Surveillance

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Surveillance is published as the Ministry for Primary Industries' authoritative source of information on the ongoing biosecurity surveillance activity and the health status of New Zealand's animal and plant populations in both terrestrial and aquatic environments. It reports information of interest both locally and internationally and complements New Zealand's international reporting.

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Editorial

Then and now

Turn the clock back to the early 1970s. The Ministry of Agriculture and Fisheries (MAF) has an office in just about every provincial town, with farm and horticultural advisers who routinely speak to the local farmers and orchardists. An entomology technician settles down at a desk at the Advisory Services Division Plant Health & Diagnostic Station, which is spread between two buildings on the main street of Levin, 90 km north of Wellington. Entomology is upstairs above a chemist's shop in an old stone building, with three staff in small, dull rooms opposite a dentist. The plaintive wail of the drill accompanies labelling and putting insects on pins while trying to understand what the taxonomy of eriophyid mites and Psocoptera has to do with advice on producing more lambs, more milk, and growing better crops. Why would an institution whose primary purpose is advice to producers also be looking after plant quarantine for New Zealand?

Now move forward 40 years. The provincial offices and friendly MAF faces are long gone. Back then anyone could visit their local MAF office, have a chat and drop off a sample of strange insects, dying plants or squishy fruit for examination and testing. Countless institutional adjustments later, we have a very busy modern laboratory in Auckland and a satellite lab in Christchurch, with a clear biosecurity mandate to identify intercepted arthropods and other things of interest found at the border and from surveillance-related activity throughout New Zealand. If you find something that might be of interest, you can simply take a picture, dial 0800 80 99 66 on your cellphone, and send the photo through. Often an identification can be provided without needing to send a sample, but even if a sample is needed, courier services can get it to the laboratory overnight. Through initiatives like the Government Industry Agreement and Biosecurity 2025, producers are increasingly aware of biosecurity threats and know how to report things of possible concern in their crops. Future development even includes the possibility of automation, with robotics and machine-learning helping to clear identifications in cases where no further action is needed.

Given this institutional co-ordination to process incursion reports, surveillance for early detection is critically about being in the right place at the right time. How can this work? Looking specifically at plant biosecurity, New Zealand has an area of about 270,000 square kilometres, with about 25,000 species of land plants, 2,500 of them native, as potential hosts for new pests and pathogens. Auckland City, a focal point of ever-growing international trade and travel, is about 1,000 square kilometres in area, and along with our other towns has significant botanical diversity, with many good host plants. History tells us we have a recipe that is working well for detecting and eradicating fruit flies, gypsy moths and ants. But what about everything else?

The regrettable conclusion is that most of the exotic pests and diseases that make it past the border won't be found in time to eradicate them, so the best approach is to keep them out altogether. Some that get through find their way to the farm or orchard as first point of landing, and are therefore subject to industry-based vigilance, but most will first appear in our cities and towns where cargo is unloaded or where people unpack after arriving from overseas. Should we therefore place an emphasis on surveillance in our cities and towns, in our crops, pastures, forests and parks and reserves, or in all of these places? How can we separate out the things and places where specific investment will yield tangible benefits? How can we ensure that people report suspect new pests and diseases in a way that makes best use of our diagnostic laboratories and Incursion Investigators, and prevent overload with low-risk reports from well-meaning, concerned people? Many are mindful of these questions, including people in MPI, DOC, regional councils, industry and research.

Our biosecurity system contributes much to safe travel and trade, and improvement is constantly being sought through initiatives like Biosecurity 2025 and science programmes like Better Border Biosecurity and the Biological Heritage National Science Challenge. How do we drive scientific discovery to frontline application in this highly complex business, particularly when deployment can cost a lot more than demonstrating proof of concept – for example when deploying remote-sensing devices in insect traps? This takes skilled people who are thoroughly conversant with their work, the science that will help them, and the ability to get different parts of the system on side. Policy expertise is also critical if arguments for capital expenditure need to be formulated. This all calls for a diverse range of skills.

Core knowledge vested in biology and ecology is critical. Without taxonomy we can't identify things; without biosystematics we can't understand how organisms relate to each other and their global affinities; without accurate identifications we can't understand the biology and the causal dynamics of pest and disease problems. We can't hope to manage a problem effectively without a good understanding of the underlying ecology and epidemiology.

A risk of making institutional change is that skillsets and the need for good communication can end up being undervalued. Decades of primary production have resulted in an internationally recognised alignment of science-based skillsets that must not be overlooked. Animal production requires animal health and veterinary expertise; production of crops and pastoral farming require expertise in plant protection and integrated pest management; aquatic health requires people with freshwater and marine qualifications. Experts in all of

these areas will almost certainly confirm that they are working in multi-dimensional and multi-disciplinary space, and are unlikely to underestimate the complexity of the challenges they face. This includes the need to interact with the community.

They are also likely to confirm that, to be effective, they need a good view of the threats and emerging technologies and science, which includes what others in biosecurity are doing to address these things in their respective areas. For fruit fly, our practitioners should know about the arrangements that have been made to exclude the flies from entry pathways, our exposure levels, how to detect them at the border, how best to detect them in the surveillance system, and what needs to be in place in order to eradicate them as soon as they are found. MPI's current arrangements for preventing the establishment of fruit fly go back to the early 1990s, when a construct called Plants Biosecurity enabled straightforward communication throughout the system. As a result, a fully integrated system was able to be developed with minimal transaction costs. Quality assurance systems were developed for offshore treatment of commodities before arrival in New Zealand, and onshore for surveillance, response and eradication. These systems have now been tested and proven for more than 25 years.

Effective biosecurity relies on excellent communication along the whole chain, to provide New Zealand with integrated sets of measures that will help overcome biosecurity threats now and in the future. Institutional arrangements that keep things simple, and which support and enable skilled people to communicate and agree on what needs to be done about complex challenges, are most welcome.

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Quarterly report of diagnostic cases: July to September 2018

Gribbles Veterinary Pathology

Bovine

A farm in mid-Canterbury was experiencing an unusually high incidence of mastitis, with a significant proportion of the herd having high somatic-cell counts. Thirty milk samples were submitted to the laboratory for culture. *Streptococcus uberis* was isolated from two samples, there was no growth from six samples and five yielded no isolates of significance. However, 17 samples yielded growth of a *Prototheca* species. The isolate could not be speciated or further identified by MALDI-TOF testing. This was an outbreak of ***Prototheca* spp. mastitis.** *Prototheca* algae are widespread in moist environments and although initial infection is most likely to be from an environmental source, the infection is easily spread between animals when milking.

