Issue 2
JUNE 2019

PHEL*osophies*

News from the Plant Health and Environment Laboratory, MPI NZ

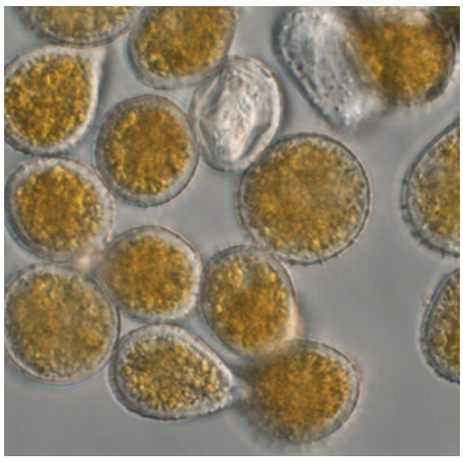
Our role in myrtle rust biosecurity response and long term management

The PHEL Mycology and Bacteriology team plays a key role in providing diagnostics in case of incursions and responses to new and unwanted fungi, bacteria and nematodes. Therefore, when a suspected find of *Austropuccinia psidii*, the fungal pathogen causing myrtle rust, was first notified to MPI in May 2017, our team was among the first responders to obtain a sample for validating the identity of the fungus. Over the following months, PHEL carried out the identification of the pathogen, managed notifications from public and survey teams, and provided organism science advice to our stakeholders and customers.

During the response and initial stages of long term management (from May 2017 to July 2018), we reviewed thousands of images and received hundreds of samples for further lab testing. The samples were handled in biocontainment, examined for the presence of characteristic spores and confirmed positive or negative for myrtle rust using DNA based testing. The molecular diagnostics were carried out using a rapid and specific real time polymerase chain reaction test developed by our team as part of our myrtle rust readiness plan and funded by MPI operational research programmes. This assay was published in 2016 (Baskarathevan et al. Plant Disease 100: 617-624) and has since been incorporated as a recommended diagnostic test for myrtle rust by the International Plant Protection Convention (ISPM 27 DP26).

Over the 14 months that we were actively involved in myrtle rust diagnostics, we analysed over 3700 suspected infections and confirmed over 1200 plants from 30 different plant species as positive for myrtle rust.

While the response has now moved on to long term management, PHEL



continues to provide scientific advice to MPI's long term management team, contribute to the myrtle rust research programmes and provide training and diagnostics as required. If a suspected new host plant with rust symptoms is found or if infected plants are found in new regions, our team also validates these finds. Some of our recent activities include the validation of the find from Greymouth in late April (new infected region in the South Island), training Department of Conservation staff in myrtle rust symptom recognition in May and reviewing the myrtle rust science plan and project reports.

- Merje Toome and Brett Alexander

PATHOGEN PROFILE: *XYLELLA FASTIDIOSA*

Status: Exotic, Unwanted Organism

Distribution: USA, South America, Taiwan, Recent outbreaks in Europe.

The Pathogen: *Xylella fastidiosa*, an insect vector-borne bacterial pathogen, is a high biosecurity threat to New Zealand. *X. fastidiosa* can have a long period of latency and may not show symptoms in some plants. It spreads via movement of infected nursery stock and sap-sucking insects e.g, sharpshooters, leaf hoppers.

Symptoms: Leaf scorch, browning and loss of leaves, stunting of young shoots leaf discoloration, gradual reduction in fruit size, dieback and over time, eventual death of the plant.

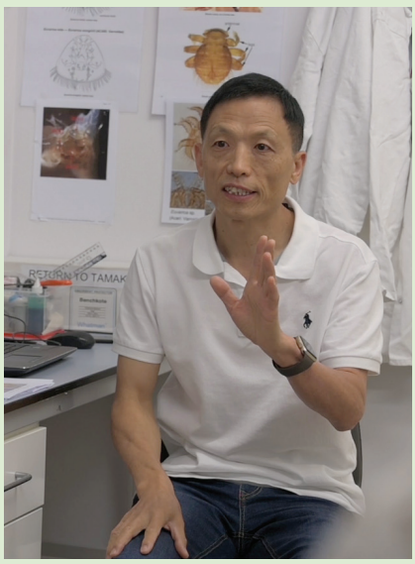
Host range: A wide range of native, commercial and ornamental plants including citrus, grapevines, olives, and summerfruit.

