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EDITORIAL

MPI'S GRADUATE DEVELOPMENT PROGRAMME

The Ministry for Primary Industries (MPI) implemented the inaugural Graduate Development Programme in February 2014. The main objective of this programme is to recruit high-potential employees who actively contribute to the success of MPI and therefore the success of our stakeholders. We aim to proactively create an in-house talent pool for in-demand roles; to identify the unique potential of each graduate and develop and align this with MPI's goals and objectives; to increase MPI's employment brand among recent graduates; to inject innovative thinking into MPI; and to contribute to the career development of high-potential New Zealand graduates.

MPI Grad Lydia Pomeroy talks to students at Victoria University of Wellington's career fair in May this year about her experiences on the programme. The purpose of the fair is to market the grad programme for the next (2016) intake.

Almost 18 months after the induction of our first 13 nervous (but excited) graduates, the programme is proving a great success. We now have a group of well-rounded MPI staff about to finish the programme and embark on their first permanent roles with the organisation, and the keenness of MPI managers to take them permanently into their teams is credit to the hard work of the graduates. After the success of the pilot programme, nine new graduates entered MPI for the second intake in February of this year, and we are gearing up for the recruitment process again for the third programme, which commences in 2016. Feedback from the graduates, their managers and mentors, and interest from outside of MPI all indicate that the programme is a success in developing the careers of highly capable and enthusiastic graduates who are contributing greatly to the work of the organisation.

ABOUT THE PROGRAMME

The Graduate Development Programme is an 18-month learning and development work programme open to recent university graduates from a wide variety of disciplines. The programme provides full-time salaried positions where graduates learn on the job and are exposed to as many areas of MPI as possible through formal workplace rotations, and gain specialist skills and training through structured learning and development. The graduates are responsible for completing specific work and also have the opportunity to relocate around New Zealand, depending on the location of host managers and work areas. The selected graduates can thus launch their careers working with and learning from MPI's team of experts, contributing to exciting, meaningful and rewarding projects and experiencing professional and personal growth. Towards the end of the 18-month programme they are helped to find an ongoing role within the Ministry that puts their skills to work and helps them find their niche.

Graduates are supported by a manager for each of their three 6-month work rotations for day-to-day support and management, a mentor who helps to guide them through and beyond the programme, a "buddy" for informal advice and support, and central HR support.

ENTHUSIASM, ADAPTABILITY AND NEW IDEAS

By their very nature our graduates have provided a number of benefits to the organisation. They've adapted easily to their new workplace and are committed to working hard, proving themselves and achieving their ambitions. They are fast and keen learners and have applied their innovative thinking to new ideas and solutions, are enthusiastic about work and are not afraid of challenges and obstacles. One common thread of feedback from managers is that they work very fast but still produce quality outputs. Managers have been kept on their toes providing graduates with work, and having graduates in their teams has challenged them to think and approach their work differently. Our graduates think differently and make connections between ideas. They also have a strong degree of initiative and self-motivation and self-efficacy. They also have great skills in building and maintaining networks, work well in a team and collaborate with a wide peer network – as evidenced in the tight bonds they've formed as a cohort and with other MPI staff.

Our graduates have contributed to high-level initiatives such as the responses to the Queensland fruit fly, the Food Act implementation, import and export discussions, hosting and translating for international delegations to New Zealand and contributing to day-to-day operations in intelligence, border clearance, organisational communications and liaison with ministers and stakeholders. In this issue you can read

about targeted passive surveillance of the brown marmorated stink bug, written by one of our 2015 intake, Alysha Bagasra, who is a member of the Surveillance and Incursion Investigation team based at our Auckland Plant Health and Environment Laboratory.

To find out more about the Programme, search "MPI Grads" on Facebook or take a look at MPI's career page on our website. Applications will be opening for the 2016 programme in late July/early August.

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THE FIRST THREE DAYS OF A FOOT-AND-MOUTH DISEASE RESPONSE: ESSENTIALS FOR A VETERINARIAN

Foot-and-mouth disease (FMD) is a notifiable vesicular disease of cloven-hoofed animals (domestic ruminants, wild ruminants and pigs). New Zealand is free of FMD and has never had an incursion. FMD is endemic in much of Africa, the Middle East and South Asia, with sporadic outbreaks occurring in eastern Europe, northern Africa and South Africa (OIE, 2014a). The World Organisation for Animal Health (OIE) Terrestrial Animal Health Code defines an FMD infection and lists the steps for a country to obtain freedom from FMD (OIE, 2014b).

FMD is a notifiable organism under the Biosecurity Act 1993 so any suspicious case must be notified to the Ministry for Primary Industries (MPI) immediately.

New Zealand has a well-established and highly effective passive surveillance system (Tana, 2014). Through this system, on average 12 investigations of vesicular disease are conducted by MPI per year. These investigations demonstrate that the passive surveillance system is functional and sensitive at a very low threshold of risk. Initial investigation involves a thorough clinical and epidemiological approach, with subsequent activities focused on tracing and ageing of vesicular lesions (Brangenberg, 2011; McFadden, 2011). To provide perspective on an FMD biosecurity response, this article begins by describing a hypothetical example of a vesicular investigation that is determined to be FMD, then outlines the first three days of the biosecurity response, and the systems, partnerships and processes that are set in place to manage an FMD incursion.

A VESICULAR INVESTIGATION ON A FARM

A dairy farmer calls his local veterinarian because his cattle are sick. The veterinarian determines that some of the cattle are lame, drooling and have vesicles in their mouths. She suspects a vesicular disease and cannot exclude FMD from the differential diagnosis so she immediately calls the MPI 24-hour exotic disease hotline (0800 80 99 66). Based on the risk criteria communicated, the MPI Incursion Investigator (II) taking the call enlists the closest available Initial Investigating Veterinarian (IIV) to undertake further investigation. IIVs are private veterinarians trained in exotic disease recognition and are Authorised Persons as defined in the Biosecurity Act 1993.

Within six hours of the original notification, an IIV visits the farm. After examining the sick animals, the IIV reports back to the II about the lesions, milk production, morbidity and mortality rates in the herd or flock, and history of movement of FMD-susceptible species and risk goods (meat, meat products, milk, milk products, carcasses, hides, skins and wool) onto and off the farm (MPI, 2014a). The IIV, in consultation with the II, makes a diagnosis of "negative" or "not negative" for FMD. Assuming the latter diagnosis in this case, temporary movement restrictions are placed on the farm until the II arrives (within 16 hours of first notification) (see **Figure 1**).

At this stage, planning for a possible biosecurity response to FMD gets underway at MPI in Wellington. If the II cannot rule out FMD on the basis of clinical signs in affected livestock, samples are collected to test for FMD. The biosecurity protocol is that the veterinarians must not visit any other properties with livestock until the investigation has been stood down. Using the fastest available method of transport, these samples are sent to the Wallaceville Animal Health Laboratory, Investigation and Diagnostic Centre (IDC). At this stage, planning for a response is escalated. If FMD virus is confirmed, e.g., by PCR and AgELISA (tested within 24 hours after notification), an FMD biosecurity response is initiated. Samples are sent to the World Reference Laboratory for FMD in Pirbright, UK, for serotyping. Once results are received, New Zealand's FMD vaccine bank is activated with the appropriate vaccine strain, in case vaccine is needed as a biosecurity response tool.

NOTIFICATIONS

MPI immediately notifies the Minister of Primary Industries, the Prime Minister and Cabinet that New Zealand is no longer free of FMD. Other parties to be notified next include other government agencies, overseas diplomatic posts, trading partners, the OIE, the media and NZ primary industry stakeholders, including farming communities and the general public.

A CRISIS FOR NEW ZEALAND

An FMD incursion would create a crisis for New Zealand, as exports of many animal products would stop immediately. Products from FMD-susceptible animals (risk goods like meat, meat by-products, milk, milk by-products, carcasses, hides, skins, wool and germplasm) would not be allowed to leave the country.

DECLARATION OF A BIOSECURITY EMERGENCY

Declaration of a biosecurity emergency can be made by the Governor-General under section 144 of the Biosecurity Act 1993, which provides broad powers to manage the outbreak, including surveillance, tracing, movement controls, cleaning and disinfection. The primary aim of any response action is to eradicate the FMD virus in the shortest possible time while minimising the impacts on the economy, human health and social, cultural and environmental wellbeing. The aim is to return to normal international and domestic trade as soon as possible. This is done through the stamping-out approach outlined in the FMD response plan (MPI, 2014b).

ESTABLISHING A RESPONSE STRUCTURE

As the lead organisation, MPI immediately implements control measures in accordance with the MPI

FMD response plan. New Zealand uses a single scalable response model based on a co-ordinated incident management system. The system or model provides the structure to co-ordinate and control a response on any scale, and is co-ordinated with other emergency services. It is a whole-of-government response structure, because other agencies are needed to manage the issues and risks that fall within their own areas of expertise. A headquarters is established in Wellington to co-ordinate response activities nationally, and field headquarters are established in the affected region, with field teams dispatched to each affected farm. A laboratory response operations centre at the IDC (Wallaceville) is established. Co-operation of all agencies associated with livestock industries, regional government, other government departments, Maori and the rest of the public, is essential for the response to be efficient and effective.

COUNTRY-WIDE MOVEMENT RESTRICTIONS

A national livestock standstill is declared immediately by MPI once FMD is confirmed. This prohibits any movement of FMD-susceptible animals (i.e., all cloven-hoofed animals) and their germplasm within New Zealand. Once the standstill is declared, any organisation or person transporting FMD susceptible animals must get to their destination as soon as possible. This includes animals from any consignment to meat processing plants, abattoirs, farms, saleyards and feedlots. Animals travelling from individual farms to shows, exhibitions and fairs have to be returned. The standstill is enforced until MPI is confident that all FMD cases have been identified, including all positive tracings. Animal databases such as Farms Online (MPI, 2014c) and the National Animal Identification and Tracing (NAIT) scheme (NAIT, 2014) are an important part of identifying all FMD-susceptible livestock that may have been in contact with a test-positive farm or animal. If any such animal is identified, the owner is contacted and all their animals will be examined and samples collected where necessary. This process will take some time and it is estimated that the standstill will be enforced for at least two to three weeks. Some movements may be allowed, but only with special permission from MPI.

For the standstill to be communicated effectively and efficiently, the communication process has been planned in advance and includes brochures, posters and media briefings. This also ensures that all stakeholders transporting livestock are contacted immediately, including the operators of trucks crossing Cook Strait by ferry.

ON-FARM MOVEMENT RESTRICTIONS

To prevent further spread of FMD, a restricted place notice is issued to the owner of any infected farm. This is a legal notice that prohibits the movement of FMD-susceptible animals, their germplasm and any other risk goods off the infected farm. All infected and high-risk farms (as determined by tracing) become subject to restricted place notices as they are identified.

MOVEMENT RESTRICTIONS ON RISK GOODS

Additional movement controls are declared around the infected area (i.e., where there are one or more infected farms in the same region). This is called a "high-risk" control area and includes a 50-km radius around the infected area. It may include the entire area under a regional council, or a natural or artificial boundary like a mountain range, river or highway. If another infected farm is not in the same region, a separate high-risk control area is declared. Risk goods are restricted to movement into, within and from this area. As the response continues and the distribution of the FMD-infected farms is better understood, this control area will become smaller over the following months. Some movements of risk goods may be allowed but MPI must be contacted to see if a permit can be issued. Some risk activities will be restricted to prevent further spread of FMD, for example hunting of wild FMD-susceptible animals (wild pigs, deer, sheep and goats). Control areas are publicly notified by radio, television, newspapers and other media.

COMPLIANCE WITH MOVEMENT RESTRICTIONS

Signage, road blocks and cordons are used to monitor compliance with movement restrictions. Signs are used to communicate information about a national livestock standstill and high-risk control areas, and road blocks are used to enforce boundaries and movement restrictions on risk goods from these areas. They are also used to prevent or re-direct movement into the area, as outward movement from the area may be cumbersome and require cleaning and disinfection as directed in the high-risk control area notice. Checkpoints are used to communicate and enforce movement restrictions on FMD-susceptible animals and their germplasm within the country, and to communicate and enforce restrictions on moving risk goods into, within and out of high-risk control areas. Cordons are used mostly for infected farms to clearly indicate that risk goods cannot enter or leave without following the cleaning and disinfecting protocols stipulated in the restricted place notice. Some movements may be allowed within a control area, but only with a permit.

LIVESTOCK BIOSECURITY PRACTICES

All livestock operations are advised to implement FMD-specific biosecurity plans, and this will continue until freedom from the virus is established. Continued movement of milk is allowed with a permit from premises with no evidence of FMD infection, provided there is adequate FMD-specific biosecurity for the truck and driver as stipulated in each company's risk-organism response plan. For example, a dairy tanker would need to be cleaned and disinfected, and driver biosecurity measures followed, before leaving a farm. This enables the milk to be processed properly while preventing improper disposal that could spread FMD. Movement of products derived from non-susceptible animals (including eggs and egg products) out of high-risk control areas may also be allowed by permit, provided that the premises have no infected FMD-susceptible species. Permit conditions require adequate biosecurity for the truck and driver throughout the outbreak.

ON-FARM BIOSECURITY PRACTICES

On-farm biosecurity will be encouraged, to prevent the inadvertent spread of FMD. Media such as the MPI website, newspapers, radio and television explain how boots, clothing, objects, fomites and hands that have been in contact

with an FMD-infected animal can spread the disease. A warning is also issued that domestic animals that are not cloven-hoofed, including horses, dogs, cats, poultry and wild animals, can also carry FMD on their skin. Wild animals susceptible to FMD should not be allowed in contact with domestic FMD-susceptible species. Farmers should move their animals to the inner paddocks of the farm, to help reduce the likelihood of contact with wild animals, or stock on neighbouring farms. The importance of not allowing them to come in contact with FMD-positive farms is stressed.

SURVEILLANCE AND TRACING

Surveillance is conducted to detect and investigate places at risk of becoming infected with FMD. These places are traced using tools such as Farms Online and NAIT. Backward-and-forward tracing is used to determine the risks from moving susceptible animals and risk goods. This process helps define links between places at risk of spreading the virus.

In addition, farms near to infected premises are inspected over a sufficient period to account for the incubation period of FMD (2–14 days) and the possibility of delayed infection associated with fomites that may not immediately come into contact with susceptible animals.

All risk goods derived from susceptible animals on the infected farm are traced. Then it is the owner's responsibility to dispose of the goods or treat them as directed by MPI to kill any virus that may be present. This applies to all risk goods in the infected area that were produced from susceptible animals, whether they originated in the infected area or on other farms.

STAMPING-OUT OF FMD-SUSCEPTIBLE HOSTS ON INFECTED PREMISES

Stamping-out is New Zealand's chosen response policy for rapid elimination of the FMD virus. This means that all cloven-hoofed livestock on farms where FMD is confirmed must be humanely culled within 24 hours after laboratory confirmation or declaration of a restricted place notice. FMD is a highly contagious virus that can be carried by wind, so both sick and seemingly healthy animals are humanely culled as not all of them will show clinical signs at the same time. Compensation is available to farmers under the Biosecurity Act for losses caused by MPI action to eradicate or manage the disease (MPI, 2014d).

Carcasses must also be disposed of within 24 hours after being culled, using a method that will prevent further spread of the virus, e.g., on-farm burial, mass burial, commercial landfill burial, on-farm pyres and rendering (Anderson, 2002). Decisions on carcass disposal are complicated, and disposal options must be technically and environmentally sound and agreed by all stakeholders and partners. After all carcasses have been disposed of, the property then needs to be thoroughly disinfected, or the virus may survive for weeks or even months in organic material or water.

Stamping-out may also involve interventions such as pre-emptive slaughter or vaccination of herds that have been or will be exposed to FMD. This would not occur within the first three days of a response and will be discussed in a future article.

THE CALL CENTRE IS ACTIVATED

Once a response has been initiated, a call centre is established to provide information and co-ordinate public hotlines and media resources. The call centre can be used by veterinarians to clarify biosecurity measures such as cleaning and disinfecting equipment, clothing and footwear, washing hands and avoiding contact with susceptible animals. These measures would also be available to the general public through the call centre.

VETERINARY EXPERTISE NEEDED

One of the main ways MPI maintains capability and capacity for field operations during a biosecurity response is via the National Biosecurity Capability Network (NBCN). This is a network and inventory of organisations and individuals within New Zealand who are able to provide services during a biosecurity response (Murray, 2011).