In another case, milk samples from two cows with clinical mastitis were received at the laboratory for culture. The cows were from a farm in the Rangitikei district. There was no growth from one milk sample but a *Prototheca* species was isolated from a second, resulting in a diagnosis of ***Prototheca* spp. mastitis**.

Two rising-2-year-old Friesian heifers from a farm in South Canterbury suffered fractures of the humerus. Liver copper concentrations in these two animals were found to be low at 16 and 28 umol/kg (adequate range 95–3,000). It was considered likely that **copper deficiency** during the growing period of these animals had significantly contributed to the poor bone strength that led to the fractures.

A 3-year-old female Friesian cross cow on a farm in the Waikato died about 8 hours after being seen eating salt. Before dying it became recumbent and displayed tremors and seizures. The serum sodium concentration was 203 mmol/L (reference range 136–146) and the chloride concentration was 173 mmol/L (reference range 90–104). A diagnosis of **salt toxicosis** was made. Other changes in the haematology and biochemistry were mild and not considered clinically significant.

A group of young calves under 5 weeks old in Southland were noted to be dull, lethargic, weak in the hindquarters and not drinking. Histological examination of the brain in two affected animals revealed scattered focal areas of neutrophilic and/or macrophagic inflammation, reactive capillary endothelial cells and a mild perivascular mononuclear cell infiltrate. The meninges had a widespread infiltrate of lymphocytes and histiocytes with fibrin effusion. There were occasional small foci of necrosis and some vessels had a fibrin-filled lumen. The lesions were typical of those caused by ***Chlamydophilia pecorum***, the aetiological agent of **sporadic bovine encephalomyelitis**, and the history of dull, lethargic and weak calves was also considered typical. Veterinarians treating similar cases in the past have reported that the most severely affected calves did not respond to treatment but those with early-stage disease responded well to tetracycline antibiotics.

Three calves under a week old on a Southland farm were noticed to have diarrhoea. Bacterial culture of faeces yielded a moderate growth of ***Salmonella* Bovismorbificans** and no other pathogens were detected on routine testing, supporting a diagnosis of **salmonellosis**. This is a relatively unusual isolate in calves of such young age.

There were a number of cases of disease associated with ***Salmonella* Brandenburg** in this quarter. In one Southland case 93 heifers were brought back to the home farm after grazing elsewhere. Two had aborted previously and another aborted 2 days after returning. Two more aborted in the following week, making a total of five. The veterinarian who was called to investigate noted that another heifer was sick, was not eating normally and had an autolysed fetus present in the uterus. Culture of the stomach contents of this fetus yielded a moderate growth of *Salmonella* Brandenburg.

Many cases of dystocia and abortion in heifers were diagnosed in July from Canterbury and the west coast of the South Island. In one episode, from South Canterbury, 20 out of 160 heifers were affected over a 3-day period and many required assistance to extract the fetuses. The heifers were bright and subsequently came into lactation. Histological examination revealed lesions in the placenta (massive bacterial colonisation of fetal villus capillaries and stroma) and ***Salmonella* Brandenburg** was readily cultured from the fetal stomach contents. The first report of *S.* Brandenburg abortion in cattle on the west coast of the South Island was in 2017. Cases from 13 farms have been recorded this year, mainly in the Hokitika area. Considering the abundant stock movement throughout New Zealand, this bacterium is very likely to have been carried to the North Island in clinically healthy cattle. Should the right environmental and host conditions occur on farms, outbreaks of *S.* Brandenburg infection may appear in the North Island in the future.

Testing of a group of Southland dairy cows with unknown history revealed liver selenium concentrations in three animals of 103,650, 90,230 and 121,400 nmol/kg (reference range 850–15,000). Concentrations above 32,000 nmol/kg are considered consistent with **selenium toxicity.**

Two heifers from a Northland dairy farm developed tachypnea and died four days after calving. At necropsy, the lungs of one heifer contained myriad scattered circular brown lesions < 1 cm in diameter. Histopathological examination revealed that these consisted of areas of necrosis, haemorrhage and inflammation associated with alveolar and intravascular fungal hyphae, consistent with a **fungal pneumonia**. This is commonly associated with placentitis caused by ***Mortierella wolfii***, although in this case normal, live calves had been produced and this may have been a primary respiratory infection (e.g. after exposure to mouldy silage).

On a Northland dairy farm, 15 out of 160 Jersey weaners had chronic ill-thrift and diarrhoea. Faecal samples consistently yielded growth of ***Yersinia pseudotuberculosis***. Strongyle eggs and coccidial oocysts were also consistently

seen, supporting a diagnosis of **combined yersiniosis, nematode parasitism** and **coccidiosis.**

Four of 16 beef cows from Northland aborted several months after purchase. One cow was presented with retained fetal membranes. Serology demonstrated ***Leptospira interrogans*** **serovar Pomona** MAT titres of 1:1,600 or more and ***L. interrogans*** **serovar Copenhageni** MAT titres of 1:800, supporting a diagnosis of **leptospiral abortion**.

Three neonatal Friesian cross calves from Northland developed diarrhoea within a few days of arriving in the rearing shed. Culture of a pooled faecal sample yielded growth of ***Salmonella*** **Bovismorbificans**. The faecal sample was also positive for rotavirus and ***Cryptosporidium*** by ELISA testing, supporting a diagnosis of **combined salmonellosis, cryptosporidiosis** and **rotavirus infection.**

A 5-year-old Friesian cow from Northland had acute watery diarrhoea and died within 48 hours. Necropsy revealed red intestinal discolouration suggestive of enteritis. Histopathological examination showed a suppurative gastroenteritis and necrosuppurative lymphadenitis with associated short Gram-negative bacilli, and a faecal sample produced growth of ***Salmonella*** **Bovismorbificans**, consistent with **salmonellosis**.

Three 1-week-old calves from the Taranaki district presented with seizures, dulled mentation and head-pressing. Histopathological examinations of two calves revealed **polioencephalomalacia**. In ruminants this can be caused by thiamine deficiency and also by sulphur, salt, or lead toxicity. In calves it is commonly associated with lead toxicity, or is occasionally seen when electrolyte solutions prepared on the farm have been administered to diarrhoeic calves.

A 2-year-old Friesian heifer from the Taranaki district was found to have multifocal raised 3–5-cm plaque-like lesions on the udder, escutcheon and flanks. Histopathological examination revealed sheets of large neoplastic lymphocytes infiltrating the dermis and epidermis. A diagnosis of **cutaneous epitheliotropic lymphoma** was made. In cattle there are two recognised lymphosarcoma syndromes: one caused by bovine leukaemia virus (that affects adult cattle) and one that is sporadic. Sporadic lymphomas manifest as three main subtypes and include juvenile, thymic and cutaneous varieties. The cutaneous form arises most commonly in cattle aged 1–3 years and is expected to be progressive.