Impact: *X. fastidiosa* has had a catastrophic effect overseas with outbreaks in Europe costing up to a billion dollars in damages. Australia has estimated that costs to their grape and wine industries alone would range from $2.8 to $7.9 billion (ABARES report 2017).

For more information:
http://bit.ly/2Idjtuz

Contact phone number for reporting: **0800 80 99 66**

INTRODUCING QING HAI FAN



QingHai Fan was born in North China and educated in South China, graduating with a PhD in entomology from Fujian Agricultural University in 1997. He served as lecturer and associate professor in Fujian Agricultural University from 1985 to 2001 and was appointed professor of entomology at Fujian Agricultural and Forestry University in 2002. From 2001 to 2002 he worked on Australian mites as a visiting scientist in Queensland University. He came to New Zealand in 2003 to study bulb mites as an acarologist at Landcare Research, and then worked on the honeybee varroa mite as a research associate at Massey University.

He joined the then Ministry of Agriculture and Forestry in 2009 as a scientist (Entomology), becoming a senior scientist in 2011 and a principal scientist in 2015 at the Plant Health and Environment Laboratory. His work involves diagnosis of insects, mites and other organisms from border, incursion investigation and response samples as well as bee pest, fruit fly and Culicoides surveillance. He also develops identification tools, and provides technical advice in areas of strategic importance to MPI.

He has an impressive scientific profile, having published seven books and nearly 160 journal papers on the systematics, biology and control of mites and insects.

Plant Importation through the Plant Health and Environment Laboratory (PHEL) Greenhouse Facility

The ability to import high-value plant germplasm is important for New Zealand to increase productivity, product diversity and profitability of its multi-billion dollar horticulture sector. This ensures the sector remains competitive in the international market. To help this, PHEL operates the only, high-risk, Post-Entry Quarantine Level 3B (PEQ L3B) greenhouse facility, accredited to the Facility Standard for Post-Entry Quarantine for Plants, in New Zealand. This facility is in high demand to provide PEQ provision for high-value horticultural crops including grapes, berry fruits, apples and citrus and is already booked until 2024.

Plant importers contact PHEL to book greenhouse space if their plants must be imported into a PEQ L3B greenhouse facility according to the Import Health Standard (IHS). For such requests, PHEL provides various services including information and advice to customers on optimising the use of their greenhouse space, a cost estimate, and booking of greenhouse space. Closer to the time of import, PHEL assists clients with the process to obtain an import permit from Plant Imports, completes a Post-Entry Quarantine Contract Agreement and provides packing and shipping instructions to customers to manage the biosecurity risk and risk of damaging the plant material during transit. Once the plants arrive at PHEL, on-arrival inspections of documents and plants are completed.

The plants are maintained in the PEQ L3B greenhouse for the period specified in the IHS. PHEL ensures traceability of plant material during the PEQ period and prevents the escape of any organism associated with these plants to the New Zealand environment. In addition, PHEL carries out, at a minimum, twice weekly visual inspections of plants throughout the PEQ period to detect any pests and diseases and facilitates the MPI Traveling Technical Supervisor to complete the required number of plant inspections as per the IHS. The plants are grown in various environmental conditions in the greenhouse as per the IHS for the development and expression of any regulated-diseases associated with imported plant material.

PHEL also carries out necessary laboratory and biological-indexing tests in their IANZ (International Accreditation New Zealand) accredited facility. PHEL ensures all pre-determined testing and general diagnostic testing are carried out in a timely manner for the plants as per the IHS and relevant import permits and prepares required reports so the imported plants can receive their Biosecurity Clearance. The PEQ team liaises with the clients to help them collect their plants once the plants have received Biosecurity Clearance.

