chemical misuse and challenges in adapting pollination-reliant industries. To address these challenges, Biosecurity Queensland (BQ) has engaged industry partners in innovative surveillance technology pilot programs, enhancing reporting and data management, and active stakeholder engagement with targeted education and heightened awareness initiatives.

Innovative partnerships pilots for AI technology

- Artificial intelligence is being used to monitor for the destructive bee pest Varroa destructor at the Port of Townsville following the installation of Purple Hive Project (Purple Hive) technology.
- BQ also supports a partnership between CSIRO, DAFF, and the University of Canberra conducting a pilot study to test Vimana tech's BeeRight technology. BeeRight is potentially a cost-effective method for detecting varroa mites in beehives, improving beekeepers' ability to detect mites and determine testing regimens.

Improved data management for beekeeper community preparation

- We have expanded the BQ permit system and developed a bespoke Varroa permit system that comes equipped with a hive tracking attribute. This system allows for tracking hives from the Surveillance Emergency Zone in NSW to Queensland, with the assistance of spatial mapping (BQ Maps). The bespoke Varroa permit system provides a more efficient and customized solution to the issue of managing Varroa permit and hive tracking.
- BQ' s Varroa Mite Prevention and Preparedness Program developed a data management platform called Bee123. Bee123 helps beekeepers enter varroa mite testing results, aiding community surveillance and preparedness efforts in Queensland. Additionally, Bee123 will be utilised to create public information tools like maps of Varroa mite population extent and mite loadings, and pollination calendars.

Innovative strategies in stakeholder engagement

- Developed communication strategies specific to demographics typically underrepresented in conventional extension services.

- BQ has adopted a targeted approach to engage with the recreational sector and promote awareness about bee biosecurity. We are establishing a Bee Biosecurity Champions Network, a group of knowledgeable and passionate recreational beekeepers from beekeeping clubs to advocate bee health and safety. Through this collaboration, BQ can deliver tailored educational content and build strong relationships with this important cohort.
- BQ has partnered with beekeepers along the NSW border to establish a sentinel hive network, recognising that biosecurity is a collective responsibility. Early detection of natural spread can only be achieved through these partnerships.
- The beekeeping industry in Queensland faces challenges due to its limited maturity in handling such significant issues. Diverse stakeholder perspectives, coupled with varying levels of trust in government roles, introduce unique risks. These are exacerbated by the rapid spread of Varroa mite, potential underreporting by beekeepers due to low compliance with directives, challenges in adapting pollination-reliant industries, and chemical misuse. To address these challenges, targeted education, awareness initiatives, enhanced surveillance, and active stakeholder engagement are crucial.

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Accelerated Fungal Taxonomy: Enhancing Names-Based Plant Biosecurity

Dr Yu Pei Tan[1], Professor Roger Shivas
[1]Queensland Department Of Agriculture & Fisheries, Dutton Park, Australia, [2]University of Southern Queensland, Toowoomba, Australia

Biography:
Dr Yu Pei Tan is a principal scientist at the Queensland Department of Agriculture and Fisheries, and an adjunct research fellow at the University of Southern Queensland. Yu Pei holds a Bachelor of Laws and Master of Science (QUT), and a PhD (Utrecht University). Yu Pei's research interests focus on the taxonomy and phylogeny of Australian plant-associated microfungi. By combining her skills in molecular biology and bioinformatics, Yu Pei has identified, classified, and named over 250 new Australian fungal species. Yu Pei manages Australia's largest collection of living plant pathogenic fungi held at the Queensland Plant Pathology Herbarium.

Abstract:
Science has witnessed a paradigm shift in recent years with the emergence of methodologies that accelerate the discovery and naming of species. Fuelled by advances in molecular techniques and bioinformatics, accelerated fungal taxonomy has emerged as an essential tool in the landscape of plant biosecurity. With increasing globalisation of trade and travel, the threats posed by invasive fungal plant pathogens to agricultural production and natural ecosystems have increased. The accurate identification and naming of fungal species are fundamental for effective biosecurity. Accurate scientific names harmonise communication, facilitate collaboration, and streamline regulatory processes. This presentation explores the significance of accelerated taxonomy in mycology, and its role in a names-based plant biosecurity environment.

Foremost, only about 200 000 fungal species have been discovered and named, while it is estimated that between 2 and 11 million fungal species exist. This vast unknown kingdom of life undoubtedly holds many undiscovered species, including many that are potentially beneficial or harmful. At the current rate of fungal species discovery, it will take about 2,000 years to document the world's fungi.

Accelerated fungal taxonomy applies innovative methodologies and technologies to speed up species discovery, identification, classification, and preservation. Advancements in molecular techniques, such as DNA sequencing, have revolutionised mycology by providing rapid and accurate means of species delimitation through statistical phylogenetic inference. These techniques enable taxonomists to delineate species boundaries with greater accuracy and efficiency, allowing the timely identification of biosecurity threats.

Plant biosecurity depends on a names-based approach for fungal pathogens. Accurate species names are a gateway to reliable information, such as species distribution, pathogenicity, and economic impact. Taxonomic uncertainty or outdated nomenclature impedes the effectiveness of biosecurity protocols, leading to inadequate risk assessments and control measures. Accelerated taxonomy addresses this challenge by rapidly providing species names for newly discovered fungi. Traditional taxonomic approaches can take years, even decades, to go from discovery to naming. Accelerated taxonomic methods can take days or weeks to bridge this gap.