Ovine

Two of 1,200 two-tooth ewes on a Southland property aborted. ***Campylobacter fetus*** **ssp.** ***fetus*** was isolated from fetal stomach contents, supporting a diagnosis of **campylobacterial abortion.** The ewes had not been vaccinated against this disease.

Thirty of 180 mixed-age ewes aborted on a small Southland property. None died and all appeared healthy after they aborted. There were no obvious lesions in the lambs on gross examination. Culture of fetal stomach contents for *Campylobacter, Salmonella* and *Listeria* spp. produced negative results. Histological examination of the brain revealed several small foci of white-matter necrosis, sometimes with mineralisation. These lesions were considered suspicious for **toxoplasmosis**, and subsequent PCR testing of fetal stomach contents was positive for ***Toxoplasma*** **spp**.

Several very young lambs less than 10 kg in bodyweight were found dead the day after tailing and vaccination on a North Canterbury property. They had been given a 5-in-1 clostridial vaccine that contained selenium. **Selenium toxicity** was suspected and this was confirmed after high liver selenium concentrations (73,620, 95,100 and 91,060 nmol/kg; reference range 450–9,999) were detected in three animals.

Three out of 700 ewe hoggets in North Otago were found dead. Histopathological examination of one revealed monophasic, multifocal myocardiocyte loss, degeneration and fibrosis. This lesion was suggestive of a cardiac insult, most likely toxic in origin. Although further investigations did not reveal the specific aetiological agent, differentials considered as the possible cause of the **toxic myocardial injury** included ionophore toxicity (e.g. monensin), cardiotoxic plants (e.g. avocado leaves, oleander, *Lantana* spp. and *Phalaris* spp.), sodium fluoroacetate (1080) and thallium.

Several mixed-aged ewes that were brought onto a farm in the Hastings area began aborting in the late stages of pregnancy. Their vaccination status was unknown. Histopathology on three of the aborted fetuses revealed a suppurative bronchopneumonia and hepatitis with intralesional rod-shaped bacteria. *Campylobacter jejuni* was cultured from the stomach contents, confirming the diagnosis of ***Campylobacter jejuni*** **abortion.** *C. jejuni* can be found in the intestinal tract of many animal species, including sheep, as well as in humans. It can be associated with abortions in sheep when naive stock are exposed to it during pregnancy. This species of *Campylobacter* is a much less common cause of ovine abortion than *C. fetus* ssp. *fetus.*

A single rising-1-year-old Merino ram hogget from a group of 600 on an extensive Otago property was noticed to have crusts around the face. About a week later the whole muzzle, ears and dorsal fleece appeared affected by an exudative dermatitis with extensive crust formation. The distal limbs and ventrum were unaffected. The "paintbrush" appearance of the fleece and the raw skin underneath led the attending veterinarian to suspect lumpy wool disease. The ram had an elevated body temperature (40.5 °C). A few others in the same group were noticed at that stage to have similar though less severe and less extensive lesions. Scab material was submitted to the laboratory for examination but no ectoparasites were seen. However, large numbers of organisms consistent with ***Dermatophilus congolensis*** were seen after methylene blue staining, confirming a diagnosis of **dermatophilosis.**

Six ewes in a flock of 45 on a Canterbury property aborted and samples were received from one aborted lamb. No bacteria were grown from the stomach contents. Histological examination of the brain revealed focal lesions of encephalitis, with a protozoal cyst visible in one of the foci, and there was leukomalacia. The placenta had multiple foci of necrosis and mineralisation. The brain and placental lesions were typical of those seen in ***Toxoplasma*** **abortions**.

Camelid

An 18-month-old alpaca from Northland had bilateral hindlimb weakness, lameness and poor body condition. There had been no recent vitamin supplementation. Significant changes

in serum biochemistry included low phosphate (0.2 mmol/L; reference range 1.35–2.8) and calcium (1.87 mmol/L; reference range 2.14–2.49). Serum vitamin D3 was quantified by a reference laboratory as 10 nmol/L. This was suggestive of **vitamin D deficiency** since one study established a reference range of 50–200 nmol/L for serum vitamin D3 in alpacas (Gerspach, 2010).

A 15-month-old alpaca from the Auckland region developed pale mucous membranes, tachycardia, tachypnoea and recumbency. It then died despite supportive care. Significant changes noted in blood samples collected before death included a low haematocrit (0.05; reference range 0.21–0.41), low haemoglobin (18 g/L; reference range 97–165) and a low red blood cell count (2.24 x 10^{12}/L; reference range 9.25–5.45 x 10^{12}). Microcytosis and hypochromasia were also noted on microscopic examination of a blood smear and albumin was low at 15 g/L (reference range 34–44). These changes were considered consistent with chronic blood loss and supported a diagnosis of **haemonchosis**, which had been suspected from history and the clinical signs.

A 6-month-old alpaca from the Auckland region was lethargic and losing weight. Haematological examination showed a neutrophilia (18.9 x 10^{9}/L; reference range 3.1–14.4) and significant changes in serum biochemistry included increased creatinine (1,182 µmol/L; reference range 60–145) and urea (66.9 mmol/L; reference range 4.1–9.8). She was treated with fluid therapy and other supportive care including oxytetracycline, but 2 days later her azotaemia had worsened (creatinine 1,195 µmol/L and urea 80.3 mmol/L). The alpaca was euthanased and samples were collected for histopathology, which showed a severe **tubulointerstitial nephritis** with intratubular spiral-shaped bacteria visible on silver staining, consistent with **leptospirosis**.

Caprine

An adult doe from the Auckland region was quiet, depressed, anorectic and thin. The right udder was swollen and clotted purulent material could be expressed from the gland. ***Mannheimia haemolytica*** was cultured from a sample of this material, consistent with ***Mannheimia*** **mastitis**, which has been previously described in sheep and goats.

A 1-year-old crossbred goat from the Auckland region was losing hair on the abdomen and legs. It was pruritic and scabs were seen in the affected areas. A hair sample contained ***Psoroptes*** **sp. mites**, consistent with **psoroptic mange**.

A Saanen goat from the New Plymouth area was presented for veterinary examination as it was acutely unwell a couple of days after kidding. It was ataxic, uncoordinated and had dull mentation. There had apparently been several other similar cases on the farm but these had not been investigated. Histopathological examination of the brain revealed a suppurative **meningoencephalitis** of the brainstem consistent with a diagnosis of **listeriosis.**

Cervine

Three 2-year-old red deer hinds from a South Canterbury property died suddenly 2 days after being given an injectable copper supplement. At necropsy the carcasses were noted to be jaundiced and haemorrhages were also seen. Histological examination of the liver revealed acute periacinar and mid-zonal necrosis, typical of a toxic injury. Kidney copper concentrations in three animals were 212, 642 and 410 umol/kg (reference range 0–157), supporting the clinical suspicion of **acute copper poisoning.**

Multiple large **biliary cysts** were present throughout the liver from a deer of unknown age that was slaughtered and inspected at a South Canterbury meat processing plant. Grossly, the cysts strongly resembled hydatid cysts but histologically they were lined with biliary epithelium and were not parasitic, ruling out hydatid disease.