PHEL is planning to expand its PEQ L3B greenhouse capacity as one of the ways to increase its contribution for Growing and Protecting New Zealand.

- *Priyanka Wickramasinghe, Carol Elliott and Sathish Puthigae*

Editorial

The first issue focussed entirely on entomology whilst this issue includes the other teams of PHEL; Mycology, and Bacteriology, PEQ & Botany and Virology. One can read about the PHEL Post-Entry Quarantine greenhouse facility, our work with the International Plant Protection Convention, the virology team visiting Fiji as part of NZAID training, and two unusual enquiries that the entomologists solved.

Our Work For International Plant Protection Convention (IPPC)

IPPC Technical panel members at the February 2018 meeting (European Plant Protection Organisation, Paris, France).

IPPC is an international body, consisting of 183 member countries, responsible for improving plant health worldwide, and sets the standards for international trade to ensure protection from plant disease. Accurate pest detection and identification is crucial to ensure appropriate phytosanitary actions are taken to respond to biosecurity threats.

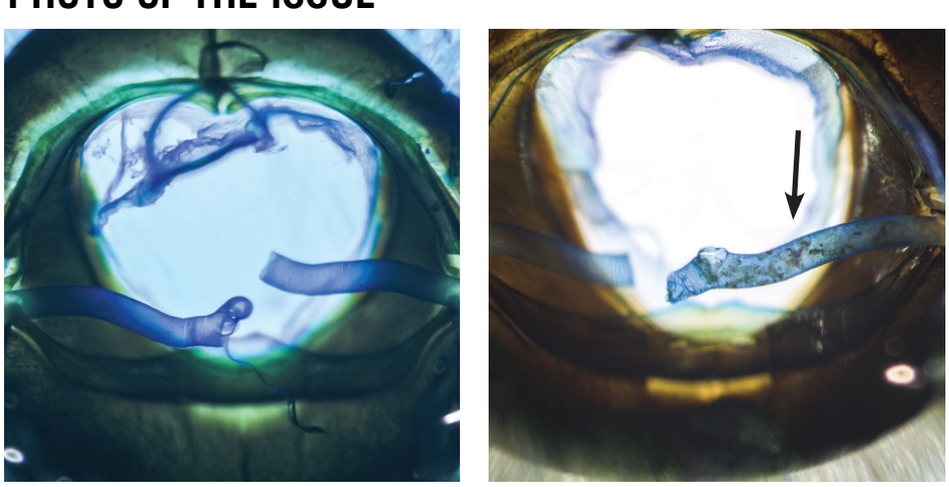
Rob Taylor, a Principal Scientist from the PHEL Mycology and Bacteriology team contributes as an international diagnostic expert on the IPPC technical panel for diagnostic protocols for regulated pests and leads the bacteriology discipline. Rob is the only New Zealand representative on the technical panel which consists of 10 representatives, all from different countries. The technical panel develops the diagnostic protocols that are included in the International Standard of Phytosanitary Measures (ISPM 27) diagnostic protocols for regulated pests. These protocols describe the procedures and methods for the official diagnosis of regulated pests that are relevant for international trade. Many of the diagnostic tests developed at PHEL are considered world class and have been included in the ISPM 27, e.g. diagnostic protocols for *Erwinia amylovora* (cause of fire blight), *Austropuccinia psidii* (the myrtle rust pathogen), and *Xylella fastidiosa* (cause of Pierce's disease on grapevines). The preparation of some of the protocols is also led by PHEL, e.g. Rob was the lead author of the *Xylella fastidiosa* diagnostic protocol, and Lia Liefting from the PHEL Virology team was the lead author of the phytoplasma and *Candidatus* Liberibacter solanacerum diagnostic protocol.

IPPC
International Plant Protection Convention
Protecting the world's plant resources from pests

These diagnostic protocols can be found at https://www.ippc.int/en/core-activities/standards-setting/ispms/#publications.