If many farms are affected the International Animal Health Emergency Reserves (IAHER) may be activated. This is a multilateral agreement between Australia, Canada, Ireland, the UK and NZ to provide mutual support and assistance during exotic disease outbreaks. IAHER will be used when and if New Zealand's resources and expertise are overwhelmed by the demands of the incursion. An FMD response is very resource-hungry and it is likely that thousands of people will be involved.

EMERGENCY RESPONSE TEAMS ON STANDBY

MPI communicates with other emergency response teams including the NZ Defence Force, police and regional Civil Defence emergency management to partially "stand-up" their operations. These response teams may be called upon to help, depending on the resources required.

CONCLUSION

The three components for a country to be completely ready for an FMD incursion are early disease detection, legislation to support response activities, and a fully operationalised FMD response plan. Early disease detection is supported by the number of vesicular events reported each year through passive surveillance. The Biosecurity Act provides appropriate legislation for MPI to manage an FMD outbreak effectively and quickly, using such tools as surveillance, tracing and movement control. An FMD response plan enables New Zealand to be best prepared and ready to eradicate an FMD incursion.

Currently MPI is working with New Zealand's primary industries, stakeholders and Maori to prepare the FMD response plan. A unified approach is being taken so that we respond as a whole country, with pre-agreed decisions, in order to have a fully operationalised response plan from the day an FMD incursion is first detected. This covers not only how we manage the disease, but how we manage trade and recovery.

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Figure 1: MPI Incursion Investigator John O'Connell examining a Southland sheep for a suspected vesicular disease

INVESTIGATION OF AN UNUSUAL VETERINARY SYNDROME LEADING TO CONFIRMATION OF SPORADIC BOVINE ENCEPHALOMYELITIS (SBE) IN NEW ZEALAND

As part of protecting biosecurity, MPI's Investigation and Diagnostic Centres and Response (IDCR) group is often called upon to rule out exotic infectious animal disease. Big-name exotic diseases such as foot and mouth disease are only part of the work done by MPI's Incursion Investigators and Animal Health Laboratory scientists. A lesser-known role of IDCR is to help establish the presence and clarify the impact of diseases and agents already present in New Zealand. One such example is sporadic bovine encephalomyelitis (SBE), a neurological disease in young calves caused by the bacterium *Chlamydophila pecorum*.

This article summarises the investigation into SBE outbreaks seen in New Zealand during 2013 and 2014 and outlines the diagnostics undertaken by MPI to confirm the disease. These investigations relied heavily upon the veterinarians and veterinary pathologists who provided cases, information and samples to MPI.

SBE is a specific syndrome of cattle, caused by the bacterial agent *Chlamydophila pecorum*. This agent causes disease in multiple species including cattle, sheep and koalas. In adult sheep and cattle *C. pecorum* causes disease including arthritis, metritis and abortion. In koalas, *C. pecorum* is one of the major causes of chlamydiosis, a well-characterised and debilitating infection causing conjunctivitis and genitourinary infection. Sporadic bovine encephalomyelitis (SBE) is a syndrome of young cattle, in which encephalitis is often the primary clinical sign. Reports vary, but young calves aged 1–4 and up to 6 months are typically affected, often in outbreaks of multiple animals. Clinical signs tend to include systemic pyrexia and central nervous system (CNS) signs such as depression and hindlimb ataxia. Post-mortem lesions can include fibrinous pleuritis, pericarditis and peritonitis. The mechanism of disease in SBE is vasculitis resulting from infection and destruction of blood-vessel endothelium.

Chlamydophila spp., including *C. pecorum*, can be found in the gastrointestinal tracts of normal cattle. Up to 50 percent of calves acquire non-pathogenic intestinal infection during the first few months of life (Jee *et al.*, 2004). How *C. pecorum* changes from part of the digestive flora to an agent of disease is not well understood but it seems to occur after bacteria traverse the intestinal mucosa and become blood-borne. At that time, bacteria invade the inner lining of blood vessels (the endothelial cells) and replicate, leading to death of the cell and localised blood-vessel inflammation (vasculitis). *C. pecorum* is an obligate intracellular bacterium, meaning it only grows within animal cells. It cannot be cultured on standard agar-based plates.

C. pecorum was first reported in New Zealand in 2002 (Mackereth & Stanislawek, 2002). The bacterium was isolated from goat kids in the Waikato region, as part of an exotic disease investigation to rule out *Chlamydophila psittaci* (now *C. abortus*), the cause of ovine enzootic abortion. Routine testing is not performed for *C. pecorum* in New Zealand and no further reports of the agent were made subsequent to 2002.

RECOGNITION OF SPORADIC BOVINE ENCEPHALOMYELITIS IN NEW ZEALAND

The first suspect SBE cases in New Zealand were noticed by a Gribbles veterinary pathologist in the South Island in 2011. A further case was seen in 2012 (Bingham, 2012), but it was not until an outbreak of disease in 3-to-5-month-old Manawatu calves in 2013 that the Incursion Investigation Team initiated an investigation into possible SBE. Veterinary pathologists have notified most of the suspect SBE cases to date and provided the impetus behind MPI's investigation into the disease.

2013 OUTBREAK

In 2013 a Manawatu farm was affected by an outbreak of illness in calves. Within one month, 40 of 150 calves became ill, of which 13 died or were euthanased. Autopsy and histopathology showed a polyserositis (inflammation of the membranes lining thoracic and abdominal organs). Histology of the brain showed inflammation centring on blood vessels, with secondary lesions including local tissue damage and haemorrhage.

Culture of initial cases at a commercial laboratory was negative for *Pasteurella* spp. and *Histophilus somni*, two common causes of septicaemia and encephalitis in calves.

An investigation was opened into the cause of this outbreak. The private practitioner and veterinary pathologists from Massey University and NZVP, MPI Incursion Investigators, the MPI veterinary pathologist and MPI AHL scientists worked together to evaluate diagnostic options and collect tissues for testing. Initially formalin-fixed brain from the first animals examined was used and it tested negative. Subsequently, fresh brain from another affected animal was tested by PCR and was positive. It was suspected that formalin fixation might impair PCR sensitivity. It is not usual for practitioners to collect fresh brain, and as a result PCR testing was confined to one sample for 2013. That sample was positive for *C. pecorum* on PCR (**Table 1**), and also contained consistent histological lesions which were positive on IHC (see later).

Owing to the poor sensitivity of the *C. pecorum* PCR on fixed brain, other modalities were explored for confirmatory testing. A common technique used on formalin-fixed

TABLE 1: DIAGNOSTIC TEST RESULTS FOR SUSPECT SPORADIC BOVINE ENCEPHALOMYELITIS CASES

YEAR*	REGION/S	Positive PCR on fresh brain† (number positive/total animals tested)	Positive IHC for *Chlamydophila*§ (number positive/total animals tested)
2011	Southland	n/a	1/1
2012	Canterbury	n/a	1/1
2013	Manawatu Canterbury	1/1 n/a	7/7 0/1
2014	Canterbury	1/3	0/3

*Suspect cases for the years 2011 and 2012 were tested retrospectively following the 2013 outbreak; fresh brain was unavailable.

†Performed by the MPI Animal Health Laboratory. Sequencing of the PCR product showed highest similarity (100 percent) to *Chlamydophila pecorum*.

§Performed by The University of Sydney, using antibodies for *Chlamydophila* spp.

tissue is immunohistochemistry (IHC), which uses specific antibodies to bind agents within tissue. An advantage of IHC is that it can be done on tissue slides, where it is able to show the location of a pathogen relative to visible lesions. IHC testing was performed for *C. pecorum* (at the University of Sydney) and *Histophilus somni* (University of Wyoming). Results for the 2013 Manawatu cases were strongly supportive of SBE, with seven animals testing positive for *Chlamydophila* IHC, while the same animals tested negative for *H. somni*, a possible differential. *Chlamydophila* IHC staining was found adjacent to affected blood vessels, indicating not only infection but the likely cause of the lesions (**Figure 1**). A second 2013 outbreak was reported, this time in Canterbury. Tissues from the only calf submitted were negative for *Chlamydophil*a spp. by IHC, and the cause of that outbreak remains speculative.

2014 OUTBREAKS

The spring of 2014 saw further outbreaks of similar disease, all reported by veterinary pathologists. There were outbreaks on four farms, all in Canterbury. Clinical signs, gross pathology and histopathology showed similar disease to that seen in 2013.

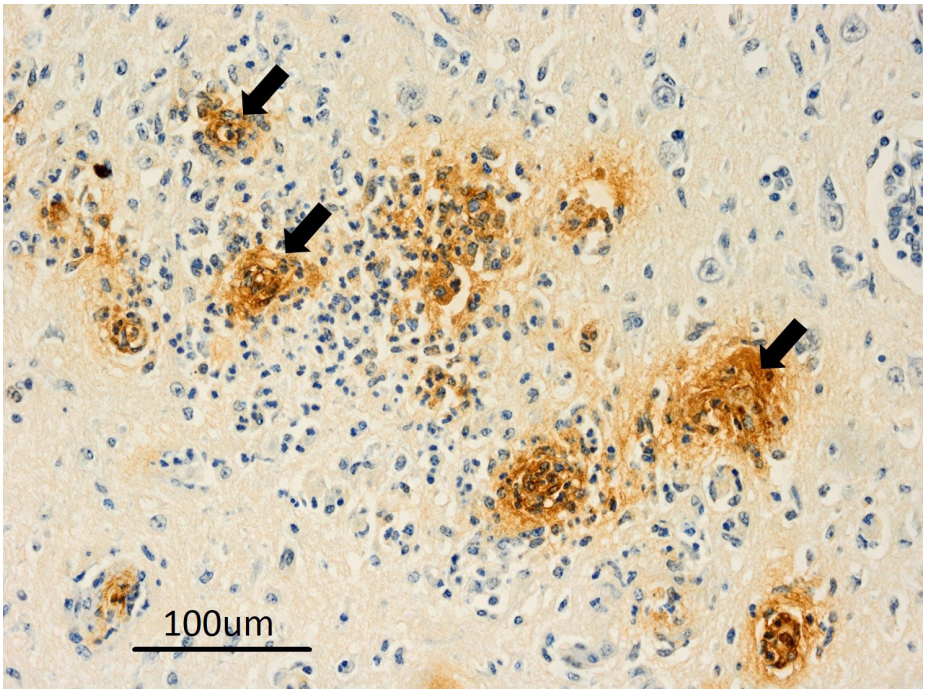

Figure 1: Immunohistochemistry staining (brown-orange) for *Chlamydophila* spp. organisms centring on blood vessels (indicated by arrows) in the brain of an affected calf from the 2011 outbreak. There is increased cellularity within adjacent neuropil. (200x)

Three samples of fresh brain were obtained, one from each of three affected farms. Only one sample was positive on PCR for *C. pecorum*. *Chlamydophila* IHC was negative for the only three cases collected. Although IHC did not support SBE, the presence of similar clinical disease with similar lesions plus a positive PCR was strongly supportive of the disease and these outbreaks were considered to be likely cases of SBE. However, test discrepancies highlight the need for better testing options in the future.

RETROSPECTIVE CASES

Suspect cases from 2011 and 2012 (one case each year) were retrospectively submitted for IHC and both tested positive (see **Table 1**). For the 2012 case, PCR had been performed on formalin-fixed tissues with false negative results (Bingham, 2012). This was thought to be explained by the effect of formalin fixation.

IMPACT OF SBE WITHIN NEW ZEALAND

Since 2013 MPI has received notifications of SBE in dairy calf operations in both the North and South Islands. Outbreaks have been characterised by high morbidity and variable mortality. Early treatment with appropriate antibiotics is reported to be effective and curative. The extent of SBE within New Zealand is not clear, and more work is needed to clarify factors such as its distribution in the dairy and beef sectors, number and extent of outbreaks of disease, whether beef calves are affected and what risk factors exist for clinical outbreaks. Veterinarians and pathologists involved

in these outbreaks have helped to lift the profile of this disease via presentations and articles.

CHALLENGES OF SBE TO THE VETERINARY COMMUNITY

In New Zealand, SBE can be difficult to diagnose because it mimics other better-known diseases such as pasteurellosis and histophilosis (thrombotic meningoencephalitis or TME). Practitioners have not been aware of the disease, resulting in delayed diagnosis and treatment. Diagnostics are further complicated because the agent does not grow on standard culture, and fresh brain is considered to be the optimal tissue for PCR. Results from the presumed outbreaks in 2014 call into question the usefulness of IHC and PCR. More work is needed to determine the optimal diagnostics for SBE, including consideration of serological testing as a method. Regarding treatment, fortunately *C. pecorum* is susceptible to many broad-spectrum antibiotics, with tetracycline the treatment of choice.

FUTURE WORK

Disease investigators at MPI are interested in following up cases of suspected SBE, to help address gaps in knowledge of the disease in NZ. Veterinarians suspecting SBE should collect fresh or frozen brain for histology as well as the usual formalin-fixed samples. Veterinary pathologists suspecting SBE on histopathology should call the MPI exotic pest and disease hotline (0800 80 99 66) to report cases and arrange for further testing.

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QUARTERLY REPORT OF DIAGNOSTIC CASES: JANUARY TO MARCH 2015

GRIBBLES VETERINARY PATHOLOGY

BOVINE

Photosensitivity occurred in January among dairy cows on a Canterbury farm that was feeding turnips. Blood from several affected cows revealed elevated gamma-glutamyl transferase concentrations (529–1092 IU/L; reference range 6–37) and normal to elevated glutamate dehydrogenase (35–697 IU/L; reference range 0–59), indicating bilary and liver damage. Fixed liver received from one cow had lesions of biliary damage as described in cows developing **turnip-induced photosensitivity** (Collett, 2013).

Sections were also received from a calf grazing rape in South Canterbury. This calf had liver and kidney lesions similar to those seen in cows in Southland grazing swedes.

A 3-kg mass was present in the neck of a two-year-old crossbred dairy heifer on a North Canterbury farm. The animal was euthanased by the farmer and a sample of the mass was taken. Histologically it was composed of neoplastic lymphocytes and this was a typical case of **sporadic bovine lymphoma**.

Cases of **polioencephalomalacia** were seen in dairy calves in Canterbury during the typical period from late November to February. Most cases were suspected (based on the clinical signs) but some presented as sudden deaths. In many cases the areas of cortical necrosis fluoresced under UV light but in several acute cases fluorescence was absent.

On a Southland dairy farm, 14 five-month-old calves from a mob of 150 died over a three-week period. Two were found recumbent and dying. One was necropsied and large amount of fibrin was found filling the pleural cavity. A heavy growth of ***Pasteurella multocida*** was isolated from this fluid.

The dermatophyte ***Trichophyton verrucosum*** was isolated from scaly fungal-type skin lesions in an outbreak of ringworm in Angus cattle on a Southland beef farm. There were two mobs affected. In a mob of 275 adult breeding cows with calves at foot, only the calves were affected. In the other mob, of 95 heifers, 10 percent were affected.

A mob of 89 two-year-old bulls on an Otago beef farm were placed on an undeveloped grazing block with minimal feed. A week later they were checked and 29 were found dead, with a further nine showing nervous signs of blindness, circling, aggression, ataxia, foaming at the mouth and regurgitation. Necropsy of some of the dead animals revealed no obvious gross lesions but their rumens contained leaves that resembled **tutu (*Coriaria arborea*),** a highly toxic native shrub. Further examination of the paddock revealed a number of recently grazed tutu bushes.

A six-year-old Friesian dairy cow from the Waikato developed aggressive behaviour. It charged the farmer and other cows in the paddock before dying a few hours later. The brain was removed and examined under the transmissible spongiform encephalopathy scheme. There was extensive microcavitation at the grey/white matter interface and Alzheimer type II astrocytosis was present, consistent with a **hepatic encephalopathy**.

A seven-month-old Friesian heifer from a central North Island dairy farm developed dysentery, depression, blindness and anaemia. Examination of faeces found numerous coccidial oocysts consistent with a diagnosis of **coccidiosis.** Coccidial infections have been previously associated with central nervous system symptoms in cattle (Hill & Ebbett, 2000).

A single mixed-breed yearling dairy heifer on a Taranaki farm was examined because of recumbency and extensor rigidity. On physical examination the heifer was also found to have hypopyon and nystagmus. The heifer was thin and smaller than the others in the mob. A bovine viral diarrhoea virus (BVDV) antigen ELISA test had a high positive result, indicating persistent infection with **BVDV and mucosal disease**.

In a similar case on a Rangitikei lifestyle block, a two-year-old heifer grazing with three others was noticeably smaller than the others and had developed diarrhoea. A high positive result by BVDV antigen ELISA confirmed persistent BVDV infection.