Three tail-end (poorer growing) fawns on a central Canterbury deer farm were lame and had enlarged joints. The most severely affected animal was euthanased. Its bones were submitted for histological examination and its liver for copper determination. Histologically, the bones had lesions typical of **osteochondrosis** and the liver copper concentration was low at 77 umol/L (reference range 110–2,000).

Equine

A horse in Southland presented with a 30x20x10-mm ovoid cutaneous mass in the girth area. Histopathological examination revealed numerous neoplastic mast cells, demonstrating that this was a **mast cell tumour**. These are usually benign tumours in horses.

Avian

A 1-year-old peacock from Southland presented with chronic weight loss and lethargy over the previous month. The peacock was part of a group of six, two of which had recently died. The peacocks shared an outdoor area with many ducks, pigeons, pheasants and chickens that had no reported health concerns. On clinical presentation, the bird was bright, alert and responsive, but very underweight (body condition score 2/9). No discharges were present around the eyes, mouth, nares or cloaca, and the hydration level was appropriate. The bird was euthanased and on necropsy the skin and body fat were very yellow. The crop and gizzard were full of ingesta. The caeca were very thickened, with a thick plaque lining the lumen. Histological examination revealed that the mucosa of the caeca was ulcerated and glands were markedly reduced in number. There was a marked transmural infiltrate of macrophages, plasma cells and (fewer) neutrophils, admixed with abundant oval protozoa. A core of necrotic debris was present in the lumen. The morphological diagnosis was marked transmural histiocytic inflammation with intralesional protozoa, consistent with ***Histomonas meleagridis*** **infection.** The caeca are the classic site for this disease and the organisms may spread via the portal system and produce lesions in the liver. The organisms are transmitted between birds in the eggs of the nematode parasite ***Hetarakis gallinarum***. Chickens can get this disease but are more resistant than other birds, and they may be a source of protozoa for other avian species. The protozoa can survive for long periods in the soil.

There was an increased mortality rate in one pen of 10-day-old chicks from the New Plymouth area. The drinker line had apparently malfunctioned, leading to dehydration. Necropsy revealed that some of the chicks had lesions consistent with **visceral gout.** Histologically there was evidence of tubular degeneration and necrosis, with intralesional urate tophi, which confirmed the diagnosis. One of the main causes of visceral gout in birds is impaired urate excretion caused by dehydration.

A 2-year-old male great spotted kiwi (*Apteryx haastii*) from a wildlife reserve

in Canterbury had white plaques on both the upper and lower bill. The bird had a history of candidiasis and had last been treated for this 6 months previously. Examination of Gram-stained smears from both the upper and lower bill showed large numbers of yeast cells that were morphologically consistent with *Candida* spp., and ***C. albicans*** was isolated on fungal culture, confirming the clinical suspicion of **candidiasis.**

A juvenile female swamp harrier (*Circus approximans*, also known as Australasian harrier or kahu) was presented to a South Canterbury veterinarian with neurological signs, and **lead poisoning** was suspected. The blood lead concentration was 0.38 mg/L. It received chelation therapy using calcium EDTA for 5 days, as well as fluid therapy. Two days after her last treatment the blood lead concentration was re-tested and found to be 0.23 mg/L. Although no locally validated reference range for this species is available, in general terms a blood lead concentration of 0.2 mg/L or more suggests acute lead toxicity if there are supportive clinical signs. Also, when monitoring blood lead during treatment, the aim is usually to reduce the concentration to < 0.05 mg/L because the concentration may increase slightly on cessation of therapy (Dumonceaux & Harrison, 1994). A study of 25 swamp harriers presented to a wildlife clinic in 2005 and 2006 with a variety of signs including clenched feet revealed that they had a mean blood lead of 0.806 mg/L (s.d. 1.155, range 0.014–3.7). These results could not be used to determine a reference range as all these birds were sick, but it was noted that six birds with clenched feet had significantly higher mean blood lead concentrations (2.35 mg/L, s.d. 1.179) than the 19 birds without clenched feet (0.318 mg/L, s.d. 0.589) (Youl, 2009).

Two separate cases from a Nelson zoological park involved red-crowned parakeets/kakariki (*Cyanoramphus novaezelandiae*) that had died suddenly. Both birds had small white-to-yellow foci disseminated throughout the liver, and histologically these lesions were large aggregates of Gram-negative bacteria or areas of acute necrosis with large bacterial aggregates. The lesions were considered typical of **yersiniosis.** ***Yersinia pseudotuberculosis*** was cultured from a sample of fresh liver.

Canine

A six-year-old female Border Collie from Southland had surgery on its foot. Twelve days later there was a distinct swelling over the tarsal region, with pitting oedema, and the veterinarian suspected that it could have a bacterial infection. An aspirate from the affected area yielded a light, pure growth of ***Staphylococcus aureus***, which was sensitive to enrofloxacin, neomycin and trimethoprim/sulphamethoxazole and resistant to amoxicillin/clavulanic acid, cephalothin and polymyxin B. It was also resistant to cefoxitin, which is the method used for screening for methicillin/meticillin resistance at this laboratory. This suggests that the isolate was a **methicillin-resistant *Staphylococcus aureus* (MRSA).** This is rarely seen in *S. aureus* at this laboratory.

An adult cattle dog from Northland had a history of several weeks of diarrhoea with urgency. A faecal sample was positive for ***Giardia*** antigen by ELISA. The sample also contained ***Trichuris*** eggs (1,850 eggs per gram), consistent with **combined giardiasis** and **whipworm infection**.

A 9-year-old male Staffordshire Bull Terrier presented with a history of atopy and severe pododermatitis with associated bacterial infection. A skin swab collected for culture and in pure growth this yielded a *Staphylococcus* sp. whose characteristics were consistent with the *S. intermedius* group, most likely *S. pseudintermedius*. The isolate was resistant to oxacillin, which is the method used at this laboratory to screen for methicillin/meticillin resistance (i.e. it was a likely methicillin-resistant *Staphylococcus pseudintermedius* or MRSP). This was a **multi-drug-resistant and methicillin-resistant *Staphylococcus pseudintermedius* (MRSP)** isolate, which was sensitive to polymixin B, fusidic acid, rifampicin, chloramphenicol and amikacin. It also had intermediate sensitivity to neomycin, but was resistant to amoxicillin/clavulanate, cephalothin, enrofloxacin, trimethoprim/sulphamethoxazole, ciprofloxacin, marbofloxacin, clindamycin, tetracycline, gentamicin and cefovecin.