- Rob Taylor

PHOTO OF THE ISSUE



Close-up of bee trachea; on the left a healthy trachea extracted from a sample in the lab and on the right, trachea extracted from a Canadian bee, with tracheal mites visible. Tracheal mites are one of the pests screened for in MPI's Apiculture Surveillance Programme, and are not present in New Zealand.

Experts baffled

In early February, Auckland PHEL public enquiries was contacted by a couple who had discovered some strange little creatures wriggling in their kitchen. The couple had uploaded the find on Facebook where it had become viral, and a number of suggestions had been made including that they were baby stingrays or baby mice.

Photo / Tim Clerke Facebook

PHEL advised the couple that they were moth legs, from a large moth from the Noctuidae family like the Granny's cloak moth (*Speiredonia spectans*). At the same time other organisations had been contacted providing conflicting and incorrect identifications. The story was picked up by the NZ Herald, Stuff and IFL Science website, usually with the heading "experts baffled". Dr Sarah Tassell, entomologist at the New Zealand Arthropod Collection at Manaaki Whenua - Landcare Research, agreed with PHEL that the "creatures" were the legs of a large moth. Sarah states "If you look at the photos you can see that what you are looking at are jointed legs. They are hairy and have some distinctive spines". As for the movement, Sarah explains "It is not unusual for the nerves to keep firing for a while in recently dismembered limbs and dead animals".

Good to see entomology in the headlines!

Some links to news stories:

Mystery creatures found in Auckland home likely to be moths experts say.(STUFF)

Mother finds strange creatures wriggling on her kitchen floor in now viral video (IFL SCIENCE)

Experts baffled by mysterious creature discovered in Kiwi's kitchen (NZ HERALD)

- Ben Boyd

SPOT THE FRUIT FLY

Common species notified to MPI during the 2019 fruit fly response

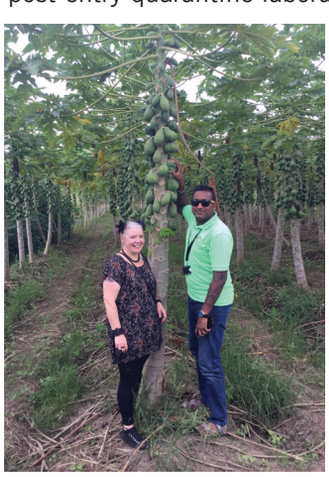
Can you spot the fruit fly?? See following page to see if you got it right!

NZ AID

PHEL Virology Team provide training to Fijian Biosecurity staff

Since mid-2016 PHEL has been involved in training our South Pacific biosecurity colleagues from Fiji, Cook Islands and Niue, as part of a five year project funded by NZAID. Until now the training provided by PHEL has focused on upskilling South Pacific Island biosecurity staff in diagnostic techniques for identifying insect, fungal and bacterial pests.

In March 2019, for the first time, the PHEL Virology Team provided Fijian Biosecurity Authority (BAF) staff with training on plant virus diagnostics. This was followed by another one week training workshop, in April, at the BAF post-entry quarantine laboratory in Koronivia, Suva.



L: Dr Catia Delmiglio with BAF staff Riten, R: Virology training with BAF staff

During the two training workshops, PHEL virologists provided a mix of theoretical and practical training and assessments. The first workshop provided theoretical training on symptomatology and molecular diagnostics for the detection of viruses, viroids, phytoplasmas and liberibacters, plant sampling, virus-vector interactions and transmission, nucleotide sequence analysis, phylogenetics and primer design.

The practical training in Fiji covered field sampling, nucleic acid extractions from collected plant material, PCR techniques, gel electrophoresis, interpretation of PCR results, and nucleotide sequence analysis for virus identification. The training at the BAF laboratory, conducted by Dr Catia Delmiglio, provided a refresher on the theory but mainly focussed on trialling the techniques learned at PHEL, validating some virus test protocols and performing some trouble-shooting necessary for the implementation of the new techniques in the Fiji lab. As part of the training the Fijian laboratory quality framework was also updated to include these new techniques.

Quarantine officers at a packhouse inspecting okra for pests and diseases.