Poor reproductive performance was investigated in a mixed-age beef cow herd in Hawke's Bay. The sample to positive (S/P) ratio measured on a pooled sample of 12 sera from the cows by the BVDV antibody ELISA was 1.97 (Hill *et al.*, 2010), indicating exposure of these cows to BVD virus. By comparison, the S/P ratio of a pooled sample from the heifer mob was 0.08, indicating there had been no exposure to BVDV in this age-group. Further sampling would be required in the mixed-age cow herd to determine the likelihood of current BVDV infection, compared to historical infection.

A pregnant yearling Jersey heifer on a Taranaki dairy farm was examined after exhibiting central nervous system signs for the previous two days. She had marked opisthotonus and was therefore euthanased. Another heifer had died recently after displaying signs of neurological disease. Histopathology of the brain from the killed heifer revealed moderate lymphoplasmacytic vasculitis consistent with **ovine herpes virus-2** infection and **malignant catarrhal fever**.

A two-year-old Friesian/Jersey cross heifer in Taranaki was noticed to be irritable and kicking her abdomen. She had swollen skin in the white areas and also on the teats. A serum sample revealed an increased gamma-glutamyl transferase concentration of 2882 IU/L (reference range 6–37) and glutamate dehydrogenase concentration of 656 IU/L (reference range 0–59), consistent with severe biliary damage and moderate liver damage. These changes suggested exposure to **sporidesmin** toxin from the pasture fungus *Pithomyces chartarum,* consistent with the disease known as **facial eczema**.

A number of tumours were diagnosed in cattle from Taranaki during early 2015. A four-month-old Angus heifer on a

Taranaki farm developed marked ascites and dyspnoea. It was reportedly the fourth affected animal on the property in six months, the others being two adult bulls and a yearling heifer. Post-mortem examination revealed 100 litres of clear fluid in the abdomen, accompanied by fibrin coating many organs and fine nodules throughout the intestinal serosa and mesentery. Histology revealed neoplastic epithelial cells in glandular structures and nests, confirming a diagnosis of **intestinal adenocarcinoma.**

On another Taranaki farm, a year-old Friesian dairy heifer developed a 10-cm-diameter mass on the side of the face. Black fluid was aspirated. Biopsy revealed sheets and nests of heavily pigmented melanocytes consistent with **melanocytoma.** These are uncommon but reasonably well recognised tumours of young cattle that may be congenital in some cases. They can grow very large but are generally benign (Millar *et al*., 1995).

A **granulosa cell tumour** was diagnosed in a two-year-old Friesian heifer on a Taranaki dairy farm. The heifer reportedly had a thick neck and had been bellowing like a bull. A baseball-sized mass replaced one of the ovaries. Histology revealed a neoplasm composed of cells in nests, glandular and cystic arrangements supported by bands of dense fibrous stroma. The cells often palisaded along the stroma and formed occasional rosette-like structures with central secretory material (Call-Exner bodies). Granulosa cell tumours are the most common ovarian tumours of cows. Most are unilateral and non-malignant, but many produce various combinations of hormones including inhibin, progesterone, oestrogen and testosterone, resulting in clinical signs that may include nymphomania, masculinisation and anoestrus. The clinical history in this case indicates likely testosterone production.

An adult Friesian cow presented for slaughter at a Taranaki meatworks was found to have 30 white cystic lesions up to 5 cm in diameter scattered throughout the peritoneum. Histology was requested on some of the lesions to rule out cestode involvement. Histology revealed cystic structures lined by neoplastic epithelium consistent with a **cystadenocarcinoma.** The primary neoplasm was not identified but ovarian and biliary origins were considered possible differentials.

Another adult dairy cow at a Taranaki meatworks was found to have several cream-coloured nodular masses up to 15 mm diameter in the heart, oesophagus and intercostal muscles. The lesions were suspected to be *Cysticercus bovis* cysts so they were collected for histology. Microscopically the mass consisted of intersecting fascicles and whorls of mesenchymal cells supported by a delicate fibrovascular stroma. Cells were embedded in pale eosinophilic fibrillar matrix. A diagnosis of **neurofibromatosis** (multiple peripheral nerve sheath tumours) was made.

Five mixed-age Friesian cows that were due to calve on a Rangitikei dairy farm during autumn 2015 aborted over a period of three weeks. They were being fed pasture and silage and were otherwise in good condition. Abortions occurred during the second and third trimesters. Culture of foetal abomasal contents from one animal produced a growth of *Aspergillus* spp. Histological examination revealed inflammatory and necrotising lesions in the lung and liver, but no placenta was available for examination. A diagnosis of **mycotic abortion** was considered most likely, the probable source being the silage.

A 600-cow dairy herd in north Waikato was being fed liquid whey after each milking. Over a period of one week, three died and 18 more were noted to be ataxic and recumbent. Samples from two recumbent cows revealed ethanol concentrations of 51 and 72 mmol/L, confirming **ethanol toxicity**. Rapid development of clinical signs after drinking whey meant this was the likely source of the ethanol. A sample of whey was tested and found to have an ethanol concentration of 6 percent. It was not determined whether the ethanol was present in the whey tank at delivery or had formed by fermentation in the tank as a result of hot summer weather.

A four-year-old Friesian cow from Northland was scouring, with weight loss and anaemia. A Johne's serum antibody ELISA test was positive, consistent with **Johne's disease**.

A six-month-old Friesian calf from Northland was losing weight and scouring. Serum GGT was normal (11 IU/L) as was serum copper (15 umol/L; normal range 7.5–20) and a faecal culture did not yield *Yersinia* or *Salmonella* spp. **Coccidiosis** was diagnosed by the high to extremely high numbers of oocysts in a faecal egg count.

Coccidiosis was also identified in two seven-month-old Friesian calves from Northland, which were ill-thrifty, scouring with blood and rough-coated. These had moderate to heavy numbers of oocysts on a faecal egg count.

OVINE

In a mob of 200 seven-month-old crossbreds on a North Canterbury farm, two hoggets had died and one was depressed. There were no gross lesions in one animal examined but histologically the brain had widespread lesions of protein-rich perivascular oedema, typical of the lesions of **enterotoxemia** produced by the epsilon toxin of ***Clostridium perfringens* type D**.

There was a large outbreak of **coccidiosis** in a mob of 300 three-month-old lambs on a Southland sheep-milking farm. More than 50 lambs were very unthrifty with diarrhoea and at least 10 had died. Very high numbers of coccidia were found in fixed sections of the ileum of one lamb and there were high numbers of oocysts in its faeces.

***Salmonella* Hindmarsh** was isolated from dead ewes on sheep farms in Otago and Southland. It was isolated from the intestinal contents of mature ewes dying in 12 separate outbreaks. Lambs and young ewes were not affected. Reports from veterinarians suggested that there were more outbreaks where affected ewes were not tested, and the diagnosis was made on clinical and necropsy findings only. On one farm 20 ewes were found dead in one mob over a two-day period.

A severe haemorrhagic enteropathy was found on necropsy of shed-reared lambs from a Southland sheep-milking farm. The affected lambs were found dead within seven hours after being placed on pasture. Five lambs were necropsied and similar lesions of haemorrhage into the intestine and colon were seen, often with external evidence of dysentery. Gastrointestinal torsion (red gut) was ruled out at necropsy. Aerobic bacterial cultures were negative and intestinal sections showed no inflammatory changes. The cause was thought to be the epsilon toxin of **Clostridium perfringens Type D** (pulpy kidney) as these lambs had only been given one inoculation of a clostridia vaccine.

Broken legs were being found in four-month-old lambs on a Rangitikei hill-country property and copper deficiency was suspected. Liver samples were collected from four lambs and revealed liver copper concentrations of 44, 51, 60 and 71 µmol/kg (adequate > 95 µmol/kg), confirming **copper deficiency** as the cause of bone fragility.

In Hawke's Bay, about 50 lambs had died from a mob of 500 being grazed on a brassica crop over a two-week period. Serum samples collected from two affected live lambs revealed elevated creatinine phosphokinase concentrations of 28 440 and 61 746 IU/L (reference range 132–1513) and elevated aspartate transferase concentrations of 1298 and 4262 IU/L (reference range 64–225), indicating significant subacute muscle damage. Staggerweed (*Stachys arvensis*) ingestion has been shown to be a cause of myonecrosis in lambs grazing crops (Vaatstra *et al*., 2014) and dense clusters of this plant were found around the perimeter of the brassica crop, confirming **staggerweed-induced myonecrosis**. Lambs often eat weeds and grasses around the periphery of a crop before they will sample the crop itself.

Five lambs died and two developed diarrhoea and recumbency in a flock of 612 being fed grain and straw stubble in the Wairarapa. Serum samples collected from a live lamb showed evidence of elevated fibrinogen at 19 g/L (normal < 6), indicating acute inflammation, as well as decreased bicarbonate at 10 mmol/L (normal 26–34). These findings of indicated acidosis and inflammation suggested that grain overload (**ruminal acidosis**) was the cause of the deaths.

Four mixed-age ewes were found dead near a dam on a Wairarapa sheep farm. Post-mortem examination revealed intense reddening of the abomasum and small intestine. ***Salmonella* Hindmarsh** was cultured from intestinal contents, confirming a diagnosis of **salmonellosis**.

A firm lesion was palpated in the epididymis of a ram on a Taranaki sheep farm at the annual ram check. A complement fixation test for *Brucella ovis* on a serum sample from this ram was positive, confirming **ovine brucellosis**. *B. ovis* ELISA tests on the remaining 10 flockmates found two further serologically positive rams.

Numerous cases of lamb **pneumonia** were reported during summer and autumn 2015. One outbreak occurred in six-month-old Romney ewe lamb replacements on a Hawke's Bay sheep farm. Of 1200 lambs, about 300 developed clinical signs including lethargy, cough and pyrexia. Six affected lambs died. At post-mortem there was extensive dark red consolidation of the cranioventral lung lobes. Histological examination confirmed severe chronic-active regionally extensive suppurative and lymphohistiocytic bronchopneumonia with bronchial hyperplasia and type II pneumocyte hyperplasia.

A Manawatu sheep farmer reported the sudden deaths of 10–20 Suffolk cross lambs over a one-week period in the summer. The lambs had been drenched about three weeks before grazing a crop but had not been vaccinated for clostridial diseases. Post-mortem examination of a recently dead lamb revealed only mild reddening of the distal small intestine. Microscopic examination of the brain revealed capillaries and venules in the subcortical white matter, surrounded by lakes of homogeneous eosinophilic material (protein-rich oedema). Endothelial cells of affected blood vessels had swollen, vesicular nuclei. These changes are pathognomonic for **enterotoxaemia** caused by ***Clostridium perfringens* type D** epsilon toxin.

CAPRINE

A North Waikato dairy goat operation with 1000 at-risk animals was losing about five mixed-age does per week. Deaths occurred in a group that might not have received 5-in-1 clostridial vaccination. Clinical signs included weight loss, milk drop, fever, diarrhoea and sudden death. Some animals had severe abdominal pain and were euthanased. Four does had few post-mortem findings apart from abomasal or intestinal reddening and an enlarged mesenteric lymph node. One had cranioventral lung consolidation and caudodorsal lung abscesses; another looked pale. Histopathology on various tissues showed varying examples of pulmonary haemorrhage and oedema, neutrophilic and eosinophilic pneumonia (sometimes associated with *Muellerius capillaris*) and interstitial pneumonia. Other investigations (faecal culture for *Yersinia*, *Salmonella*, *Campylobacter*; faecal egg counts; serum copper and selenium) did not yield a definitive diagnosis, and a final diagnosis of **enterotoxaemia** was suggested. This is very difficult to diagnose definitively in goats, which typically lack the classical histological lesion of focal symmetrical encephalomalacia. Goats can have peracute, acute, chronic or subclinical enterotoxaemia, with signs ranging from sudden death to diarrhoea, abdominal discomfort and chronic weight loss.

Haemonchosis was suspected in two Saanen goats from the Bay of Plenty. They were anaemic with reduced haemoglobin (42 and 62 g/L; reference range 80–140), along with low haematocrits (0.11 and 0.17 L/L; reference range 0.2–0.4), slight microcytosis (mean cellular volume 13 and 14 fL; reference range 15–30) and increased mean cellular haemoglobin concentration (370 and 375 g/L; reference range 300–340). Faecal egg counts revealed 550 and 650 strongyle eggs per gram.

CANINE

A four-month-old Newfoundland puppy from the Waikato developed diarrhoea while being fed a raw-food-only diet. Culture of a faecal sample isolated a pure growth of ***Campylobacter jejuni***, consistent with **campylobacteriosis.**

A farm in central Hawke's Bay reported a three-month history of sudden weight loss and death in working dog puppies aged six to 12 weeks. A total of 30–40 working dogs were kept on the farm, with two to three bitches in pup at any one time. Vaccination history was variable, with some pups vaccinated against parvovirus at six weeks and others not receiving the first dose until 12 weeks. Two pups presented for veterinary attention with anorexia and lethargy, and recovered after treatment with intravenous fluids, antibiotics and supportive care. Two weeks later, two pups from another litter developed anorexia and dehydration and both died within 24 hours. A parvovirus antigen snap test was conducted on intestinal contents from one pup but was negative. Post-mortem findings included a finely granular texture to the intestinal serosa, with tan, friable mucosa and fetid, reddish-brown liquid contents. Histopathology confirmed a diagnosis of **parvoviral enteritis,** characterised

by severe necrotising enteritis, eschar formation, crypt necrosis and occasional crypt regeneration.

An 18-month-old Retriever dog from Auckland had a nine-month history of intermittent mucoid and sometimes bloody diarrhoea. Fever had also been recorded. A faecal egg count did not reveal any parasites and ELISA for *Cryptosporidium* antigen was negative but a *Giardia* antigen test was positive, suggesting a diagnosis of **giardiasis**.

CERVINE

Two out a mob of 32 two-month-old fawns on a Southland deer farm were found dead within a day of being shifted with their mothers into an adjacent paddock. Necropsy of both fawns showed no gross lesions. Faecal cultures and parasitology were negative and histological examination of a range of tissues including brain was unremarkable. Sections of the myocardium showed large areas of replacement fibrosis of the muscle fibres and swelling and granulation of the surrounding intact myocytes but no inflammatory changes. Fixed skeletal muscle was not provided. Liver selenium concentration was very low, at 220 nmol/kg. Although there is no published reference range for selenium in deer, white muscle disease has been identified in fawns with liver selenium of 240–590 nmol/kg. A **selenium responsive cardiomyopathy** was the most likely cause of death of these fawns. The remaining fawns were given supplemental selenium and no more deaths occurred.

On a Southland deer farm, five out of a mob of 80 unweaned four-to-eight-week-old wapiti fawns were found dead over a three-week period. Affected fawns first appeared dull and lethargic, then were found dead one to three days later. A necropsy of an affected fawn revealed that both kidneys were swollen and pale. This fawn was well grown but in very poor condition. There were no other gross lesions. Sections of the fixed kidney showed a severe **nephrosis**. A blood sample taken from this animal before death showed a severe azotaemia (creatinine 645 µmol/L; reference range 46–96, and urea 81 nmol/L; reference range 5.4–9.4) confirming either renal failure or severe dehydration. Toxic plant material such as oak leaves or acorns could have been the cause of the kidney damage but a search of the paddock found no possible toxic plants. After the deaths started, all fawns had been heavily drenched with both an oral and injectable anthelmintic, which may have exacerbated the problem and contributed to further deaths.

EQUINE

A seven-year-old riding horse exhibited a cough and slightly enlarged lymph nodes around the head. It appeared otherwise normal apart from a lump in the ventral neck, which from its location was probably an enlarged thyroid. A blood sample was taken and thyroxine (T4) was elevated at 96 nmol/L (reference range 10–20) and the serum iodine concentration was 27 ug/L (no normal range available). At a second blood sampling two weeks later, thyroxine was still above the reference range, at 47 nmol/L, suggesting a probable diagnosis of **hyperthyroidism** as the result of a thyroid tumour. The owner reported that this horse exhibited altered behaviour and exercise intolerance.

An adult horse from the Auckland region had a yellow nasal discharge, slightly increased temperature and a painful enlarged submandibular lymph node. It was treated with penicillin for two days but then found dead the next day. Culture of a nasal swab revealed scant growth of mixed organisms. Histopathology on a sample of lymph node showed a homogeneous population of round cells with scant eosinophilic cytoplasm and pleomorphic nuclei, consistent with a diagnosis of **lymphoma**.