A faecal swab was received from a 6-month-old male Labradoodle (Poodle/Labrador cross) from the Christchurch area, which had diarrhoea. ***Salmonella* Brandenburg** was isolated. This is a common isolate in sheep and cattle but unusual in dogs. It was speculated that the dog might have acquired this infection by having access to a farm or farm animals or from consuming raw meat, but no further history was available.

Feline

A 3-year-old Domestic Shorthaired cat of unspecified sex from the Christchurch area was presented for veterinary examination after vomiting and diarrhoea of 24 hours' duration. On examination the cat was found to be pyrexic and it had abdominal pain. Worms were visible in the faeces. The cat had a history of being a keen hunter. A faecal egg count revealed ascarid eggs (100 eggs per gram), confirming a roundworm infection. Additionally, a *Salmonella* species was isolated from enrichment culture and identified as ***Salmonella* Typhimurium phage type 56**, confirming a diagnosis of **combined salmonellosis** and **ascarid parasitism**. Salmonellosis secondary to predation or scavenging of wild birds has been called "songbird fever". However, illness in cats after eating bird carcasses can also be due to toxicosis and infection by a variety of other agents.

Piscine

A captive adult blue maomao (*Scorpis violacea*) from the Auckland region was found dead. Necropsy revealed dorsal subcutaneous haemorrhage. Histopathology of multiple tissues revealed ulcerative and necrotising dermatitis and myositis with intralesional and intravascular bacilli, and necrotising splenitis with bacilli. ***Vibrio* spp.** bacteria were cultured from the subcutis, consistent with **vibriosis**. This is primarily a disease of marine and estuarine fish, both in commercial production systems and natural waters, and is seen throughout the world. Stress and overcrowding can be associated with outbreaks of disease.

Antelope

A waterbuck (*Kobus ellipsiprymnus*) from a Canterbury wildlife reserve was found to be off-colour in the morning and was recumbent and grunting in the afternoon. It was found dead the next morning. There were no gross lesions. Histological examination revealed subtle lesions of lymphocytic phlebitis in the liver and even more subtle lesions

in other tissues such as the lung and kidney. These changes raised suspicions of **malignant catarrhal fever.** An EDTA blood sample tested positive by PCR for **ovine herpesvirus-2**, the agent causing malignant catarrhal fever in New Zealand.

New Zealand Veterinary Pathology

Bovine

An individual mature KiwiCross dairy cow from a farm in the Matamata-Piako district was noted to be trailing the mob and was repeatedly last out of the paddock. She was found to be inappetant, with foul-smelling, watery scour, and was not pyrexic at the time of examination. Faecal culture yielded a growth of ***Salmonella* Typhimurium**. This is one of the most common serovars of *Salmonella* isolated from dairy cattle with diarrhoea.

An adult dairy cow from Manawatu became recumbent immediately after calving. Serum biochemistry from a pre-treatment sample revealed marked hypocalcaemia (0.96 mmol/L; reference range 2.00–2.60), and marked hypophosphataemia (0.16 mmol/L; reference range 1.1–2.8). A diagnosis of **milk fever** was made. The cow had been treated empirically for presumed milk fever, and post-treatment serum biochemistry showed improvements in calcium and phosphate levels, at 1.58 and 1.02 mmol/L respectively. It is an indication of the severity of changes in this case that parameters were still decreased after treatment; it is quite common for reference labs to receive samples from down cows showing hypercalcaemia that, in an absence of a treatment history, is generally assumed to be iatrogenic.

Five of a group of 170 calves in Waikato region were affected with diarrhoea and four had died. Faecal culture isolated ***Salmonella* Bovismorbificans**, giving a primary diagnosis of **salmonellosis**. However, low to moderate numbers of cryptosporidia were also noted on faecal examination, so it is possible that **cryptosporidiosis** was contributing to diarrhoea in these animals. In another case, from the Manawatu, *S.* Bovismorbificans was also isolated on faecal culture from three mixed-age scouring Friesian cows, and there was also a severe outbreak of scours in 1–2-week-old calves from the Carterton area. In the lattermost case, intestinal histopathology from two affected calves revealed severe **enteritis**.

Four 3-year-old KiwiCross dairy cows from a group of 560 in the Waikato presented with inappetence and decreased milk production. Routine serum biochemistry from one affected cow revealed hypoproteinaemia (total serum protein 55 g/L; reference range 60–86) and a mild hypoalbuminaemia (21 g/L; reference range 23–38). Creatinine was low at 44 umol/L (reference range 55–130), consistent with poor body condition. Subsequent ELISA testing for **Johne's disease** was positive, confirming underlying ***Mycobacterium avium* ssp. *paratuberculosis*** infection. This was a frequent diagnosis in cases of ill-thrift and scouring in many regions this quarter.

Two 2-week-old calves from a group of 90 in the New Plymouth district presented with scouring. Faecal culture yielded ***Campylobacter jejuni*** in both animals. This organism can cause thick, mucoid diarrhoea, often with blood flecks, but may also be isolated incidentally as a commensal in many species. There is potential for zoonotic transmission.

Rising-1-year bulls presented with evidence of enteritis with deaths in South Wairarapa. Faecal culture yielded a growth of ***Yersinia pseudotuberculosis***. **Yersiniosis** is particularly prevalent in weaned calves, yearlings and young adults; clinical disease is more common during the winter and spring months. Environmental or management stress factors tend to be associated with the disease.

A recently-calved 2-year-old crossbred cow from Manawatu presented with pallor, jaundice and an elevated heart rate of 130 bpm. The animal had been grazed in Hawke's Bay over the previous summer months. Severe **anaemia** was diagnosed, with a haemoglobin result of 32 g/L (reference range 85–130) and haematocrit of 0.12 (reference range 0.24–0.40). ***Theileria orientalis* Ikeda** was identified by PCR on whole blood.

A farm near Invercargill area had 10–15 calves die and another 30–40 affected with scours. Faecal culture from four affected calves yielded ***Salmonella* Brandenburg** in all samples. In addition, some of the four calves also had light to moderate numbers of ***Cryptosporidium* sp.**, and one was positive for **rotavirus**. **Salmonellosis** was considered to be the primary disease process in this outbreak, although **cryptosporidiosis** and other enteric pathogens may also have been contributing to scours. ***Salmonella* Brandenburg** was also isolated from several scouring calves < 1 week old from the Ashburton district.