On the last day in Fiji, Catia, was taken to visit important export crops (e.g. okra, eggplant, papaya, taro), a pack-house that deal with export fresh produce, and the fruit-fly treatment facility at Nadi airport.

This was a fantastic opportunity for the PHEL Virology Team to share their expertise and skills in order to improve the diagnostic skills of the BAF staff. In addition, it was a great opportunity to gain a better understanding of the production and export processes for fresh produce in Fiji. The Virology Team received great feedback on this initial virology training module, and the Fijian biosecurity staff are keen to receive additional virology training in future.

- Catia Delmiglio

(4) is the Queensland Fruit Fly or *Bactrocera tryoni*, a major agricultural pest at the centre of MPI's Response on the North Shore area of Auckland this year.

THE NUMBERS *November 2018- June 2019*

Stinkbug submissions to PHEL in 2019*:

346
Brown Marmorated Stink Bug
(*Halyomorpha halys*)

78
Yellow Spotted Stink Bug
(*Erthesina fullo*)

*both species not present in New Zealand

Bot fly on a bot, ewwwww… myiasis

In April, a week after returning to New Zealand from Peru, a patient presented themselves to the emergency department of the Auckland North Shore Hospital. Two weeks earlier they had noticed small wounds on their buttock which they considered to be mosquito bites. However, the wounds were not healing and they noticed a 'tail' protruding from one of these wounds. Upon further inspection, a larva was extracted. In the emergency department an additional three larvae were extracted.

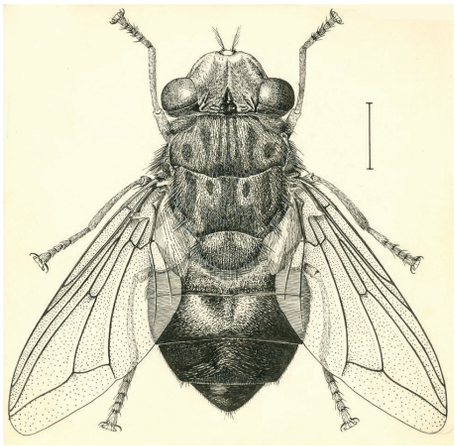
The three 2nd instar larvae

The doctor at the North Shore Hospital contacted MPI AHL, and the three larvae were sent to the Auckland based PHEL entomologists for diagnosis. They were identified as 2nd instar larvae of the human bot fly, *Dermatobia hominis* (DIPTERA: Oestridae).

The human bot fly is native to Central and South America, from Mexico in the north to Paraguay and Argentina in the south. It is unlikely that this species could survive in New Zealand.

The fly is not known to transmit disease-causing pathogens, but the larvae infests the skin of mammals and live out the larval stage in the subcutaneous layer. The infestation of any fly larvae inside the body is known as myiasis.

The adult female bot fly lays her eggs onto a blood-feeding arthropod, usually a mosquito or tick, which is captured by the bot fly in flight. As the vector takes a blood meal on the host, the bot fly eggs react to the change in temperature, hatch and the larvae enter the skin. The larvae breathe through two posterior spiracles which lie flush with the skin of the host. This is the 'tail' that the patient had observed. The larvae feed on exudate, fluid emitted by the open wound of the host. In general, the life of the larvae inside the host is five to twelve weeks. Once the larvae is fully developed it crawls out of the host to pupate in the soil. The host's wound usually heals rapidly and without complications. When the adult bot fly emerge from the pupal case, they mate and do not feed.



***Dermatobia hominis* adult (A.Cushman, USDA).**

You can find a video here about an entomologist who gave birth to some bot fly in his own body: https://vimeo.com/116518067

- Ben Boyd

PHEL*osophies* is a biannual newsletter produced by the Plant Health and Environment Laboratory, Ministry for Primary Industries New Zealand.

For further information please contact:
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Biosecurity New Zealand
Ministry for Primary Industries
Manatū Ahu Matua

PEST AND DISEASE HOTLINE

Call to report any exotic pests or diseases of plants or animals

0800 80 99 66