LAGOMORPH

Several reports of sudden deaths in rabbits from the lower North Island were received during summer and autumn 2015. In one case, at least eight rabbits ranging from eight to 10 weeks of age were found dead over a period of days. The rabbits lived in a research colony that was normally isolated from the outside environment but was undergoing building work at the time of the outbreak. One of the dead rabbits was submitted for gross and histopathological examination. Necropsy findings included oedematous and congested lungs, mild diarrhoea staining the perineum, and a slightly enlarged liver with rounded margins. Histology revealed widespread hepatic necrosis, dissociation, and degeneration and fibrin thrombi within blood vessels of the renal glomeruli, lung and liver. These findings are characteristic of **rabbit haemorrhagic disease,** caused by a highly contagious and rapidly fatal **calicivirus**.

POULTRY

A mite infestation had spread from the henhouse into the surrounding garden of a Wairarapa property. Several mites were identified as ***Dermanyssus gallinae,*** also known as chicken mite or red mite. These mites can affect poultry and cage birds and require thorough miticide treatment of birds, cage and surroundings. The mites feed nocturnally on the affected birds and hide in the environment through the day.

NEW ZEALAND VETERINARY PATHOLOGY

BOVINE

A group of six-month-old calves in the western Bay of Plenty had a history of sudden weight loss and diarrhoea. Ferroxidase, pepsinogen, serum selenium and GGT were all within normal limits. Moderate numbers of coccidial oocysts were visible on faecal egg count. Culture of faeces for *Yersinia pseudotuberculosis* was positive. **Yersiniosis** complicated by **coccidiosis** was diagnosed.

Five cows in the Rangitikei district exhibited evidence of mild photosensitivity on clinical examination. The cows were being fed palm kernel extract, chicory and rape. All animals tested had markedly elevated gamma-glutamyl transferase (> 1000 IU/L; reference range 0–36). One animal that was more extensively studied also had high glutamate dehydrogenase (488 IU/L; reference range 8–41) and bilirubin (57 umol/L; reference range 0–13). **Hepatopathy** with photosensitivity was diagnosed and ascribed to the feeding of rape (*Brassica napus*). Rape and other brassicas such as turnips (*B. rapa*) contain hepatotoxic glucosinolate compounds.

A yearling calf in a mob of 60 animals in the Waikato had a history of weight loss with depression. No ticks had been seen recently on the property. The calf was pale on clinical examination. The PCV and haemoglobin were within normal limits and *Theileria* spp. were not detected on examination of a submitted blood smear. However, PCR for ***Theleria orientalis* ssp. Ikeda** was positive.

A weaner calf in the western Bay of Plenty was found down and very pale. The rest of the mob appeared clinically well. Haematologic testing revealed a high white blood cell count (25.2 x 10^9/L; reference range 6.3–14.4 x 10^9) with a non-regenerative anaemia. Large blast lymphocytes were visible in the peripheral blood smear, consistent with **sporadic bovine leukosis/lymphoma**.

Nine cows from a mob in the Waikato aborted. All were *Neospora* ELISA test positive. **Neosporosis** was diagnosed.

A one-year-old heifer in South Waikato had pale pink fleshy growths at the lateral limbus of both eyes, near to the margin of the sclera and cornea. Histology on the growth showed chronic suppurative inflammation with moderate dysplasia of conjunctival epithelium. Bacilli consistent with ***Moraxella bovis*** were observed in conjunction with the inflammation.

A two-year-old Friesian cow in the Waikato was pale and had an increased heart rate and diarrhoea. There was a marked anaemia but no evidence of *Theileria* visible on the blood smear. Gamma-glutamyl transferase and glutamate dehydrogenase levels were within normal limits but serum zinc was 160 µmol/L (reference range 11–20; therapeutic range for facial eczema up to 35). **Zinc toxicity** likely caused both the haemolytic anemia and the diarrhoea.

A 10-year-old mare in South Auckland had a pedunculated nasal mass in the right nostril, attached to the nasal septum. Histology revealed that the mass was composed of myxomatous tissue containing numerous neutrophils and lower numbers of eosinophils and macrophages. An **inflammatory polyp** was diagnosed.

A two-year-old cow in the Waikato had numerous lumps over the skin and in the abdominal cavity. The cow had a temperature of 40.5°C and there was a marked drop in milk production. Histology revealed that one of the skin masses was composed of neoplastic round cells, consistent with **sporadic bovine lymphoma**.

A 10-year-old cow in the Hauraki district had haemoglobinuria accompanied by diarrhoea. The cow had elevated gamma-glutamyl transferase (687 IU/L; reference range 0–36), and a marked increase in serum zinc (260 µmol/L; therapeutic range up to 35). **Zinc toxicity** was diagnosed.

Six out of 200 autumn-calving dairy cows in the northern Waikato developed fever and diarrhoea over a two-day period. Faeces from four animals were cultured and revealed ***Salmonella* Bovismorbificans**. The total outbreak has involved about 25 cases to date and about four animals have been culled owing to severe disease. The whole herd has been vaccinated twice with a vaccine that includes *Salmonella* Bovismorbificans, and the infection rate has dropped, although occasional sick animals are still observed.

Three cows in a mob of 320 had severe hosepipe diarrhoea. They were on a Waikato dairy farm with a history of Johne's disease. One animal also had marked submandibular oedema. All three were positive on Johne's ELISA testing, consistent with **Johne's disease**.

A herd of adult cows in the Hauraki region were known to have been overdosed with zinc via a supplement that was intended to control facial eczema. Serum zinc assays were performed on eight animals and ranged from 34 to 250 umol/L. Prophylactic zinc administration in anticipation of sporodesmin exposure typically results in serum zinc concentrations around 20–35 umol/L. Higher levels, as seen in this case, are therefore consistent with **zinc toxicity**.

A group of six-month-old calves in the Waikato region had loose faeces and had a history of access to acorns. Blood chemistry on two of the affected animals revealed severe uremia accompanied by acidosis, hypocalcaemia and a mild hepatopathy. **Acorn toxicity** was diagnosed.

A group of R1 calves in Christchurch had ill thrift and were known to be selenium deficient. They had not responded to a drench and selenium supplementation two weeks prior to sampling. Culture of the faeces revealed *Yersinia pseudotuberculosis*. **Yersiniosis** was diagnosed.

Nine animals in a dairy herd were down one morning in Waitaki. The animals had not eaten the previous night because effluent had been placed on the pasture break. Magnesium oxide and lime flour supplementation had also ceased 48 hours prior. All of the cows tested had a severe hypocalcemia, with serum calcium levels ranging from 1.03 to 1.39 umol/L (reference range 2.00–2.60 umol/L). **Hypocalcemia** was diagnosed.

OVINE

A group of lambs from Northland were found to have dark patches grossly visible on the rumen wall at slaughter. There were no prior clinical signs. Histologic examination of the rumen wall revealed the presence of a **multifocal suppurative and necrotising rumenitis**. The underlying cause was not identified, but a chemical rumenitis secondary to ruminal acidosis was considered most likely.

EQUINE

Punch biopsies were submitted from a 25-year-old gelding with severe disseminated skin disease. Histologic examination of skin biopsies revealed extensive infiltration of the dermis by histiocytic cells, lymphocytes and multinucleate giant cells. **Equine sarcoidosis** was diagnosed. The horse was euthanased several weeks later and at necropsy had a severe generalised dermatitis affecting most of the body, with scaling, crusting and alopecia. Histologic examination of tissues revealed disseminated granulomas in the liver, lung, pulmonary lymph nodes and skin. There was also a mild membranous glomerulopathy. Equine sarcoidosis has not been previously recorded in New Zealand (Sloet van Oldruitenborgh-Oosterbaan & Grinwis, 2012).

A two-year-old Thoroughbred horse in the Waikato had a history of recurrent colic with hypoalbuminaemia and weight loss. An exploratory laparotomy was performed. There was generalised thickening of the distal half of the small intestine, with multiple focal serosal plaques visible. Histology of the affected small intestine revealed a severe ulcerative enteritis with fibrin microthrombi visible in the mucosal capillaries, a histological finding suggestive of **salmonellosis**. *Salmonella* cultures on this animal were negative.

A 10-year-old mare in South Auckland had a pedunculated nasal mass in the right nostril, attached to the nasal septum. Histology revealed that the mass was composed of myxomatous tissue containing numerous neutrophils and lower numbers of eosinophils

and macrophages. An **inflammatory polyp** was diagnosed.

LLAMOID

An alpaca in Northland died suddenly. One forelimb was covered in maggots and the animal had a marked abdominal, thoracic and pericardial effusion. Faecal egg count revealed 33825 strongyle eggs per gram of faeces. Larval culture showed that 97 percent of these eggs were *Haemonchus* sp. Histology revealed an acute periacinar hepatic necrosis, suggesting hypoxia caused by severe anemia. There was also a mild pyelonephritis present. Severe **haemonchosis** with marked hypoproteinemia and anaemia was diagnosed.

A 10-year-old castrated male alpaca in the Waikato died after being seen down and inappetant for 24 hours. Histologic examination revealed an acute periacinar necrosis in the liver, likely reflecting perimortem hypoxaemia. In addition there was a population of atypical epithelioid cells infiltrating the liver, extending from the portal tract out through the sinusoids. These cells had a high mitotic rate and exhibited marked nuclear atypia, with numerous giant cells present. Scattered aggregates of atypical cells were also visible in pulmonary blood vessels. The lesions were considered to be consistent with the presence of **metastatic carcinoma**, but a primary tumour was not located.

PORCINE

Two four-day-old piglets from Canterbury were submitted for necropsy, with a history of scour and sudden death. Necropsy revealed an acute enteritis, with a reddened small intestine and fluid intestinal content. ***Escherichia coli* K88** was isolated from the gut contents. Antigen testing for rotavirus was negative. Anaerobic culture of gut content revealed the presence of *Clostridium perfringens*, which can be a normal commensal. **Enteritis** caused by **enterotoxigenic *E. coli*** was diagnosed.

CAPRINE

A group of 30 six-month-old goats in the Horowhenua region had two sudden deaths after a spell of wet and windy weather. Necropsy revealed a severe fibrinous bronchopneumonia and pleuritis, which was confirmed on histologic examination. Culture of the lung revealed a heavy growth of ***Mannheimia haemolytica***.

REPTILE/AMPHIBIAN

A rare native Archey's froglet (*Leiopelma archeyi*) in an Auckland breeding facility was found dead. Histologic examination revealed the presence of hepatic steatosis. Renal tubules contained scattered luminal myxozoa, but these parasites were not associated with any inflammatory lesions. **Myxosporidia** are observed in other frog species in North America and Europe, and are not associated with clinical disease.

A hawksbill turtle (*Eretmochelys imbricata*), a critically endangered turtle in an Auckland zoological collection, was losing weight rapidly (1 kg over two to three weeks). The turtle was bright and alert. Biochemistry and haematologic parameters appeared within normal limits. Low numbers of **spirorchid trematode** eggs (40 per gram) were noted in faeces. Spirorchid trematodes are also referred to as "blood flukes". They are common in wild sea turtles, where they live in the circulatory system, and are associated with mortality in wild green sea turtles (*Chelonia mydas*) (Gordon *et al.*, 1998).

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QUARTERLY REPORT OF INVESTIGATIONS OF SUSPECTED EXOTIC DISEASES

Exotic disease investigations are managed and reported by MPI Investigation and Diagnostic Centre and Response (IDCR), Wallaceville. The following is a summary of investigations of suspected exotic disease during the period from January to March 2015.

EXOTIC VESICULAR DISEASES RULED OUT

A veterinarian called the MPI exotic pest and disease hotline after reviewing photographs that a client had sent him of adult sheep with swelling and dark crusting affecting the lips and muzzle area. Under the instruction of an MPI Incursion Investigator, the veterinarian visited the property, inspected the flock and clinically examined all affected sheep. Nine ewes from the mob of about 30 mixed-aged ewes showed variable swelling, erythema and crusting of the nasal planum and lip area. There were no buccal or tongue lesions and the feet, udders and vulva were unaffected. Hyperaemia of the buccal and vulval mucous membranes was evident in the worst-affected animals, accompanied by pyrexia (39.8–40.8°C). Exotic vesicular diseases were excluded on clinical and epidemiological grounds. Biopsies, lesion scrapings and serum samples were collected to help establish an endemic diagnosis. Histopathology identified subacute proliferative dermatitis consistent with ovine parapox virus ("orf", "scabby mouth"). Although the histological findings are not pathognomonic for orf, no other probable aetiologies were evident in the biopsy sections. A generic poxvirus molecular assay carried out on lesion scrapings was positive, with sequence analysis identifying the greatest homology to ovine parapox virus. The severe presentation of this condition in the flock was consistent with the introduction a few months earlier of four sheep into a previously closed flock that was not vaccinated against orf. Exotic disease was excluded and the investigation was stood down.

A veterinarian called MPI's exotic pest and disease hotline after examining a dry cow with granulomatous swellings occluding the nostrils, small (5 mm) ulcerations on the hard palate and firm, swollen submandibular lymph nodes. The cow was mouth-breathing and coughing but was not pyrexic (38.9°C) and the remainder of the mouth and tongue were clinically normal, as were the feet, udder and vulva. The cow had received a single antibiotic treatment for suspected woody tongue (actinobacillosis) four months earlier. The other 80 heifers and dry cows in the mob were healthy. The veterinarian submitted photographs of the lesions and the Incursion Investigator was able to exclude exotic vesicular disease on clinical and epidemiological grounds. An endemic diagnosis was pursued because the presentation had implications for exotic disease differential diagnoses. Serum was collected before the cow was processed for pet food. The head was submitted for postmortem at New Zealand Veterinary Pathology, where samples were collected for histology. An antigen ELISA test for bovine viral diarrhoea and a molecular assay for malignant catarrhal fever were both negative. Postmortem identified multiple granulomas, some with small white to pale yellow centres, affecting the palatine tonsils, surface of the turbinates and along the lymphatic chain from the commissure of the lips to the submandibular lymph nodes, typical of actinobacillosis. Histology confirmed multifocal granulomatous inflammation and fibrosis, which is consistent with actinobacillosis. Cutaneous actinobacillosis, including presentation on the nares, is seen infrequently. Exotic disease was excluded and the investigation was stood down.

SPORADIC BOVINE ENCEPHALOMYELITIS INVESTIGATED

A veterinary pathologist called MPI's exotic pest and disease hotline to report two dairy farms, in Methven and Ashburton, with high numbers of young calves showing neurological signs suspected to be sporadic bovine encephalomyelitis (SBE). Histopathology on samples from both farms revealed vasculocentric inflammatory lesions in the brain, typical of those seen in previous SBE cases. This is a clinical syndrome that develops when calves are infected with the bacterium *Chlamydophila pecorum*, and reports have been on the rise during the last two years. Fresh brain was obtained from one affected calf on each farm and tested for *C. pecorum* by PCR. The sample from Methven was positive and the sample from Ashburton was negative. Immunohistochemistry (IHC) on the brain samples for *Chlamydophila* was negative for both farms. Together with the positive PCR result, the clinical signs and histopathology, these cases are thought to be consistent with SBE. The usefulness of IHC and PCR as diagnostic tests is still unclear. In a previous investigation, cases from earlier years were strongly positive for IHC, but the present investigation is only the second time the technique has been used in New Zealand on suspected SBE cases. More work is needed to develop more robust testing protocols for *C. pecorum*, which cannot be cultured on standard plates, and for which PCR and IHC appear inconsistent (Buckle & Ha, 2015).

EXOTIC LEPTOSPIROSIS SEROVARS EXCLUDED

An MPI scientist notified the Incursion Investigation team after serum tests required for export of bovine semen returned low positive titres for *Leptospira canicola* in two bulls. The bulls had no history of travel outside of New Zealand and had been vaccinated frequently for leptospirosis. The microscopic agglutination test gave a low positive titre (2:50) for *L.* Canicola in both bulls. A repeat serum was collected from each bull and tested, along with the initial sample, for several other *Leptospira* serovars, including *L.* Canicola. Titres

were detected against *L.* Pomona (1:100), *L.* Copenhageni (1:50) and *L.* Hardjo (1:200). This pattern was consistent with high-intensity vaccination against *Leptospira* serovars Hardjo, Pomona and Copenhageni. Exotic disease was ruled out, and the investigation was stood down.

