Issue 1
DECEMBER 2018

PHEL*osophies*

News from the Plant Health and Environment Laboratory, MPI NZ

Editorial

This is the first issue of *PHELosophies*. Our aim is to keep readers up to date with our work within the Plant Health and Environment Laboratory (PHEL). The mission of the PHEL is to help protect New Zealand's primary industries and environment from suspected exotic organisms and reassure our trading partners that New Zealand is free of certain pests and diseases. Diagnostics related to organisms found on imported commodities play a large role in our work, though in this issue you can discover we are also involved in surveillance activities, training international colleagues, researching the Brown Marmorated Stink Bug, and providing advice to the public.

Fruit Fly Surveillance work

New Zealand is free from damaging economically important fruit flies of the family Tephritidae, which if present, could affect 80% of the fruit and vegetables in New Zealand making them inedible and not fit for export. MPI conducts a national fruit fly surveillance programme to monitor the country for the presence of these high impact exotic fruit flies and PHEL plays a crucial role in this programme. The surveillance programme has dual functions: to act as an early detection system to ensure any populations of fruit flies are trapped and eradicated as soon as possible, and to provide assurance to our trade partners of New Zealand's pest fruit fly-free status, thereby supporting our multi-billion dollar horticulture industry.

PHEL conducts screening of samples from 7877 fruit fly traps deployed by AsureQuality every year across the country, with higher densities around high risk areas. Traps are inspected fortnightly between October and July by trained AsureQuality trappers and insects found in the traps that meet the size and shape requirements are sent to PHEL to be screened for exotic fruit fly species. During the 2017-18 season, 6869 vials containing insects cleared from traps were screened by PHEL. In addition to the screening, PHEL scientists are involved in annual fruit fly trapper training and the development of new diagnostic molecular tools for identification of fruit fly pest species. PHEL is also involved with efficacy experiments with the lures, traps and insecticides used in the surveillance programme and provides scientific advice during detections, incursions and responses to fruit flies. Since the implementation of the surveillance programme in the 1970s, there have been 10 trap detections of exotic fruit fly species in New Zealand, two of which led to the discovery of a small population and required quick response and eradication measures. In the other cases, intensified surveillance did not yield further flies, and it was concluded that these cases probably arose from discarded infested fruit brought in by travellers from overseas. To date, all incursions have been successfully controlled and New Zealand remains free from high impact exotic Tephritidae species.

- *Santha France*

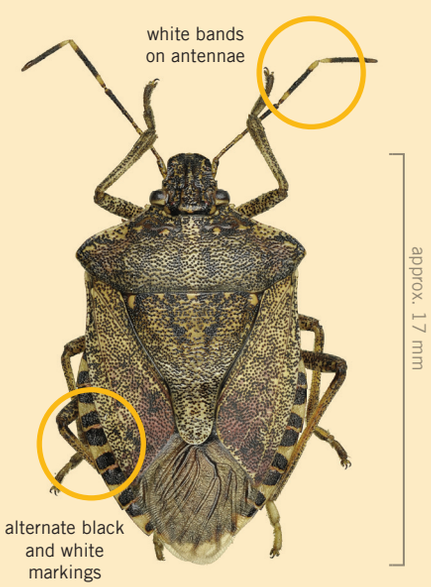
PEST PROFILE: BROWN MARMORATED STINK BUG (*Halyomorpha halys*)

Status: Exotic, Unwanted organism

Distribution: Native to China and Japan. Introduced to USA, Canada, Chile and Europe.

Description

Adults are between 12-17mm long and "shield shaped". They have distinctive brown marbled or variegated pattern/colouration, with white/tan underside.
White banding on the antennae across segments 4 & 5. Alternate black and white markings on the margin of the abdomen. Wing membrane with dark bands on veins.



Industries affected: Agriculture, Horticulture, Nuisance pest for home owners.

Entry pathways: Sea Cargo, Air Cargo, Air Passengers, Mail

High Risk months: October to May (high risk season from Northern Hemisphere)

https://goo.gl/o1V6gN
https://goo.gl/MYg4tK

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

INTRODUCING STACEY LAMONT

Stacey joined PHEL in February 2016 as a Specimen Receptionist, and since September 2016 has been working as a Senior Technician in the Entomology team. Stacey studied her masters in Biosecurity and Conservation at The University of Auckland, where she focussed on the ecology of native spider fauna, and studied spider communities in restored ecosystems in the Hawke's Bay, NZ.

As part of her work in the Entomology team, Stacey deals with public enquiries, carries out diagnostic and screening work and helps to look after MPI's Apiculture Surveillance Programme. This programme is carried out annually to provide assurance of ongoing country freedom from targeted organisms, such as the small hive beetle (*Aethina tumida*) and to provide an early warning of incursions.