A 2-month-old female Jersey calf from a farm in the Matamata-Piako district presented with blindness, and was noted to be slightly ataxic. Blood lead was measured at > 0.60 mg/L. Blood lead levels > 0.35 mg/L are considered to be consistent with **lead poisoning** in cattle, which explains the clinical presentation in this case. Two other calves had also been found dead the previous week, but samples were not collected.

A farm in the Hauraki district experienced an outbreak of conjunctivitis affecting Red Devon cross calves, most of which were under 5 days of age. ***Moraxella bovis*** was isolated from conjunctival swabs collected from two affected calves less than 2 days old. In addition, the serum IgG in both calves was marginally decreased, at 1,190 and 1,275 mg/dL (adequate for this age group > 1,600), raising the possibility that some degree of failure of passive transfer may have been contributing to the outbreak.

A 7-year-old dairy cow from the Hamilton area had a history of mastitis affecting multiple quarters, with no response to oxytetracycline treatment administered by the owner. Mild samples from two affected quarters were submitted, and ***Aspergillus* sp.** was isolated from both samples, warranting a diagnosis of **mycotic mastitis**. This is an occasionally reported cause of mastitis, and has been considered a potential contaminant that may be introduced into the teat when prophylactic dry-cow antibiotic treatment is used without adequate hygiene (Thompson et al., 1978). It is not known whether dry-cow treatment was used in this cow.

A 6-year-old Friesian cow from the Matamata-Piako district presented with severe metritis and pneumonia about 5 days post-calving. She was the second of three animals affected from a group of 200 at risk. A severe inflammatory leukogram was evident with neutropenia

(in-house results) but signs were unresponsive to antibiotic treatment. A postmortem was performed and lung histology revealed acute fibrinopurulent inflammation with haemorrhage and visible fungal hyphae, warranting a diagnosis of **mycotic pneumonia**. Fungal culture isolated ***Mortierella wolfii***, an organism classically associated with mycotic abortion and subsequent development of maternal pneumonia. Poorly preserved silage is a risk factor and can lead to outbreaks of an otherwise usually sporadic disease.

Ovine

Several sudden deaths occurred in mature Romney ewes on a Wairarapa farm. Ten of 5,000 animals had died prior to submission of intestinal contents from a dead ewe for culture. A moderate growth of ***Salmonella*** **Hindmarsh** was isolated. This is a common cause of **salmonellosis** recognised as a cause of death in ewes, with some animals dying before the development of characteristic scours.

Caprine

A single 3-year-old female goat from the Hamilton area presented with recumbency and unspecified nervous signs followed by death. Post-mortem examination revealed peritoneal, pleural and pericardial effusions with fibrin strands and an enlarged, flaccid heart with a thin left ventricular wall. Histologically, the myocardium showed multifocal replacement of cardiomyocytes by loose fibrous connective tissue with scattered fibres showing enlarged and irregular nuclei. Small amounts of fatty and lymphocytic infiltration were also noted. A diagnosis of **chronic dilated cardiomyopathy** was made. Additional findings in other organs included hepatic centrilobular degeneration and necrosis (likely due to passive congestion), and nodular areas of chronic inflammation in the lung with intralesional nematode larvae and adult nematodes in small bronchioles (likely ***Dictyocaulus*** **sp**.). Dilated cardiomyopathy is rarely reported in goats, but a report describes histologically similar lesions in two adult female goats and notes the similarity to lesions in adult cattle with dilated cardiomyopathy (Tontis et al., 1992).

Equine

A 1-year-old Thoroughbred filly from Manawatu presented for surgical management of a bone sequestrum involving a hindlimb splint bone. Culture of a swab from a pocket around the sequestrum yielded a heavy growth of ***Bacteroides*** **sp.** Bone sequestra often form in the distal limbs of foals, secondary to traumatic injury to the bone and periosteum, other penetrating wounds, or following bacteraemia. Mixed infection is often present in cases of **septic osteitis** initiated by trauma, suggesting that **bacteraemia** may have been involved in this case.

In the Waipa area, a single 3-year-old female Thoroughbred from a group of 15 had a 3-week history of coughing with increased mucus production. Tracheal wash cytology yielded a high-cellularity sample with the majority of neutrophils accompanied by intracellular and extracellular coccoid bacteria. Culture yielded a heavy growth of ***Streptococcus equi*** **ssp.** ***zooepidemicus***. This organism is commonly isolated from healthy animals, but the heavy growth combined with the cytological findings indicate this was likely a significant infection.

Avian

A backyard chicken in the Auckland region presented with increased respiratory effort, cyanotic mucous membranes and a distended abdomen. Post-mortem examination revealed ascites and a dilated heart. Histopathology of the heart and liver revealed fatty infiltration of the outer half of the ventricular wall. These findings are suggestive of **ascites syndrome**, an entity usually seen in fast-growing broiler chickens. The underlying cause is thought to be multifactorial, likely involving interactions between dietary, environmental and genetic factors. Other cardiomyopathy would be expected to produce similar changes, and cannot be entirely ruled out in this case.

SVS Laboratories

Bovine

Several cases of **brassica-associated liver disease** (BALD) were diagnosed over the season. In one case, in the Gisborne district, a mob of yearling beef steers had been allowed limited daily access to a rape crop over a period of 8 weeks. The farmer increased the grazing period in order to finish off the crop, but within 48 hours of doing so, several steers stopped grazing and became lethargic. The two worst-affected steers had tongue ulcerations and one had severe muzzle ulcerations (**Figure 1**). Blood samples from three steers submitted for clinical pathology showed evidence of marked cholestasis and hepatocellular injury, with severely increased GGT (2,367 IU/L; reference range 1–36) and markedly increased GLDH (769 IU/L; reference

Figure 1: Severe muzzle ulceration, the result of secondary photosensitisation caused by brassica-associated liver disease (photo: Dr. Theresa Hoyle)

range 8–41). The case was referred to Mark Collett at Massey University, who co-ordinates the "No Cost to Farmer BALD cases" programme in collaboration with PGG Wrightson (who are primarily investigating the 2018 swede crop issue, but are also investigating some other crops, such as the rape variety that was involved in this case). BALD is linked to the hepatotoxic effects of high concentrations of **glucosinolates**, which become more concentrated in the flowers and seeds of brassica plants (M. Collett, pers. comm.). It was noted that the crop in this case had begun to flower, which together with the increased grazing access would have led to increased consumption of glucosinolates.

Seven late-term abortions occurred in mature cows over a month in a 750-cow Waikato dairy herd. Fetal and placental samples from one cow were submitted for histopathology. Cotyledonary necrosis with marked suppuration and large numbers of fungal hyphae was seen, consistent with a **fungal placentitis** as the cause of abortion. Fetal lesions included sinusoidal neutrophils in the liver and pulmonary interstitial neutrophilic aggregates, consistent with systemic fetal infection. PCRs for definitive fungal identification were not requested. Consumption of silage spoiled by recent flooding was a likely source of fungal infection.