UNUSUAL COCCIDIA IN DEER CONFIRMED

An NZVP veterinary pathologist called the MPI exotic pest and disease hotline to report an unusual presentation of coccidial enteritis in one of 80 farmed deer from North Otago. The crossbred hind had a history of ill-thrift and there was histological evidence of coccidial enteritis and abomasal ostertagiasis. Unusually, the coccidial stages were mostly present in the nuclei of affected enterocytes, rather than in the cytoplasm. Electron microscopy confirmed that an intranuclear apicomplexan was present, with visible stages including macrogamonts, microgametes and merozoites. PCR showed the agent had a 99 percent homology with *Cyclospora* sp. Guangzhou as previously characterised by Li *et al.* (2007). *Cyclospora* sp. Guangzhou infection has been reported in two cattle from Japan, with a similar presentation of intestinal intranuclear coccidiosis (Yamada *et al.*, 2014). *Cyclospora* is a genus of the Eimeriidae family of coccidia, and with modern molecular techniques more *Cyclospora* spp. are being characterised. This is the first known case of *Cyclospora* infection in a deer, and the first known case of ruminant *Cyclospora* infection in New Zealand. Deer have not been imported since 1997 but cattle are imported from Australia. The few reports from cattle in China and Japan support low morbidity and mortality rates in infected herds. Further work is needed to completely characterise *Cyclospora* parasites, but they appear to cause a sporadic, low incidence of disease and seem likely to occur worldwide. The biosecurity risk to New Zealand was considered to be low in this case and the investigation was stood down. Follow-up work will be performed if further cases arise.

HYDATIDS EXCLUDED

An MPI Verification Services veterinarian called the MPI exotic pest and disease hotline after examining the internal organs of a lamb presented for routine slaughter. Thick-walled cysts (~2–4 cm) were seen across the liver surface and throughout the parenchyma. The veterinarian was concerned about the possibility of hydatidosis. The liver was submitted to AHL Wallaceville, where samples were collected for histological examination and bacterial culture. Histology identified chronic multifocal pyogranulomatous hepatitis with intralesional bacterial colonies. Culture yielded a heavy predominant growth of *Fusobacterium necrophorum*. Hepatitis caused by *F. necrophorum* is common in lambs, often leading to a terminal septicaemia. Exotic disease was excluded and the investigation was stood down.

EIA/EVA RULED OUT

A veterinarian informed MPI via the exotic pest and disease hotline of a Quarter horse imported from Australia 18 months previously, with pyrexia and progressive oedema of all limbs. Routine haematology had identified slightly reduced red cell parameters and a mild inflammatory leucogram with elevated fibrinogen. Equine viral arteritis and equine infectious anaemia were excluded after negative results in the virus-neutralisation test and the agar-gel immunodiffusion test respectively, which were carried out on acute and convalescent sera at AHL (Wallaceville). The involvement of equine piroplasm, including *Theileria* spp., *Babesia* spp. and *Anaplasma phagocytophilium*, was excluded after assessments of blood films and specific molecular assays were negative. The horse recovered slowly over 7–10 days and no further affected horses were identified. Exotic disease was excluded and the investigation was stood down.

UNUSUAL STREPTOCOCCI INVESTIGATED

A Gribbles veterinary pathologist informed MPI via the exotic pest and disease hotline of concerns regarding a *Streptococcus* sp. isolated from the liver of an aborted piglet. It had been preliminarily typed as *S. porcinus* using matrix-assisted laser desorption ionisation time-of-flight mass spectrometry. The sow had aborted eight piglets, some of which were mummified, about 30 days pre-term. *Escherichia coli* was also cultured from the liver sample. It was considered important to differentiate *S. porcinus* from *S. pseudoporcinus,* which is associated with human disease; and furthermore, *S. porcinus* has only rarely been isolated in New Zealand. The isolate was submitted to the AHL for molecular typing and determined to be *S. porcinus*. The abortion was considered likely to be due to an ascending placentitis. This can occur after premature cervical opening caused by marginal or inadequate hormonal maintenance of pregnancy. The occurrence of mummified piglets indicated that they had died some time before the abortion occurred. No further abortions were reported and the sow recovered uneventfully. Exotic disease was excluded and the investigation was stood down.

CANINE DIROFILARIASIS EXCLUDED

A veterinarian contacted MPI via the exotic pest and disease hotline to report a dog, imported from South Africa two years previously, with a severe heart murmur and exercise intolerance. Earlier the dog had lived in Zambia and the UK. There were no suggestive radiographic abnormalities or other lesions of canine heartworm (*Dirofilaria immitis*). A whole blood and serum sample was submitted to the AHL. Testing was negative for canine heartworm antigen and microfilariae by ELISA and Knotts concentration test respectively. Exotic disease was excluded and the investigation was stood down.

BRUCELLA CANIS EXCLUDED

A veterinarian called the MPI exotic pest and disease hotline to report epididymitis and orchitis in a dog she had just castrated. One of the testicles contained mottled, pale regions and the epididymis contained purulent material. *Brucella canis* is considered the major exotic differential diagnosis for epididymitis and orchitis in dogs. The mature dog had no history of overseas travel, which meant brucellosis was less likely. Fresh and fixed testicle and serum were submitted to the AHL for testing. PCR was negative for *Brucella* spp. and serology (*B. canis* card test) was negative for *B. canis*. Histopathology showed the presence of several granulomas (interpreted as sperm granulomas) and a non-suppurative epididymitis with no evident bacterial cause. *B. canis* was ruled out. No other definitive cause was evident

and the investigation was stood down.

A veterinarian contacted the exotic pest and disease hotline to report a 4-year-old entire male dog with discospondylitis that had not responded to treatment. Because the dog's breeding history was vague, a serum sample was requested for *Brucella canis* serology. A rapid slide agglutination test (card test) was negative and the investigation was stood down.

A veterinarian called the exotic pest and disease hotline about an imported dog that presented with a swollen, inflamed testicle. A serum sample was requested and provided to the IDC, where serology ruled out *Brucella canis*. The dog did not respond to medical treatment and was subsequently castrated. Histopathology revealed the dog had two tumour types – seminoma and squamous cell carcinoma in the testicular tissue. The testicular inflammation appears to have been in response to extensive tumour necrosis.

A veterinary reproductive specialist contacted MPI via the exotic pest and disease hotline to reporting three bitches with fetal reabsorption diagnosed by ultrasound. Canine herpes virus and *Brucella canis* are the key differentials for fetal loss, so vaginal swabs were collected from the dogs and tested by PCR for both these agents. All tests were negative for canine herpes virus and *B. canis*. It remains unknown what caused the reproductive failure.

A veterinarian contacted MPI via the exotic pest and disease hotline after examining a pregnant (~60-day term) seven-year old Huntaway bitch that was unwell. A dead fetus was identified on ultrasound examination. At follow-up examination two days later a further two fetuses were found to be dead. The dog underwent a hysterectomy and serum, uterine swabs and foetal tissues were submitted to the AHL (Wallaceville). *Brucella canis* was excluded after serum tested negative in the *B. canis* rapid slide agglutination test and uterine swabs were negative for *Brucella* spp. by PCR. Exotic disease was excluded and the investigation stood down.

CANINE BARTONELLOSIS EXCLUDED

A veterinary pathologist called the MPI exotic pest and disease hotline to report disease resembling bartonellosis in a dog. The six-year old Huntaway presented with intravascular immune-mediated haemolytic anaemia. Cytology of enlarged lymph nodes showed suppurative lymphadenitis but no organisms were seen. This unusual clinical picture was felt to fit best with *Bartonella hensalae* infection or an exotic fungal disease. *B. hensalae* is thought to be present in New Zealand but is considered unusual, and routine testing is not available. Blood and lymph node smears were examined for fungal bodies with negative results. PCR for *Bartonella* was negative on whole blood. No infectious cause of the dog's illness was found. *B. hensalae* and exotic fungi were ruled out and the investigation was stood down.

CANINE BABESIOSIS EXCLUDED

The Incursion Investigation team was contacted by MPI Border Verification Services after a laboratory report indicating a positive molecular test for *Babesia canis* in a dog in quarantine, recently imported from Malaysia. Several ticks were found and exotic disease testing was undertaken. Incursion Investigators were asked to determine whether there was any biosecurity risk from this dog. The tick vector for *B. canis* is not present in New Zealand. Subspeciation of the parasite by the AHL showed that it most closely matched the subspecies *B. canis vogelli*. Treatment was not considered strictly necessary but was performed prophylactically by border staff before releasing the dog from quarantine. Treatment for *B. canis*, unlike *B. gibsoni*, is considered to cause complete clearance of the parasite. No further ticks were found, and in conjunction with the Animal Imports team the dog was considered to have fulfilled its Import Health Standards requirements. The dog was released and the investigation was closed.

UNUSUAL FUNGAL DERMATITIS CONFIRMED

A veterinary pathologist called the MPI exotic pest and disease hotline to report an unusual fungal infection causing swelling and ulceration on the front paw of a mature Domestic Medium-hair cat. An aspirate of the swelling showed pyogranulomatous inflammation with many fungal hyphae and some associated yeast-like structures. Infection by *Sporothrix schenckii*, which is endemic but unusual in cats here, was considered possible, as well as by other unusual saprophytic fungi. Because of the unusual manifestation of this infection, fungal culture was undertaken by the AHL and this yielded a pigmented fungus that was identified as being 95 percent similar to *Scytalidium* sp. This is a genus of opportunistically infectious dematiaceous fungi often associated with penetration by foreign bodies such as sticks and grass awns. Members of the genus are known to occur in New Zealand but while there are occasional reports of dematiaceous fungal infection in cats, there have been no reports of feline infection with any *Scytalidium* sp.

EUROPEAN FOULBROOD EXCLUDED

A beekeeper in Whangarei called the MPI exotic pest and disease hotline to report brood disease in one hive out of 10 at an apiary site near Port Whangarei. The single affected hive had dead, smelly brood. Adult bees were not affected. Samples were tested at the AHL for the exotic disease European foulbrood (EFB, caused by the bacterium *Melissococcus pluton*), and the endemic diseases American foulbrood (AFB, caused by the bacterium *Paenibacillus larvae* ssp. *larvae*) and sacbrood virus. PCR tests for EFB and AFB were negative but PCR for sacbrood virus was positive. Sacbrood virus causes disease in developing larvae, often resulting in death before pupation. The virus is common and generally affects only small amounts of brood. EFB was ruled out as the cause of disease in this hive and the investigation was stood down.

An apiculture expert called the MPI exotic pest and disease hotline to report unusual brood disease in a single hive out of 10 in an apiary in Canterbury. The hive showed evidence of cannibalism, death of larvae and moulding of dead larvae. The mouldy larvae bore a resemblance to larvae with chalkbrood (caused by the fungus *Ascophaera apis*), which is endemic to New Zealand. Brood samples were submitted to the AHL, where they were tested for the agent of European foulbrood (EFB, caused by *Melissococcus pluton*) and were cultured for fungal species. A molecular assay for EFB was negative. The yeast *Metschnikowia reukaufii* (synonym *Candida rancensis*)

was isolated by culture. *M. reukaufii* is a nectar yeast, which is likely to have been present in collected nectar and to have overgrown on dead larvae. The larval deaths were considered to be a result of cannibalism, which can be caused by an acute pollen shortage. Exotic disease was excluded and the investigation was stood down.

An Apiary Advisory Officer reported that larvae in diseased hives had signs consistent with European foulbrood (EFB). These hives were located with two different beekeeping operations in Canterbury. Signs included discolouration of larvae, and corkscrew larvae in the cell. Samples of affected larvae were collected from the colonies and transported to the IDC for testing. *Melissococcus plutonius*, the causative agent for EFB, was excluded by PCR testing. Exotic disease was excluded and the investigation was stood down.

IAPV EXCLUDED

An AsureQuality Apiary Advisory Officer called the MPI exotic pest and disease hotline after a hobbyist beekeeper with a single hive informed him of weak bees that appeared darker than usual, around the hive entrance. Affected bees were collected and submitted to the AHL (Wallaceville). Molecular assays excluded Israeli acute paralysis virus. On examination the bees were in fact hairless, which gave them a shiny, black appearance. The change, termed "black robber" or "hairless black" syndrome, is characteristic of infection with chronic paralysis virus, an endemic agent. Exotic disease was excluded and the investigation was stood down.

TRACHEAL MITES EXCLUDED

An AsureQuality Apiary Advisory Officer called the MPI exotic pest and disease hotline after a commercial beekeeper reported that eight of 12 hives at an apiary site were very weak. There were abundant dead bees on the ground, inside and around the entrances of three hives. The officer visited the apiary and confirmed the beekeeper's assessment but also noticed three seemingly unaffected, strong hives that were full of honey. The changes in the hives at the apiary site were consistent with a robbing event (with messy wax on the frames and pollen left behind), and the affected hives were concentrated near the tyre tracks left when the beekeeper last visited to harvest honey a few weeks earlier. Numerous dead bees were collected and submitted to the PHEL (Tamaki) for examination for tracheal and external mites. No tracheal mites were identified. Bee washings identified a common external mite, *Acarapis externus* on two worker bees. Findings are considered consistent with robbing that began during harvesting and continued thereafter in the closest hives. Exotic disease was excluded and the investigation was stood down.

EXOTIC HAEMOPARASITES IN LITTLE BLUE PENGUIN EXCLUDED

A veterinary pathologist called the MPI exotic pest and disease hotline to report an unusual blood parasite in a wild fledging little blue penguin (*Eudyptula minor*). The penguin was in rehabilitation after having been found injured on an Auckland beach. It was not anaemic despite the haemoparasitaemia, though it developed tracheal aspergillosis (a fungal disease) that later proved fatal. In a blood smear, various stages of the haemoparasites were found in the cytoplasm of erythrocytes. PCR identified these as *Plasmodium elongatum*, one of the causes of avian malaria. *Plasmodium* spp. have been reported to cause mostly subclinical infection in little blue penguins (Gracyzyk *et al.*, 1995), but in most cases species identification has not been reported. *P. elongatum* is known to infect endemic and introduced New Zealand birds (Howe *et al.*, 2012) and has recently been identified in several little blue penguins, leading to the concern that it may be increasing in prevalence. This investigation contributed to knowledge of the distribution of *P. elongatum* in little blue penguins in New Zealand, and is one of the first confirmed reports from a little blue penguin.

CANV IN TUATARAS CONFIRMED

A veterinary pathologist called MPI to report a case of fungal dermatitis in an adult female tuatara. The tuatara had several 3–4-mm-diameter slightly-raised light brown skin lesions on the lateral abdomen, which resembled disease caused by *Paranannizziopsis australiensis* (formerly known as CANV – *Chrysosporium* anamorph of *Nannizziopsis vriesii*). *P. australiensis* is unique to Australasia (Sigler *et al.*, 2013) and has been associated with fungal dermatitis in captive tuatara. Previously within New Zealand *P. australiensis* had only been identified from a single captive facility, and it has never been found in wild tuatara. Skin scrapings from the lesions were sent to the AHL, where they were cultured and PCR of the isolate confirmed the presence of *P. australiensis*. Communication with the facility's veterinarians and the Department of Conservation is ongoing to determine the best plan for containing this disease.

EXOTIC TICKS RULED OUT

A medical laboratory technician called MPI's exotic pest and disease hotline to report receiving a tick submitted by a doctor. The tick had been removed from the shoulder of a nine-year-old girl and was submitted to PHEL (Christchurch) where it was identified as an adult female *Haemaphysalis longicornis* (New Zealand cattle tick). There was no recent history of overseas travel and the child lived on the edge of town in a region (Marlborough) known to support cattle ticks. Exotic disease was excluded and the investigation was stood down.

A veterinarian in Tauranga called the MPI exotic pest and disease hotline to report that a client had found a tick on his clinically-ill dog. The four-year-old Staffordshire bull terrier had developed lethargy, hind-end weakness, vomiting and increased flatulence shortly after visiting the dog park. Two days after onset of illness the engorged tick was found. The owner of the dog had recently had guests from South Africa and was worried that the tick might be exotic and could be causing the dog's illness. Photographs of the engorged tick were initially sent to IDC Tamaki, and next day the sample was couriered to the lab. MPI entomologists determined the tick to be *Haemaphysalis longicornis,* which is endemic in New Zealand. The dog's clinical illness completely resolved with supportive therapy and antibiotics, and the probable cause was considered to be dietary indiscretion. The investigation was stood down.

EXOTIC MOSQUITOES RULED OUT

A member of the public called the MPI exotic pest and disease hotline after finding flying insects in a number of

recently imported used vehicles. Thirty-nine vehicles had recently arrived at the commercial site after biosecurity clearance at the Port of Auckland. An Incursion Investigator visited the site and inspected 15 of the vehicles. Five vehicles contained live mosquitoes, which were collected and submitted to the IDC (Tamaki) for identification. The manager of the site placed a voluntary hold on all vehicles in the recent consignment and arrangements were made for all associated vehicles to be permigas-treated. All the vehicles at the site had been pre-cleared by MPI in Japan.