She has a particular interest in ecological modelling and has recently been working on CLIMEX modelling, to understand how these could be a valuable addition to the technical work and advice that PHEL provides.

Operational Research Project

BMSB origin using RAD sequencing

Identification of the geographical origin of an invasive pest is crucial to make effective biosecurity decisions during an investigation and response.

In recent years, the brown marmorated stink bug (BMSB), *Halyomorpha halys* (Hemiptera: Pentatomidae) has been increasingly intercepted at New Zealand's border, and post border. In response to this, MPI has developed a research project to obtain DNA sequence information for BMSB from different countries using a Restriction Associated DNA (RAD) sequencing approach in order to develop a robust and cost-effective method to trace the geographical origin of BMSB.

RAD sequencing will be applied for genetic marker calling because of its low cost and high-throughput. Compared to previous technologies such as Amplified fragment length polymorphism and oligonucleotide hybridization, RAD sequencing supports a much higher resolution for genetic marker detection. Therefore it can be used to call both SNPs (single nucleotide polymorphisms) and Indels (insertion or deletion). In addition, it does not need a reference genome which facilitates the study of non-model organisms compared to other Next-generation sequencing (NGS) based methods, such as GBS (genotyping by sequencing).

The project started in early September 2018 and to date, a literature review on BMSB and RAD sequencing has been conducted. BMSB scaffold genome sequence data has been obtained and simulation of restriction enzymes on the draft genome sequences has been completed. In addition, a number of BMSB samples from China, Italy, Chile, Romania and various other countries have been sourced, DNA extraction methods have been optimized and RAD libraries are going to be prepared by comparing different pairs of enzymes for Illumina sequencing.

Once the method is developed, it will be applied at PHEL for BMSB interceptions and will greatly assist in the decision making during an incursion and response.

Approaches:

- Collect BMSB specimens from different origins/countries;
- Obtain partial genome sequences;
- Identify molecular markers;
- Establish method for tracing BMSB geographical origin.

- Dongmei Li/ Juncong Yan

DID YOU KNOW?

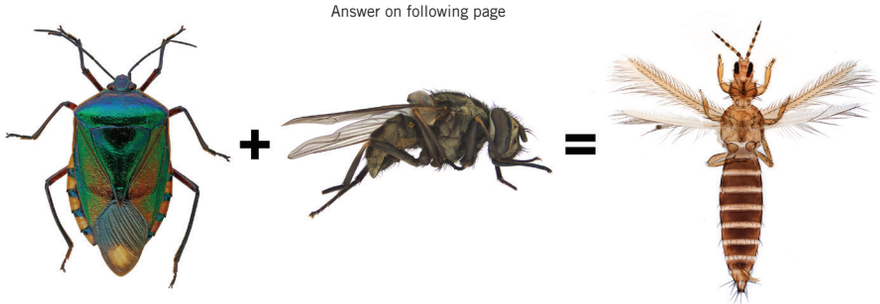
Each mound made by *Syntermes dirus* termites in Brazil is made up of approximately 50m³ of soil, created by underground excavation of a volume of earth equal to approximately 4000 Great Pyramids of Giza!

As reported by Martin et.al (2018) *Current Biology, 28.*

BRAIN TEASER

One morphological feature (common for all organisms pictured) can be used to complete the equation. What is it?

Answer on following page



DIAGNOSTIC NOTES
Delusory Parasitosis

Australian paralysis tick (*Ixodes holocyclus*)- a genuine parasite we don't want in New Zealand (Image: Ken Walker).

For entomologists, reports of itchy or other skin problems suspected to be caused by parasites have to be taken seriously to rule out real arthropod causes. If submitted samples include identifiable mite exuviae (cast skins), moth scales or caterpillar setae, the source of the irritation may be traceable. These can include bird mites as they wander around looking for a new host after fledglings recently left a nest on or near a building. Some stored grain products can also become breeding grounds for mites which migrate when looking for a new food source, causing itchiness if they come in contact with sensitive areas of skin. Biting insects such as bed bugs and fleas can be much harder to detect having more secretive life habits. Other insects can occasionally cause genuine skin allergies or respiratory problems, for example, moth scales or hairy caterpillars. A skin rash can occur during bamboo moth larval migration in a back yard, or as an allergic reaction in technicians working on certain insects in the laboratory! Other genuine causes may remain a mystery but symptoms are usually short-lived. Rarely people unwittingly bring back parasites on themselves after being in tropical countries.