Six cows died and 10 were blind and recumbent on a dairy farm in Bay of Plenty. Lime sulphur spray had been applied to pasture 10 days before the onset of clinical signs. An increase in sulphur intake increases the need for thiamine (Apley, 2014) so the brain from one cow was submitted to look for histologic evidence of thiamine deficiency. The cerebrum showed extensive diffuse cerebrocortical necrosis, confirming **polioencephalomalacia**.

Several cases of inadequate colostral management in calves led to **failure of passive transfer** and deaths secondary to **enteric infections**. In one case, calves less than a week old were dying on a dairy farm in the Matamata-Piako district. Blood samples from two sick calves tested for serum IgG showed extremely low levels (24.9 and 24.1 mg/dL; < 400 mg/dL indicates failure of passive transfer and > 800 mg/dL is adequate). It was considered that the use of teat seal for dry cows might have been a factor in the calf colostral management.

In a second case, involving deaths of young calves in Waikato, failure of passive transfer was associated with poor colostral quality after a sample was found to have only 444 mg of IgG per dL. Good-quality colostrum should have a level > 5,000.

Eight of 24 milk samples submitted from a Matamata-Piako dairy farm for **mastitis** cultures yielded ***Prototheca* spp**. Environmental contamination was the likely original source of infection, but cow-to-cow transmission may also occur, particularly via contaminated milking equipment. These algal infections of mammary tissue can cause high somatic-cell counts and do not respond to treatment, so culling of infected cows is required.

A known error in feed formulation leading to a monensin overdose caused weight loss and death of a Jersey cow from a Waikato herd. Necropsy tissues submitted for histopathology showed typical lesions associated with **monensin toxicity** in cardiac and skeletal muscle (biceps femoris, diaphragm), including myocardial degeneration/necrosis and skeletal muscle degenerative/regenerative findings. Secondary changes caused by compromised cardiac output included pulmonary congestion and hepatocellular centrilobular vacuolation.

A cow in the Matamata-Piako district presented with a swollen head ("trumpet head"), nasal discharge and enlarged submandibular lymph nodes, and it was unresponsive to oxytetracycline treatment. The cow was sent to a processing plant, from where the head was submitted to SVS Labs for necropsy examination. The skinned head had numerous pale subcutaneous nodules up to 25 mm in diameter with grey/green inspissated pus on cut surfaces. There were ulcerations of the muzzle and a bilateral suppurative nasal discharge. Examination of the oral/pharyngeal region showed copious bright yellow exudate over the gums and hard and soft palate, as well as enlarged, yellow discolouration of the tonsils, retropharyngeal lymph nodes and parotid salivary glands. Histopathology confirmed a **nodular granulomatous inflammation, tonsillitis, lymphadenitis and sialadenitis**. Cultures of the nodules and pharyngeal tissues yielded pure, heavy growths of ***Actinobacillus lignieriesii***, a well-known oral-cavity opportunist causing granulomatous glossitis (woody tongue) and stomatitis. The subsequent proliferation of the bacteria was likely due to orolingual abrasions from coarse plants or soils. This case showed more extensive tissue involvement and exudation than is usually seen, and may have been related to generally poor nutritional management that forced the cow to graze unsuitable coarse or thorny forage.

Two young dairy calves (2 and 4 days old) in the Buller district were found moribund during a daily routine calf check. Both had been born healthy and were stomach-tubed with colostrum during the first 12 hours. Following euthanasia, on-farm necropsies revealed peritonitis, pleurisy and hyperaemic intestines. There was no gross evidence of oesophageal injuries from stomach tubing. Tissues were submitted for histopathology, which revealed extensive hepatocellular necrosis in one calf and diffuse marked hepatocellular vesiculation in the younger calf, both consistent with severe acute hepatotoxicity. Other findings included peritonitis (without intestinal mucosal pathology) and pleurisy (without oesophageal tubing injury), which raised the suspicion that the animals had ingested caustic chemical residues from within the stomach tube. Further questioning revealed that the stomach tubes had been washed with dairy-shed **sodium hypochlorite** solution to remove the high-fat colostral residues and prevent bacterial buildup, but had not been thoroughly rinsed. As a result, some of the chemical had remained in the tube and was ingested by the calves, causing the **acute toxicosis** observed.

Between 40 and 50 young Jersey calves (less than a week old) on a Waikato dairy farm were found recumbent, and a further 20 had become ataxic a few hours after being fed colostrum that was stored in a well-stirred, chilled vat. On clinical examination the calves were non-pyrexic, showed tachycardia/tachypnoea, and were ataxic and weak when helped to stand. Owing to the slightly fermented smell of a colostrum sample, **ethanol toxicity** was suspected and confirmed on testing two calves for serum ethanol (82 and 77 mmol/L; Waikato Hospital reference levels > 60 indicate a comatose state in human subjects). Despite the chilling and stirring of the colostrum,

sufficient fermentation had occurred to intoxicate these highly susceptible young calves. Fluid therapy was administered and all calves recovered uneventfully within 24–48 hours. Subsequently, fresh colostrum was fed to these calves and a colostral keeper was added to later batches.

Equine

A neonatal Thoroughbred foal in Waikato presented with marked mucous-membrane petechiations and a fluctuant supra-ocular swelling, but was otherwise normal and feeding well. Blood samples submitted for haematology revealed marked thrombocytopaenia (a smear estimate had to be made owing to clumping: 10–20 x 10^9/L; reference range 140–315 x 10^9.) An **immune-mediated thrombocytopaenia** was suspected and in the absence of any suspicion of viral infection in either foal or mare, an alloimmune thrombocytopaenia caused by colostral anti-foal-platelet antibodies was considered most likely. The foal was fed a commercial colostrum replacement to prevent further ingestion of the antibodies, and platelet levels returned to normal within 2 weeks. This condition is rare in horses.

A Thoroughbred mare in Waikato presented with a 5-cm ulcerated lip lesion extending through the mucosa to the haired skin. A biopsy was submitted for histopathology, which revealed Pautrier's microabscesses within the stratum spinosum, composed of neoplastic lymphocytes extending into and effacing the architecture of the dermis and subcutaneous tissues. **Epitheliotropic lymphoma** (**mycosis fungoides**) was diagnosed. This neoplasm is rare in the horse, though a higher incidence is reported in Thoroughbreds and Quarter horses. Initial clinical signs are often a reddened plaque mouth lesion (that does not blanch with pressure), sometimes in association with a mild lymphadenopathy. Metastasis to the viscera usually occurs and later evidence of leukaemia may arise (Sezary syndrome).