The mosquitoes were examined by MPI entomologists, identified as *Culex* sp. and subsequently referred to New Zealand Biosecure Entomology Laboratory, the Ministry of Health's contractors for exotic mosquito species determination.

There was a risk that mosquitoes might have escaped when staff were moving the vehicles on the site, so public health officers deployed a surveillance programme with traps on site. The mosquitoes collected from the vehicles were determined to be the established introduced species *Culex quinquefasciatus*. One specimen of *Aedes notoscriptus*, another established introduced species, was found during the surveillance work. Exotic mosquito species were excluded and the investigation was closed.

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QUARTERLY REPORT OF BIOSECURITY RESPONSES

The Ministry for Primary Industries (MPI) Biosecurity Response Group sits within the Operations Branch and is responsible for managing the biosecurity risk posed by new exotic and emerging pests and diseases detected within New Zealand. Responses are initiated to organisms or risk goods that may affect New Zealand's primary industries or marine, freshwater or terrestrial environments. This report covers the period January–March 2015.

The Biosecurity Response Group was managing 42 high-priority responses and four low-priority responses (i.e., where full responses were not initiated) at the end of the January–March 2015 reporting period. During that period the Group initiated three new responses. **Figure 1** shows the number of responses managed during the 12 months to the end of the current reporting period and **Figure 2** shows the breakdown by sector most affected by the organism or risk goods.

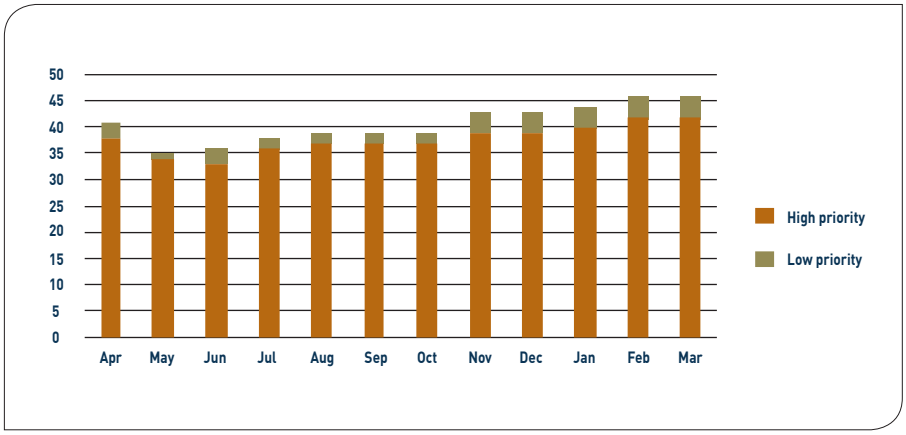

Figure 1: Biosecurity responses, April 2014–March 2015

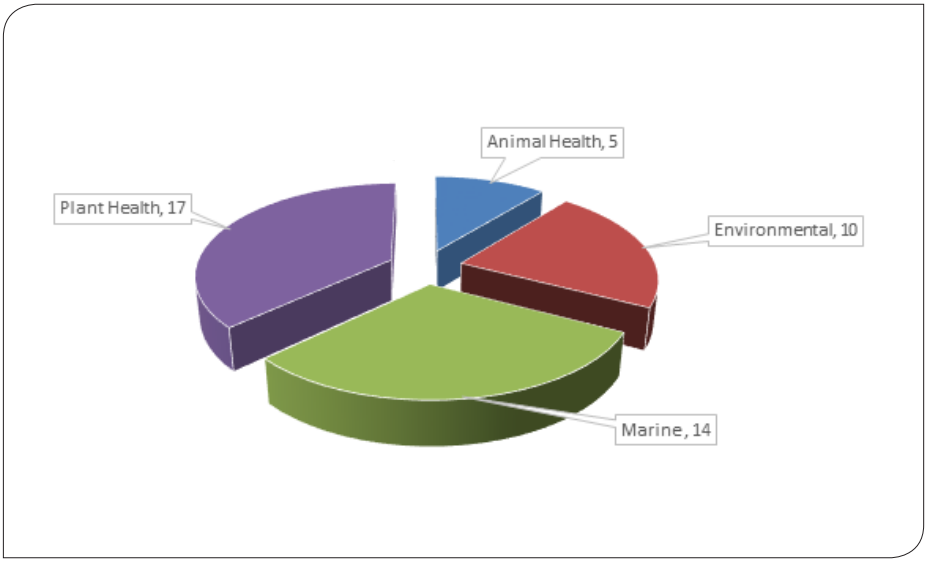

Figure 2: Sector breakdown for responses, January–March 2015

The Group also manages the eradication programmes for nine national-interest pests that have been in New Zealand for several years. The status of these programmes is unchanged since the previous reporting period.

NEW RESPONSES THIS PERIOD

BROWN DOG TICK

In January 2015 a few adult brown dog ticks (*Rhipicephalus sanguineus*) were found on two pet dogs from the same household in Canterbury. This species is a notifiable and unwanted organism that is occasionally detected and destroyed at the border. The risks associated with this organism are mainly due to its ability to carry and transmit diseases of animal and public health concern. None of these diseases are currently known to be present and the Ministry of Health subsequently assessed the incident as a low risk to human health. It is not known how the ticks entered the country: the two infested dogs had not been overseas and no ticks were reported from dogs that had recently been imported and were now resident in the same area.

A major aim of the biosecurity response was to detect and eradicate known populations of brown dog ticks. This involved contacting dog owners who had taken their dogs to the same premises visited by the two infested animals in December 2014. These in-contact dogs and the houses where they lived were checked for ticks, and Spot-on tickicide was applied to each dog. At the time of writing no further brown dog ticks have been found and there is no evidence of an established population in New Zealand.

QUEENSLAND FRUIT FLY IN AUCKLAND

The detection of a single male Queensland fruit fly (*Bactrocera tyroni*) in a fruit fly surveillance trap in suburban Auckland prompted the immediate initiation of a biosecurity response by the Ministry for Primary Industries and industry partners (Kiwifruit Vine Health and Pipfruit New Zealand). There are no established populations of either *Bactrocera* or *Ceratitis* fruit flies in New Zealand. It is very important that the country should remain free of these serious horticultural pests to maintain fruit quality for both domestic and export markets. Response activities were escalated when a breeding population was discovered in the same area. The biosecurity response is focused on eradicating this localised population and minimising the impacts.

NEW *BONAMIA* SPECIES FOUND IN OYSTERS

Bonamia ostreae has been identified for the first time in New Zealand flat oysters (*Ostrea chilensis*), from the Marlborough Sounds. The OIE has been notified of the detection. This species was not previously known to be present in New Zealand. The biosecurity response is focused on finding the source of infection, determining the extent of spread, and mitigating adverse effects on aquaculture, wild-capture fisheries and the marine environment. The flat oyster industry is primarily located in Foveaux Strait, where it is estimated to be worth > $30 million a year. There is also a large wild fishery at the Chatham Islands. Response activities are focused on containing the spread of *B. ostreae* from infected sites and protecting the high-value fisheries areas (wild and aquaculture) in the lower South Island and Chatham Islands from *B. ostreae* infection.

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QUARTERLY REPORT OF INVESTIGATIONS OF SUSPECTED EXOTIC MARINE AND FRESHWATER PESTS AND DISEASES

Exotic marine pest and aquatic disease investigations are managed and reported by MPI Investigation and Diagnostic Centre and Response, Wallaceville. The following is a summary of investigations of suspected exotic marine diseases and pests during the period from January to March 2015.

ASIAN PADDLE CRAB (*CHARYBDIS JAPONICA*) RANGE EXTENSION CONFIRMED

A member of the public called the MPI pest and disease hotline about suspected Asian paddle crab (*Charybdis japonica*) at the mouth of the Ngunguru River, Northland. The notifier had caught seven exotic-looking crabs in set-nets at the river mouth. The notifier knew that the Asian paddle crab was present in Whangarei Harbour but had not seen them near Ngunguru, and he observed that the crab had the characteristic six notches between the eyestalks, displayed aggressive behaviour and was the right colour for the Asian paddle crab. The carapace was 100 mm wide. The notifier also said that the native paddle crab (*Ovalipes catharus*) had disappeared from the area. Over a few days of putting out nets he had caught seven crabs, one a female, and he sent photographs of some of them. The specimens looked like *Charybdis japonica* but there is a similar exotic species, *C. feriata*, that has once been found in New Zealand. The photographs were sent to the Marine Invasives Taxonomic Service (MITS), where the crabs were confirmed as *C. japonica*. This interception is considered to be a range extension of the population found in Whangarei Harbour. As the Asian paddle crab is an established species that we are responding to, the finding was referred to the response team and the investigation closed.

WATERY SCALLOP SYNDROME INVESTIGATED

A fisheries officer called the MPI pest and disease hotline to report that over the past five years he had noticed the scallops in Pelorus Sound had been losing condition. He said the scallops were very watery and the second valve did not appear to be forming properly. This syndrome of flaccid and watery appearance appeared to be spreading over a wider area, to the outer reaches of Pelorus Sound. The animals were also declining in abundance, so that there was no longer a viable commercial fishery in the area. In contrast, he said the scallops in Queen Charlotte Sound were still in very good condition. Scallops were tested from two areas in Pelorus Sound: Horseshoe Bay and Northwest Bay. The scallops from Horseshoe Bay were largely unaffected, whereas the scallops from Northwest Bay all had watery flesh and no roe.

Both populations of these scallops were found to be infected with *Perkinsus olseni*, although the prevalence was lower at Horseshoe Bay. The OIE was notified as this was a new host record, but the finding was considered purely incidental. MPI investigators did not believe that *P. olseni* itself was the cause, especially as unaffected scallops also showed the presence of *P. olseni*.

Bacterial culture found high levels of *Vibrio splendidus*, which is usually an opportunistic pathogen in the marine environment but can be a primary pathogen causing vibriosis, usually during warmer summer months. Histopathology showed badly damaged gills in the affected animals whereas gills were intact in the unaffected animals. There was also evidence of copepod parasites and destruction of the digestive gland tubules. Destruction of digestive tubules has been hypothesised to be caused by a small virus-like particle, but to date not enough is known to be sure whether such particles cause this condition or are a part of the normal degenerative process in shellfish (Hine & Wesney, 1997). As *P. olseni* is considered endemic in New Zealand, the investigation was closed.

FISH MORTALITY INVESTIGATED

A member of the public alerted MPI fisheries staff to many snapper (*Pagrus auratus*) being washed up at Doubtless Bay, Northland. MPI Incursion Investigators were notified via the exotic pest and disease hotline. About 60 snapper were washed up over a three-day period along a distance of about 8 km. The fish were whole, without any obvious signs or disease or lesions indicative of net damage, handling injuries or hook injuries. Commercial fishermen also reported snapper as being skinny and in poor condition, and divers said that the water was thick and green (possibly from an algal bloom).

Samples were submitted to the IDC (Wallaceville). PCR for the exotic red sea bream iridovirus was negative. Histology showed that the snapper were suffering a well-established systemic bacterial infection, with the bacteria filling small pockets within the blood vessel walls. Culture determined that the predominant bacteria was *Vibrio harveyi*. *Vibrio* spp. are usually opportunistic secondary bacteria that invade an already weak animal but this particular species can also present as a primary pathogen. Fish can be immunocompromised post-spawning and this could be exacerbated by a systemic bacterial infection causing mortality. The mortality was determined to be a natural event that abated over 2–3 weeks and the investigation was closed.

EXOTIC FISH RULED OUT

A police officer called the exotic pest and disease hotline about suspect piranhas in a tank. Photos were submitted to a fish taxonomist, who agreed that the fish looked like red-bellied piranhas (*Pygocentrus* spp.) but could not be certain from photographs. Piranhas are listed as noxious fish in the Freshwater Fisheries Regulations 1983 and are not an approved import under the Import Health Standard (IHS) for Ornamental Fish and Marine Invertebrates. (However, they are not declared unwanted organisms under the Biosecurity Act 1993.) Permission to import can

be granted by the Department of Conservation to organisations such as the National Aquarium, for the purposes of display and education. Piranhas cannot be kept or traded by an individual.

Pacu (*Colossoma macropomum*) look very similar to piranha when young and are a permitted import. *Pliaractus brachypomus*, the red-bellied pacu, is also very similar to red-bellied piranha but is not approved for import. The biosecurity risk is that, if the fish were piranha and were released into the wild, they might establish a population or spread novel parasites or diseases.

There was potential for a criminal element to this investigation (smuggling of an unauthorised species or species not listed in the ISH), so it was referred to the Compliance Directive. A search warrant was executed to enter the property and biosecurity inspectors examined the fish to determine the species. The fish were identified as *Metynnis argenteus*, commonly known as silver dollar. These are popular fish in the pet trade and it is not illegal to keep them. As there was no biosecurity risk the investigation was closed.

REFERENCE

Hine PM, Wesney B (1997). Virus-like particles associated with cytopathology in the digestive gland epithelium of scallops *Pecten novaezelandiae* and toheroa *Paphies ventricosum*. *Diseases of Aquatic Organisms* 29: 197–204.

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ENHANCED PASSIVE SURVEILLANCE: BROWN MARMORATED STINK BUG PUBLIC CAMPAIGN

OVERVIEW

The New Zealand summer season is the time of highest incursion risk because BMSBs are known to hibernate in large aggregations in man-made structures during the northern hemisphere winter, and may end up being inadvertently exported. **Figure 1** shows a peak in BMSB border interceptions from December to March in New Zealand, which overlaps with the northern hemisphere overwintering season. BMSB poses a significant risk during the summer months and this is compounded by the lack of BMSB-specific traps and lures. In this situation an informed public would be an essential tool for early detection of a BMSB incursion. Therefore the campaign aimed to raise public awareness and help the public recognise and report sightings of BMSB to MPI's exotic pest and disease hotline (0800 80 99 66) (**Figure 2**). The enhanced passive surveillance programme used digital and print advertising. Advertising was deployed through a number of channels, targeting potential pathway entries for BMSB. This included passenger information (e-ticket advertising, and signage at Auckland International Airport), mail (advertising that targeted overseas shoppers using eBay and NZ Post) and industry partners, magazines and journals. The campaign resulted in an increase in suspect BMSB notifications being received by the exotic pest and disease hotline. Information collected from the notifications has been interpreted in this report to show trends and guide improvements for the awareness campaign, which is to be repeated next summer.

The Ministry for Primary Industries (MPI) implemented a brown marmorated stink bug (BMSB) public awareness campaign from September 2014 to April 2015 inclusive. This programme was initiated because of the rising threat of a BMSB incursion as its populations in the USA and Europe increase.

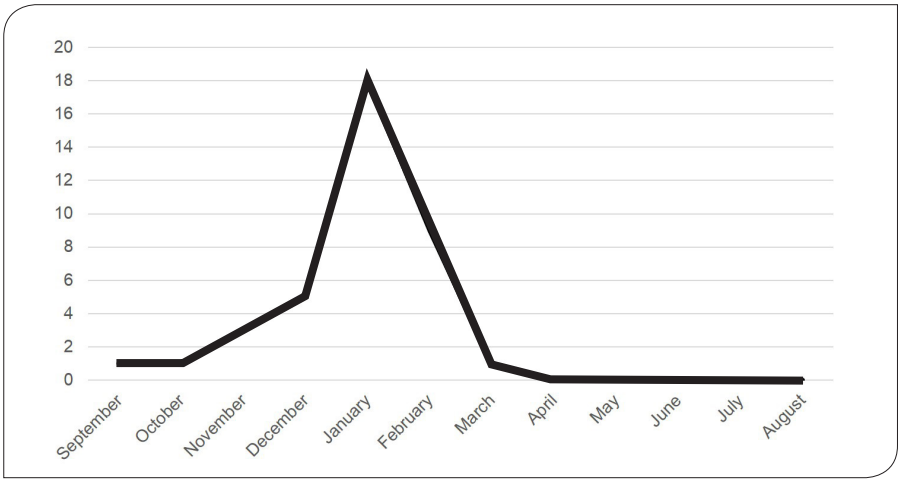

Figure 1: BMSB interception events at New Zealand borders, September 2013–August 2014. Source: Catherine Duthie presentation at BMSB preparedness workshop, April 2015.

Figure 2: Poster used during the BMSB public information campaign

NOTIFICATIONS BY MONTH REFLECT TIMING OF ADVERTISING

The number of suspect BMSB notifications increased steadily from when the campaign began in September 2014, reaching a peak in March 2015 (**Figure 3, page 28**). This can be attributed to a combination of increasing advertising and increased activity of native and established pentatomids during summer. Five positive BMSB notifications were investigated early in the season, all of which were intercepted early post-border, with two being the direct result of MPI advertising. All interceptions were associated with recently imported goods, and the biosecurity risk was mitigated upon detection.