Accelerated taxonomy in mycology has profound implications for plant biosecurity within a names-based framework. By embracing innovative methodologies, and expediting species delimitation, accelerated taxonomy serves as a cornerstone for effective biosecurity management in the face of evolving fungal threats. This innovative approach is paramount for safeguarding global plant health and ensuring food security in an era of increasing biological globalisation and climate change.

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The Innovation and Evolution of Biosecurity Detection Dogs: From Borders to Eradication Programs

Mr Ryan Tate[1]
[1]Tate Animal Training Enterprises, ,

Biography:
Ryan Tate has been training animals professionally for 20 years, has qualifications in Marine Biology, Zookeeping and Dog training. Formerly a Marine Mammal Trainer, Ryan made a full time switch to training biosecurity detection dogs in 2015. Ryan has trained and handled dogs for many eradication programs on Islands around Australia as well as Pest Proof sanctuaries.

Abstract:
Since their introduction in 1992 as guardians of biosecurity on national borders, detection dogs have emerged as indispensable assets in safeguarding Australia from invasive species. Their utilization in the sector expanded in 2002 to detect invasives such as cats, rabbits, and rodents on eradication programs. Over the past decade, this field has witnessed remarkable evolution, extending beyond vertebrates to invertebrates, weeds, and pathogens.

The transition of detection dogs from a niche application to a multifaceted biosecurity tool has been marked by significant advancements. What was once considered a novel approach has now become routine practice, with biosecurity dogs continually trained and deployed on diverse targets with increasing efficiency. This evolution has been driven by the pressing need to combat the expanding array of threats to ecosystems, necessitating innovative strategies for early detection and intervention.

At the forefront of this evolution is the work of Ryan Tate, a leading trainer in the field of biosecurity dog training and deployment. Through live demonstrations, Ryan intends to showcase the versatility of multi-purpose biosecurity dogs, adept at identifying a spectrum of threats. These demonstrations not only highlight the remarkable olfactory capabilities of these canines but also underscore their practical effectiveness in real-world scenarios.

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Designing a Biosecurity Maturity Model using the Cybersecurity Maturity Model as an analogue

Adrian Turner
[1]Exoflare, Riverview, Australia

Biography:
Adrian Turner is an experienced leader with a track record of scaling organisations at the intersection of technology and societal impact. His experience spans agriculture, technology, telecommunications and healthcare. As Co-Founder and CEO of ExoFlare, he spearheads the development of a new class of global biosecurity infrastructure, safeguarding the global food system. After 18 years in the US where he co-founded Mocana, a leading cybersecurity firm, Adrian returned to Australia to lead the establishment of Data61, Australia's national applied data science and AI research and technology organisation. In a non-profit capacity, Adrian was previously Co-Chair of AustCyber, a Board Director of the Australian eHealth Research Centre, led the Minderoo disaster resilience program and $265 million of aligned investment across 100 partners, as well as being Chair of Australia's 70,000 member expat network Advance.org, while in the US.

Abstract:
Cybersecurity is now a hot topic for boardrooms in Government and industry across Australia, but this is a relatively recent trend, triggered in part by a number of recent national level, wide scale data security breaches. As the world has become increasingly reliant on networked digital technologies, the cybersecurity sector has become increasingly sophisticated in protecting systems and networks from malicious actors. The Cybersecurity Maturity Model has emerged as an important framework to measure and benchmark an organisation's information security maturity, and whether their IT systems are fit-for-purpose to remain secure.

Similar to cybersecurity, the Australian Biosecurity system is multi-jurisdictional and intersects across Government and private sector participants, from large corporations through to individuals. Biosecurity is everyone's responsibility, however the system's ability to respond during an emergency outbreak is only as good as the weakest link in the system. How can biosecurity response, readiness and overall system resilience be measured and benchmarked, across such a wide array of actors, geographical locations and jurisdictions?

In this oral presentation Adrian Turner, ExoFlare CEO and former head of CSIRO's Data61, will outline the need for and purpose of a Biosecurity Maturity Model, based on his deep knowledge of cybersecurity. He will present a proposed Biosecurity Maturity Model, and provide examples of how ExoFlare, as one operator within the system, is using this model as a core framework in its business and product planning.

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Enhancing biosecurity system through next generation sequencing technology and community science

Dr Sonu Yadav[1]
[1]Northern Territory Government, Darwin, Australia

Biography:
Dr Sonu Yadav works as Principal Molecular Scientist with the Department of Department of Industry, Tourism and Trade (NT DITT) Northern Territory Government. Sonu has experience in molecular genomics including population genomics, landscape genomics and comparative genomics. Sonu is currently the group leader of the Molecular Diagnostics unit. In her current role, she oversees molecular diagnostics of plant pests and pathogens using traditional and next generation sequencing methods, conducting genomics research on plant pests and pathogens and developing molecular tools to undertake environmental DNA research.

Abstract:
Increased trade, travel, climate, and landscape change contribute to increased biosecurity outbreaks. Novel and innovative diagnosis methods can facilitate the timely and accurate detection of cryptic pests and pathogen species. The application of molecular methods and next-generation sequencing technology have greatly enhanced species diagnostics. Furthermore, biosecurity monitoring and surveillance activities greatly benefit from collaborative, informed, and engaged communities. Community involvement can assist in minimizing the risks of new incursions and the spreading of existing pests. Building knowledge about biosecurity through science communication, teaching, and learning is crucial to support biosecurity initiatives. In this presentation, I will outline our work involving the identification of pest species and barcoding samples for DNA reference database using next-generation sequencing technology. I will also provide an overview of our projects involving environmental DNA technology, community science, and initiatives involving school students to enhance the northern Australian biosecurity system.