Cases where a submitted sample contains only human skin flakes, scabs or hairs, fabric burrs and bits of grit or random plant fibres collected on Sellotape™ from the body or various areas in a house, are likely to be delusory parasitosis. Very often they have been carefully packed in cotton wool or tissue and sent in tiny, if elaborate boxes, as if well treasured.

Delusory parasitosis (or DOP – Delusions of Parasitosis) is a well-known phobic condition in which a person believes they have live organisms, or parasites living on or in their body, usually the skin, but sometimes internal. An insect "burrowing out of his tongue", on examination proved to be a cooked tomato seed. The submitter had a genuine allergy to tomatoes and a single rogue seed must have caused a stinging sensation before 'capture'. Delusory parasitosis can be 'contagious' within a family or group of people when all rational thought is replaced by repulsion and fear of something burrowing under the skin. Parasitology lectures at university can have the whole class scratching!

Social media does not help this phobia, spreading imagined symptoms world-wide and even giving them the name 'morgellons' which don't exist. Whist the cause may be only a perception by people suffering from delusory parasitosis, the symptoms are very real, caused by chemical changes in the brain as it reacts to a new stress or trauma, which effects our very complicated nerve network to the skin. These same itching or 'crawling insect' sensations and rashes may also occur in aging, drying skin, hormone or liver problems and a number of other medical conditions difficult to diagnose.

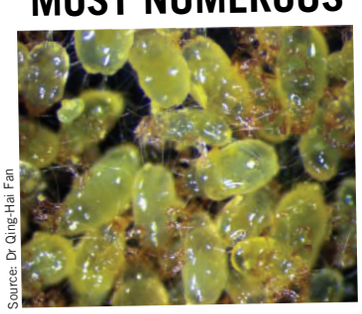
Like any developing phobia, the symptoms take over the mind and sufferers from this condition may resort to extreme measures to rid themselves of the parasites they're convinced of, such as overuse of insecticides, burning clothing or bedding and even bathing in kerosene "to kill the bugs". They are doing the best they can to make sense of symptoms from a chronic itch disorder that's undiagnosed and would disappear if only they stopped scratching. The hardest job for entomologists is to convince the person to stop self-diagnosing and go back to their doctor, who should send any samples to a medical laboratory. There are no official medical entomologists in New Zealand as in some tropical countries where actual parasites of humans are a major problem.
- *Olwyn Green*

MOST INTERESTING

Source: Dr Narayanan Sockalingam

A tick was discovered behind a man's ear on his return to NZ from Australia, and sent to PHEL for identification.

MOST NUMEROUS



Source: Dr Qing-Hai Fan

Tyrophagus mites [ACARI: Acaridae] are probably the most commonly intercepted organism. They like to feed on mould and are a common storage pest. We intercepted them 439 times this year.

MOST UNUSUAL

A dead scorpion was discovered near bananas in a supermarket in Christchurch.

Brain teaser answer: Antennomeres (the segments of the antenna)

THE NUMBERS *January - November 2018*

Submissions to PHEL in 2018*:

358
Brown Marmorated Stink Bug
(*Halyomorpha halys*)

135
Yellow Spotted Stink Bug
(*Erthesina fullo*)

29
Fruit Flies
(Tephritidae)

*all not present in New Zealand

NZ AID

Biosecurity Training in the South Pacific

PHEL is involved in training our South Pacific biosecurity colleagues from Fiji, Cook Islands and Niue, as part of a five year project which started in mid-2016. Funded by NZAID the project will enhance the biosecurity systems in these countries in order to enable them to gain easier market access, minimise the risk and impact from new pests and diseases through early detection, and provide effective investigation and response in case of an incursion.

PHEL entomologists are providing training in a number of ways, including pest diagnostic training workshops for the Entomologists/Biosecurity Inspectors that cover hands on identification of the major insect/mite groups of biosecurity concern, as well as insect/mite symptoms on crops in the field. To aid our colleagues in the laboratory, PHEL Entomology is developing diagnostic manuals to identify the main pests, along with a large online diagnostic image library. As well as morphological diagnostics, PHEL are training staff in molecular diagnostics to identify organisms using DNA techniques. Laboratories are being updated with equipment and reference books, and a quality framework similar to what PHEL is being implemented to ensure that submitted specimens can be traced from when they are first received in the laboratory, through to their identification, and when the advice has been reported to the client. *- Ben Boyd*

Top: PHEL staff, Katharina Hofer, Disna Gunawardana and Prasad Doddala with training participants from the Cook Islands and Niue earlier this year.
Bottom: Participants practicing invertebrate sampling techniques in the field.

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:
auckland@mpi.govt.nz

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