The significant drop in notifications in April is interesting and was likely caused by a combination of factors. Active feeding by adult pentatomids occurs in late spring and early summer, and wanes towards winter. People are out in the garden less or for shorter times during the cooler, rainier months and this too is

likely to mean fewer sightings. Furthermore, public advertising activities decreased, with no further digital and print advertisements published after March.

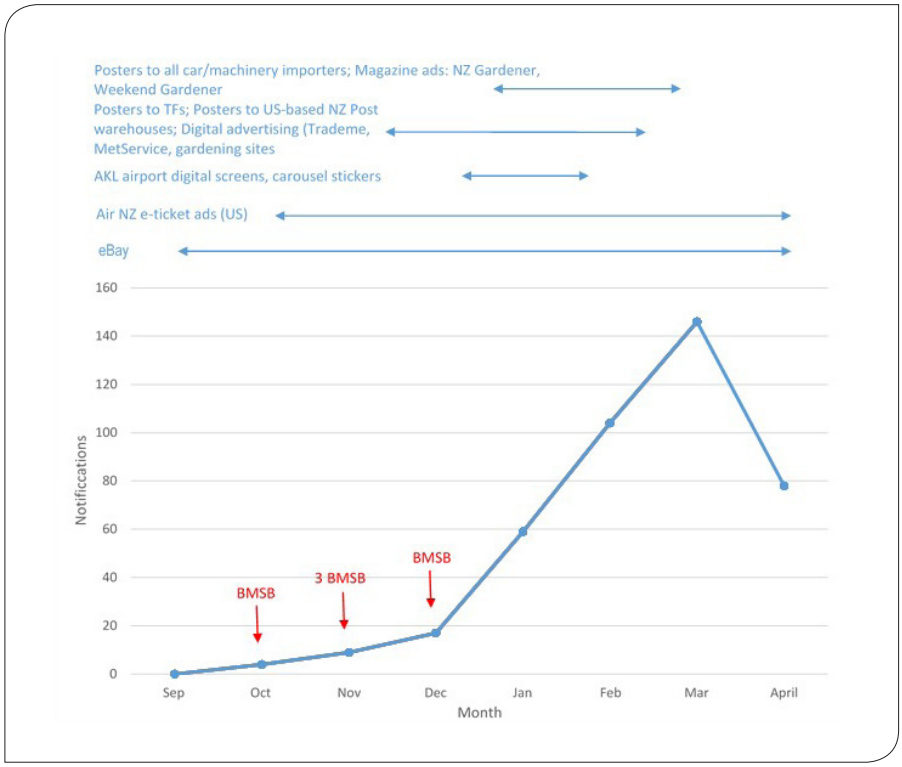

Figure 3: BMSB notifications received via the exotic pest and disease hotline per month, alongside the duration of public awareness activities. Positive BMSB interceptions are highlighted in red.

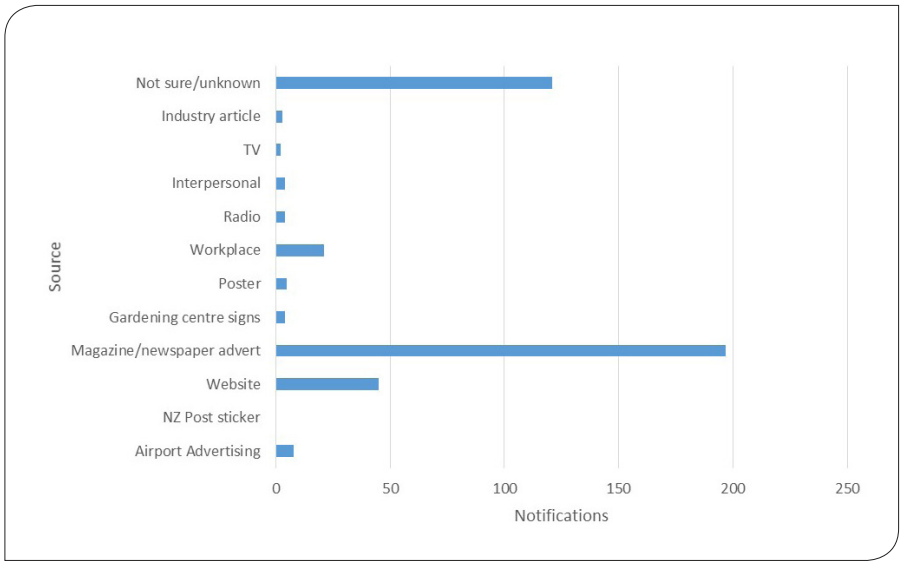

Figure 4: Source of the notifier reporting each BMSB notification

EFFECTIVENESS OF DIFFERENT MEDIA IN PROMOTING PUBLIC AWARENESS OF BMSB

The majority of notifiers became aware of the BMSB campaign through magazine or newspaper advertisements, with websites and workplace sources playing a lesser role (**Table 1, page 29**). Magazine advertising was highly effective despite its shorter duration. Targeting high-risk workplaces such as Transitional Facilities was also successful and should be continued in later programmes to help reach those members of the public who are likely to encounter BMSB. In a considerable number of cases the source of awareness was unknown, signalling an incomplete data set. It would be useful to gather more information about awareness source in subsequent campaigns. See (**Table 1, page 29**). The *NZ Gardener* was the most effective mass print media source, followed by the *Weekend Gardener*. These are popular high-circulation specialist magazines. Local newspapers were also a notable source (particularly in the Bay of Plenty). An advertisement on the MetService website was widely viewed and remembered, as was one on MPI's own website. Workplace information was important, especially in Transitional Facilities such as the premises of vehicle importers. Kiwifruit Vine Health (KVH) also undertook its own BMSB communications, with articles and handbooks that were cited as sources of awareness by some notifiers.

NOTIFICATIONS BY SECTOR

The majority of the notifications are being made by the general public (**Figure 5, page 29**). This suggests that mainstream advertising strategies are effective in raising public awareness of BMSB, such as on websites and in hobbyist magazines. The second largest sector is industry, suggesting posters and fact sheets at Transitional Facilities and importers' premises are being noticed. As the aim of the campaign is both to raise general awareness and to target groups that are more likely to make a positive identification and to report the find to MPI, targeted advertising is important to raise awareness in the industry and science community. There could be more focus on the science community by way of advertising and raising awareness in relevant labs and universities.

NOTIFICATIONS BY RISK ORIGIN

See (**Table 2, page 29**). While only 4 percent of suspect notifications were associated with recently imported goods (post-border risk goods and goods in Transitional Facilities), 29 percent of these resulted in a positive interception of BMSB, and all were early in the season (October to December). This suggests that people in contact with recently imported goods should be well informed about BMSB, as they are most likely to encounter the pest, particularly in early summer when overwintering populations can arrive by various import pathways. Later in the summer, as populations come out of the overwintering state in the northern hemisphere, the threat of a growing and established population

TABLE 1: NOTABLE SOURCES OF BMSB AWARENESS

CATEGORY	SPECIFIC SOURCE
Magazine or newspaper advertisement	*NZ Gardener* *Weekend Gardener* Local newspapers Trademe
Website	MetService MPI
Workplace	Transitional Facilities MPI QOs
Industry articles	KVH articles/handbooks

TABLE 2: ORIGIN OF BMSB NOTIFICATIONS RECEIVED BY SIIPE

ORIGIN	NOTIFICATIONS
General surveillance	404
Post-border (risk goods)	15 (5*)
Transitional Facility	2
Total	421

*Number of positive BMSB post-border interceptions since September 2014

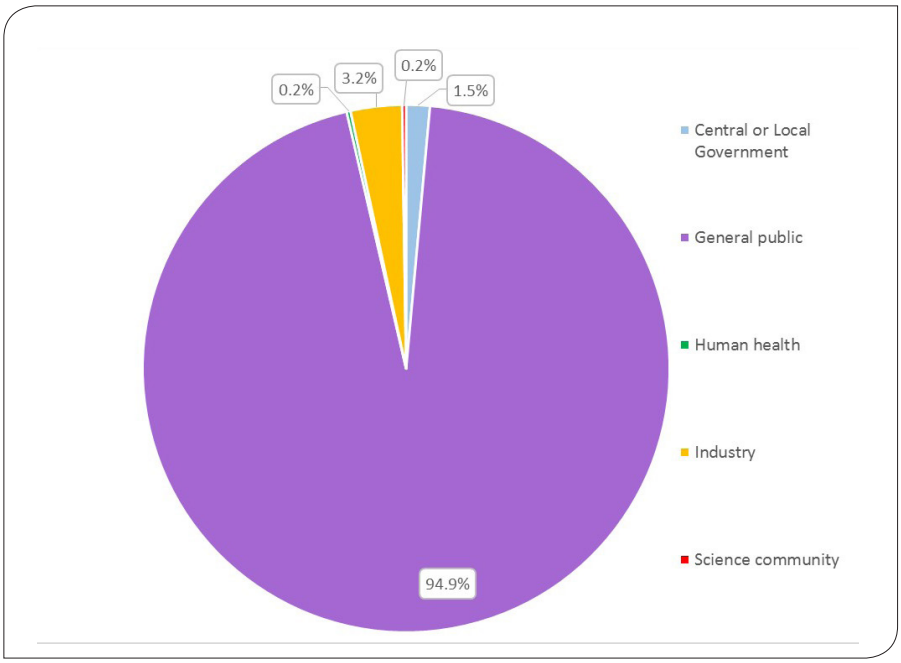

Figure 5: BMSB notifications via the exotic pest and disease hotline, by professional sector

arriving in New Zealand becomes greater. Although general surveillance has not yet resulted in a positive BMSB find, it could be vital if a population becomes established. Targeting members of the public (such as gardeners) and biosecurity workers later in the season would be effective. This would result in a bimodal communications strategy over the summer season.

NOTIFICATIONS BY DISTRICT

The vast majority of notifications were from the Bay of Plenty and Auckland regions (**Figure 6**). Public advertising was prominent in the Bay of Plenty, especially in later in the season. KVH, a GIA partner, published its own BMSB material in local Bay of Plenty newspapers during April, which corresponded with an increase of notifications from that region. Because this is a fruit-growing region, local involvement in industry may have contributed to information provision and general interest in biosecurity issues. The Auckland region has the largest population and the most Transitional Facilities and importers. Furthermore, studies have shown that BMSB is likely to establish first in an urban environment, which implicates Auckland as a high-risk area that should continue to be focused on.

REPORTED SPECIES

Most of the reported species were pentatomids, like BMSB, though a few weevils and mirids were also found. Overall the accuracy of public notifications is adequate at the family level. It is unrealistic to expect the general public to make difficult entomological identifications, so overloading advertising with diagnostic information may be counterproductive if it prevents an actual BMSB from being reported. A clear indication of size is the most useful and simplest diagnostic feature that sets BMSB apart from other pentatomids in New Zealand.

Of at least eight pentatomid species reported, the brown soldier bug, *Cermatulus nasalis*, was most often confused with BMSB (**Figure 7, page 30**). The size range can be similar but it is a predatory species, unlike BMSB, and is often reported as eating caterpillars. Emphasising that BMSB is not a predator may be a simple diagnostic tool to include in public awareness material. The brown shield bug and the pittosporum shield bug were also often mistaken for BMSB, but both are considerably smaller and this can be emphasised in public awareness material. The green vegetable bug was also frequently reported because juveniles and some morphs can be brown, especially when the weather becomes cooler.

CONCLUSION

The increase in suspect BMSB notifications via the exotic pest and disease hotline demonstrated the success of the public awareness campaign. Of about 420 notifications, five were positive for BMSB and all were associated with risk goods. Most of the other notifications were different pentatomids, with the public generally reporting species already present in New Zealand. Future public information campaigns can aim to increase accuracy of BMSB reports by targeting workplaces (e.g., Transitional Facilities), industry members and the science community. Furthermore, public advertising information can be improved by emphasising the size and feeding

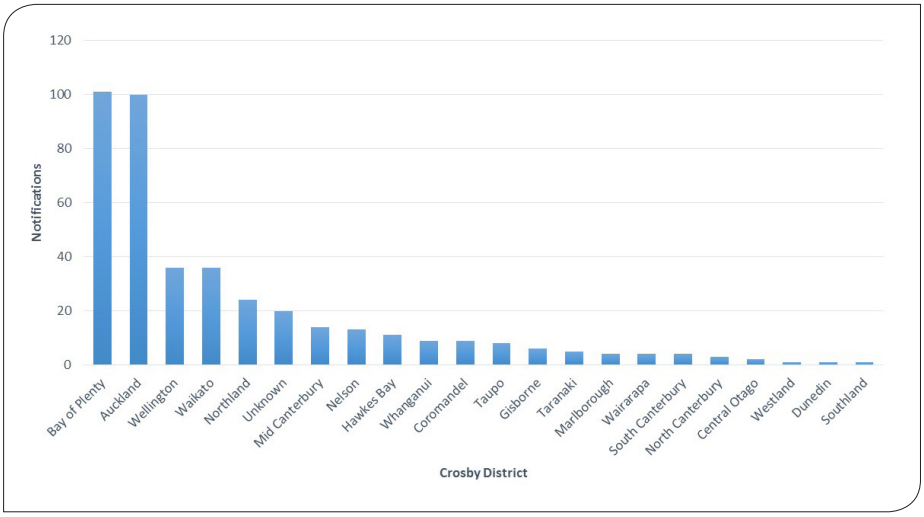

Figure 6: BMSB notifications by Crosby district. (Note: these districts differ from geopolitical boundaries such as councils.)

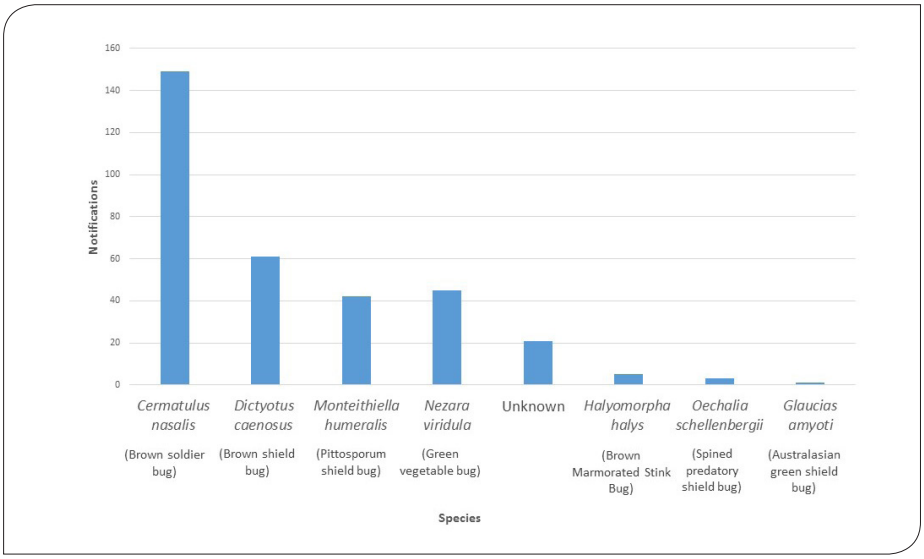

Figure 7: Pentatomids commonly misreported as potential BMSB

characteristics of BMSB. However, to avoid relying on members of the public to make complicated diagnostic decisions, advertising information should be kept simple. Linking in with industry-led BMSB communications would be beneficial, as it would enable a streamlined message and help to anticipate peaks in notifications.

The efficacy of targeted passive surveillance has been shown in several of New Zealand's biosecurity responses, such as the great white cabbage butterfly in Nelson and Queensland fruit fly in Auckland. The high volume of calls in response to the BMSB advertising information shows that the public is engaged with biosecurity issues. This passive surveillance programme has potential to provide early detection of a BMSB incursion in New Zealand and help with successful response and management.

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PLANTS AND ENVIRONMENT INVESTIGATION REPORT: JANUARY TO MARCH 2015

The Ministry for Primary Industries (MPI) Investigation and Diagnostic Centres and Response Directorate (IDCR) is responsible for surveillance, incursion investigation, diagnostics and response by managing investigations of notifications of suspected exotic pests and diseases that may affect New Zealand's primary industries.

ESTABLISHMENT OF WOOD BORERS PREVENTED

There were four separate cases involving live wood borers during this reporting period. In the first, live beetle larvae were reported feeding within the wooden frame of a couch bought about 2.5 years prior. Three live adult borers obtained were determined to be an exotic *Chlorophorus* species (Coleoptera: Cerambycidae). Investigation established that the couch was likely imported from China. No further information was obtained. Fumigation of the couch with methyl bromide (MeBr) was arranged to address the immediate biosecurity risk.

The second report involved a beetle borer infestation in a wooden (*Acacia* sp.) chopping board manufactured in China to a rabbit-shaped design for a New Zealand company. Adult emergence holes about 2 mm in diameter and borer frass were seen. The chopping board was frozen for 48 hours to kill any borer life stages present, then despatched to MPI, where destructive sampling found a single exotic longhorn larva of *Stromatium longicorne* (Coleoptera: Cerambycidae). The product had been shipped from China to a Sydney warehouse and transhipped on demand to New Zealand. The 21 boards imported into New Zealand (two shipments) during the previous 12 months had all been treated (MeBr certificate provided) prior to shipment from China, and again at the Australian border (AQIS requirement) when entering Sydney. The boards were individually wrapped in shrinkwrap plastic, with three boards to a carton and two cartons per outer carton. This may have influenced the ability of the fumigant to sufficiently penetrate the goods. The MPI border intelligence team was notified.

The third case involved a wooden pallet of goods placed in a warehouse following importation. Borer frass was evident beneath the pallet when it was moved about a month later. The pallet was enclosed in plastic and handed to MPI for destructive sampling. Splitting of the timber revealed live beetles and larvae that were subsequently identified as *Sinoxylon unidentatum* (Coleoptera: Bostrichidae), a species not present in New Zealand. About 20 more pallets in the warehouse were examined but no further evidence of infestation was found and no borer frass was evident on the floor. A report of this event plus consignment information relating to the pallet and imported goods was provided to the MPI border intelligence team.

In the fourth case, signs of wood borer activity were reported in wooden pallets at the Tiwai Point aluminium smelter, near Bluff, and notified by an MPI quarantine officer who noticed significant amounts of fresh borer frass under 20 pallets. These were isolated in a container and later fumigated with MeBr. Adult borer beetles had been collected but all were dead. These were subsequently identified as *Sinoxylon anale* (Coleoptera: Bostrichidae), the false powder post beetle, a species not established in NZ. The consignment of goods imported on the pallets had entered with an accompanying fumigation certificate. Although the presence of live borer in the pallets was not confirmed, the quantity and apparent freshness of borer frass was symptomatic of live borer larvae in the pallets. Fumigation was considered sufficient to address the risk posed by any live beetles present.

INSECT EGGS FOUND ON AIRCRAFT

Insect eggs were found on the outside of a New Zealand Defence Force (NZDF) aircraft following its return from Northern Territory, Australia. The raft of about 50 eggs was found 19 days after the aircraft's arrival and routine inspection and washing. Photos sent to MPI showed lepidopteran eggs, but these were not recognisable as any high-risk pest such as Asian gypsy moth. As the plane had been standing in warm conditions for the previous 19 days, it was expected that any viable lepidopteran eggs of Australian origin would have hatched, or else they were non-viable as a result of several hours' exposure to extremely low temperature and high altitude during the flight from Australia. It was also possible that the egg mass was of local origin. NZDF staff were told to destroy the egg mass and to re-examine the exterior of the plane and advise of any further finds. No call was received and the investigation was closed.

LIVE BUT IRRADIATED INSECTS FOUND

Live weevils were reported from mangoes and the notifier was asked to place them in a freezer. The insects were almost certainly *Sternochetus mangiferae*, the mango seed weevil, which have previously been intercepted in imported mangoes. The manager of the retailing company that sold the infested fruit was contacted and a "track and trace" requested for the imported fruit. The retailer confirmed the mangoes were imported from Australia and had been treated by irradiation, which renders the insects sterile and addresses the biosecurity risk. The notifier was advised and the case was closed.

PSYLLID PEST RULED OUT

An Approved Person at a Christchurch Transitional Facility (TF) reported flying insects associated with tyres imported from India. The insects were noticed during devanning, so the partially emptied container was shut and the devanned tyres swiftly placed into a second container, which was then closed. Insect samples were then

submitted to MPI and both containers were held in secure custody pending urgent identification. The insects were tentatively identified as exotic psyllids (Hemiptera: Psyllidae) but identification to genus and species was not possible owing to an immediate lack of available literature. An MPI diagnostic entomologist and border staff visited the TF to investigate. Meanwhile, arrangements were underway to fumigate both containers with MeBr, when a number of psyllids were spotted on the hi-viz jacket of a worker, and further examination revealed psyllids present on many surfaces in the immediate vicinity. Fortunately the entomologist arrived soon after, and was able to establish a strong association between the psyllids and a nearby eucalyptus tree. This helped speed up the identification of the psyllid, which was determined to be *Ctenarytaina spatulata*, a species present in New Zealand and known from mid-Canterbury. The identification was later confirmed by other psyllid experts.

EXOTIC TERMITE RULED OUT

A winged adult termite (alate) was found inside a private residence by an Australian, who considered it similar to the subterranean termites present in Australia. The specimen was delivered to MPI and urgently identified as *Glyptotermes brevicornis* (Isoptera: Kalotermitidae), a species already present in New Zealand.

MYRTLE RUST RULED OUT

A horticulture teacher at an Auckland secondary school reported suspect myrtle rust on guava trees in the school grounds. Symptoms were described as leaves with brownish patterns present during this and the previous season. No yellow pustules were seen. When specimens were submitted it was determined that the trees were quince, not guava, and the symptoms were caused by *Diplocarpon mespili* (Ascomycetes) a foliar disease of quince already known in New Zealand.

CROP WEED ESTABLISHMENT PREVENTED

MPI was notified of weed seeds in imported used farm machinery, suspected to be *Alopecurus myosuroides*, black grass. This is an unwanted species under the 1993 Biosecurity Act because, if it became established in New Zealand, it would likely become a serious weed in cropping systems. The seed was found in the nozzles of a used crop sprayer from the UK, where black grass is present. The machinery had been steam-cleaned before export and fumigated in NZ for spiders, but the seed was still present in the spray nozzles when examined by the farmer who bought it. The importer joined MPI staff to visit the Canterbury farm, where visible seeds were removed from the yard where the sprayer had been stored. These seeds, together with those collected from the nozzles, were identified as black grass, *Alopecurus myosuroides* (87 seeds), together with non-regulated *Lolium* sp. (10 seeds), *Arrhenatherum elatius* (3 seeds) and *Bromus hordeaceus* (3 seeds). Of the 87 *A. myosuroides* seeds, 34 tested as viable (39 percent). As an additional precaution, the farmer cordoned off the risk area and treated it with the pre-emergence herbicide terbuthylazine at 10 times the recommended rate. Follow-up surveillance at the site was discussed with the farmer. These urgent measures were considered sufficient to prevent the establishment of this biosecurity risk species. The event was reported to the MPI border teams to highlight the pathway risk of regulated black grass seed in machinery from the UK.

ESTABLISHMENT OF RISK ANTS PREVENTED

Ants were seen foraging in a bedroom three days after the resident had returned from a trip to Cambodia. When a backpack used was examined, numerous ants were found in the spine of a book that had been carried while in Cambodia. These ants were reliably associated with the book and not the backpack. All foraging ants were killed. The book and non-electronic goods were bagged and frozen as an added precaution. The room was sprayed liberally with domestic insecticide and examined frequently for ants. Sugary baits attracted one or two foraging ants over several days, but nothing more. The probability of ant dispersal beyond the bedroom was estimated to be very low. MPI examination of the book and ants determined the presence of major and minor workers of an unidentified *Camponotus* species (Hymenoptera: Formicidae), a genus of ants not present in New Zealand but considered a high risk. The relatively large number of ants examined included no soldiers. This fact, together with the apparent absence of a nest (larvae and pupal brood), suggests the ants were foraging in the backpack and book in Cambodia (possibly feeding on the glue in the spine of the book) when the backpack was uplifted and removed from the proximity if the nest, orphaning the workers. Nest absence indicates a low biosecurity risk but nevertheless the notifier was asked to report any further ants seen in the house that might indicate an established colony.

WOOD BORER BEETLE RULED OUT

A single beetle was found inside a box containing machinery imported from the UK. It was considered likely to be an exotic species, so it was reported to MPI and identified as *Arhopalus ferus* (Coleoptera: Cerambycidae), the burnt pine longhorn beetle, a species native to Europe and already established in New Zealand. No further action was considered necessary.

FRUIT PEST RULED OUT

A live insect was found inside the stone of a nectarine purchased a week previously. The fruit was imported from the USA. The insect was identified as the European earwig, *Forficula auricularia* (Dermaptera: Forficulidae). The earwig clearly gained access through a split in the fruit and the stone. This is a species already present in New Zealand, but also present in California, the source of the fruit. While it is possible the earwig was a contaminant originating from California, it is more likely to be a case of local contamination in the notifier's fruit bowl. No further action was considered necessary.

RISK BEETLE RULED OUT

Live insects were found associated with, and apparently in, a DVD player recently purchased and imported from China. A week after purchase the owner used the DVD player for the first time, and a large number of cockroach-like insects reportedly swarmed out of the unit. Domestic fly spray was used to kill the insects. Samples received by MPI were identified as *Phyllotocus macleayi* (Coleoptera: Scarabaeidae), a species known in Australia as the nectar beetle as it mainly feeds on eucalypt

flowers. *P. macleayi* is also present in New Zealand. What the association was with the DVD player remains unclear.

LAND SNAIL ESTABLISHMENT PREVENTED

A single large snail was found on leather fern (*Rumohra adiantiformis*) plant material imported from Florida for use by florists. It was caught and couriered to MPI for identification. The remainder of the shipment was checked but no further sign of snails was found. The snail was identified as the rosy wolf snail, *Euglandina rosea* (Gastropoda: Spiraxidae), a predator of other snails and slugs, and a native of tropical North America, including Florida. It was introduced to Hawaii as a biological control agent for giant African snail, but has subsequently been implicated in the extinction of native Hawaiian snails. It has become invasive elsewhere, but may be too tropical to establish in New Zealand. The notifiers examined all fronds in the shipment and found no evidence of any further snails that might have represented a systemic inspection failure. There are no other records of post-border interceptions of this species. *Euglandina* is a cross-fertilising snail that lays its eggs in soil rather than on cut foliage. The investigation was stood down as a likely case of a solitary hitchhiker.

MANTID INSECTS DETECTED

Live insects were found during a compliance check on a car newly imported from Japan. Described as many small "praying-mantis-like" insects, they were sent to MPI for urgent identification, but because they were immature life stages they could only be identified to family (Mantidae). However, as the insects were unlikely to be a species of New Zealand origin, the vehicle was MeBr-fumigated in an empty sea container that was moved to the vehicle compliance centre for that purpose. Prior dispersal of the mantids was considered unlikely as they were found inside the car, and the notifier had applied insecticide to the car after finding the insects.

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PEST WATCH: 5 NOVEMBER 2014 – 3 JUNE 2015

Biosecurity is about managing risks: protecting New Zealand from exotic pests and diseases that could harm our natural resources and primary industries. MPI's Investigation & Diagnostic Centres and Response (IDC & R) directorate devotes much of its time to ensuring that new organism records come to its attention, and to following up as appropriate.

This information was collected from 5 November 2014 to 3 June 2015. The plant information is held in the MPI Plant Pest Information Network (PPIN) database. Wherever possible, common names have been included. Records in this format were previously published in the now discontinued magazine *Biosecurity*.

To report suspect new pests and diseases to MPI phone 0800 80 99 66.

Validated new to New Zealand reports

Type	Organism	Host	Location	Submitted by	Comments
Fungus	*Alternaria arborescens* no common name	*Solanum betaceum* tamarillo	Auckland	Landcare Research (General Surveillance)	This fungus is commonly known as *A. alternata* f. sp. *lycopersici*. It is a recorded as a pathogen on tomato and many other plants that belong to different plant families *(e.g. Acer, Corylus, Juglans, Lycopersicon).*
Fungus	*Euoidium longipes* no common name	*Solanum betaceum* tamarillo	Bay of Plenty	IDC & R (General Surveillance)	This fungus is the causal agent of powdery mildew on tamarillo leaves. It is likely to have been present in NZ for some time.
Fungus	*Globisporangium mamillatum* no common name	Soil	Central Otago	IDC & R (General Surveillance)	This organism was obtained from a soil sample and not directly associated with any plant material.
Fungus	*Phytophthora bilorbang* no common name	*Fraxinus angustifolia* narrow-leafed ash	Auckland	IDC & R (General Surveillance)	Ash tree dieback symptoms were observed.
Fungus	*Pythium dissotocum* root rot	Soil	Gisborne	IDC & R (General Surveillance)	This organism was obtained from a soil sample.
Insect	*Hylaeus* (*Gnathoprosopis*) *euxanthus* bee	*Kunzea* sp.	Auckland	S. Thorpe (General Surveillance)	An Australian solitary bee.
Insect	*Phellopsylla formicosa* psyllid	*Eucalyptus saligna* Sydney blue gum	Auckland	IDC & R (General Surveillance)	First record February 2014. Nymphs also collected in Auckland in March 2014 on *Eucalyptus saligna*, as part of the MPI High Risk Site Surveillance programme.
Mite	*Melichares agilis* mite	n/a	Mid Canterbury	IDC & R (General Surveillance)	A predator of acarid mites. Associated with *Tyrophagus* sp. (Acari: Acaridae)
Viroid	*Peach latent mosaic viroid* PLMVd	*Prunus persica* peach	Hawke's Bay	IDC & R (General Surveillance)	Evidence indicates that this viroid has been present in peach trees since the 1950s.
Virus	*Cherry virus* A CVA	*Prunus* sp. flowering cherry (ornamental)	Auckland	IDC & R (General Surveillance)	No obvious symptoms were observed. *Cherry virus* A does not appear to cause any obvious symptoms, but when combined with other viruses it may have a synergistic effect.
Virus	*Grapevine Syrah virus-1* GSyV-1	*Vitis vinifera* grape	Mid Canterbury	IDC & R (General Surveillance)	Likely to have been in NZ for some time, but there are no clear associations between symptoms and GSyV-1 infection.

If you have any enquiries regarding this information please contact surveillance@mpi.govt.nz.

Veterinary Diagnostic Laboratories

GRIBBLES VETERINARY PATHOLOGY

- AUCKLAND
  Courier: 37–41 Carbine Road, Mount Wellington, Auckland 1060
  Postal: PO Box 12049, Penrose, Auckland 1642
  Tel: 09 574 4701 Fax: 09 574 5304

- HAMILTON
  Courier: 57 Sunshine Ave, Hamilton 3240
  Postal: PO Box 195, Hamilton 3240
  Tel: 07 850 0777 Fax: 07 850 0770

- PALMERSTON NORTH
  Courier: 840 Tremaine Avenue, Palmerston North 4440
  Postal: PO Box 536, Palmerston North 4440
  Tel: 06 356 7100 Fax: 06 357 1904

- CHRISTCHURCH
  Courier: 7 Halkett Street, Christchurch 8140
  Postal: PO Box 3866, Christchurch 8140
  Tel: 03 379 9484 Fax: 03 379 9485

- DUNEDIN
  Courier: Invermay Research Centre, Block A, Puddle Alley, Mosgiel, Dunedin 9053
  Postal: PO Box 371, Dunedin 9053
  Tel: 03 489 4600 Fax: 03 489 8576

NEW ZEALAND VETERINARY PATHOLOGY

- AUCKLAND
  Courier: NZCCM, Gate 2, Auckland Zoo, Motions Road, Western Springs, Auckland 1022
  Postal: PO Box 44 422, Point Chevalier, Auckland 1246

- HAMILTON
  Courier: Cnr Anglesea and Knox Streets, Hamilton
  Postal: PO Box 944, Hamilton
  Tel: 07 839 1470 Fax: 07 839 1471

- PALMERSTON NORTH
  Courier: IVABS Building, 1st Floor, Massey University, Tennant Drive, Palmerston North
  Postal: PO Box 325, Palmerston North
  Tel: 06 353 3983 Fax: 06 353 3986

To report suspected exotic land, freshwater and marine pests, or exotic diseases in plants or animals, call:

0800 80 99 66

Investigation and Diagnostic Centre – Wallaceville
66 Ward Street
Upper Hutt
Tel: 04 526 5600

Investigation and Diagnostic Centre – Tamaki
231 Morrin Road
St Johns
Auckland
Tel: 09 909 3568

Investigation and Diagnostic Centre – Christchurch
14 Sir William Pickering Drive
Christchurch
Tel: 03 943 3209

New Zealand Government

Ministry for Primary Industries
Manatū Ahu Matua