Two unrelated cases of **clostridial enteritis** in young Thoroughbred foals in Waikato were diagnosed by PCR for ***Clostridium difficile*** toxins A and B in faeces. Both cases went on to develop jugular thrombophlebitis at the site of indwelling catheters, followed by joint infection. In one foal, cytological evaluation of synovial fluid from the affected left-fore-fetlock joint confirmed the diagnosis of **septic arthritis**. Cultures of synovial fluid from the affected joints of both foals yielded heavy growths of ***Staphylococcus aureus***, which was considered to have spread haematogenously from infection of indwelling catheters (although samples from these were not cultured). Sluggish blood flow and decreased oxygen tension in the capillary network supplying the foals' synovial membranes, epiphysis and metaphysis encourage the proliferation of bacterial growth at the chondro-osseous junction (Glass & Watts, 2017). Transphyseal vessels do not close in foals until about 10 days after birth, meaning that the synovial/epiphyseal blood supply also supplies the metaphysis, and septic foci can settle in any of these areas. In young foals, multiple joints are often affected.

Porcine

Pasture-raised 6-month-old gilts from Waikato presented with ongoing lameness, reluctance to stand and a shortened stance. Limb radiographs showed multiple fractures. Ribs submitted for examination had a rachitic rosary at the costochondral junction and were easy to bend. Histopathology confirmed failure of endochondral ossification and osteoporosis, characterised by irregularly thickened physes as well as thinned, discontinuous trabeculae and medullary fibrosis, consistent with **rickets** and **osteoporosis**. The diagnosis was **nutritional bone disease**, which can be caused by vitamin D, calcium and phosphorus deficiencies or imbalances. Phosphorus deficiency is more commonly reported in pasture-raised pigs. The pain of bearing weight on poorly calcified bones causes lameness, reluctance to move and limb fractures.

Weanling pigs from the Matamata-Piako region presented with coughing, weight loss, inappetence and death. Histopathology on submitted necropsy tissues revealed granulomatous, eosinophilic **bronchopneumonia**, in association with intraluminal nematodes whose morphologic characteristics were consistent with ***Metastrongulus* spp.** Larvated oocytes were occasionally free in the lumen of bronchi or admixed with inflammation. *Metastrongylus* spp. are porcine respiratory tract parasites that require earthworms as the intermediate host. Infection therefore occurs mainly in pasture-raised stock, notably on organic farms and lifestyle blocks.

Avian

Avian **malnutrition** was diagnosed by microscopic evaluation of Gram-stained faecal smears of multiple caged psittacines from Bay of Plenty and Waikato. Normal intestinal flora of psittacines consists mostly of Gram-positive rods, with smaller numbers of Gram-positive cocci. An increase in Gram-negative rods and yeasts seen in these birds indicated an imbalance of the intestinal microflora resulting from an incorrect diet. Malnutrition is not uncommon in psittacines fed all-seed diets, and faecal Gram staining is an important routine part of the complete evaluation of this group of birds (though it is not applicable to other groups, including poultry).

Another psittacine from Waikato presented with a cere lesion, a smear of which revealed a predominance of squamous cells, consistent with **squamous metaplasia**. This is linked to **hypovitaminosis A**, commonly reported in birds on all-seed diets.

A **metastatic seminoma** was diagnosed in a 19-year-old male Guinea fowl from Waikato that presented for post-mortem examination. Grossly, a 95x75x55-mm firm dark red tumour with scattered tan areas filled the coelomic cavity, and displaced and compressed the gastrointestinal tract. One liver lobe was diffusely tan, and less-affected lobes had multifocal spherical-to-ovoid tan metastases. Histologically, the lobulated seminoma was composed of sheets of neoplastic cells that effaced normal testicular architecture and occasionally formed cystic areas filled with erythrocytes. Neoplastic cells had distinct cell margins, moderate amounts of eosinophilic granular cytoplasm, and round nuclei with vesiculated basophilic chromatin and one or two nucleoli. Similar metastases variably effaced the liver and pancreas. While reports of testicular tumours are rare in birds, this case had a similar presentation to that seen in domestic poultry with large tumours metastasising to adjacent tissues.

Feline

A **sublingual salivary tumour** was diagnosed by histology in a 15-year-old male cat from the Rotorua region.

The cat presented with a mass on the right side of the base of the tongue. The mucosa was ulcerated and elevated by a lobular neoplasm composed of lobules and acini/tubules and individual epithelial cells. A few intercalated ducts were present but not all lobules were adjacent to these. Given the location of this tumour, a salivary adenocarcinoma was diagnosed. In cats about 90 percent of salivary tumours are reported to be malignant, and at the time of diagnosis about 40 percent of cats will have metastasis to draining lymph nodes and 15 percent will have distant metastases. The reported mean survival time for cats with adenocarcinomas is 516 days.

A 2-month old kitten in Waikato presented with ill-thrift and severe diarrhoea that had commenced soon after weaning. Selective bacterial cultures yielded a moderate growth of ***Campylobacter jejuni*** that was considered significant given the age and clinical signs. The kitten's owner was cautioned regarding the zoonotic potential, which is particularly significant with young children or immunosuppressed individuals.

Canine

A 9-year-old female Greyhound in Bay of Plenty presented as dull, lethargic and inappetant for 3 days, with occasional vomiting, though it was non-pyrexic. Biochemistry showed severe azotaemia, with highly elevated creatinine (477 umol/L; reference range 45–135) urea (37.3 mmol/L; reference range 2.6–10.2), liver disease (ALP 1,102 IU/L; reference range 0–185) and ALT (370 IU/L; reference range 0–75), which suggested **leptospirosis**. A serology test for IgM antibodies was positive, and a MAT for IgG antibodies to specific *Leptospira* serovars confirmed a high titre of 1:3,200 for ***Leptospira* Copenhageni**, confirming this as the infecting serovar. There was also a moderate titre of 1:400 for *L.* Pomona, but this was likely due to cross-reactivity in the MAT.

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Quarterly report of investigations of suspected exotic diseases

Exotic disease investigations are managed and reported by MPI Diagnostics and Surveillance Directorate (DSD), Wallaceville. The following is a summary of investigations of suspected exotic disease from July to September 2018.

Exotic vesicular diseases ruled out

A veterinary pathologist called the MPI exotic pest and disease hotline to report a submission describing oral lesions in adult cows. An AsureQuality Initial Investigating Veterinarian (IIV) visited the farm with the farm veterinarian. Foot-and-mouth disease was ruled out on clinical and epidemiological grounds. Only four cows out of 420 were affected, the first case having presented 2 weeks previously; there was no lameness and there were no teat lesions in affected cows. Oral lesions were predominantly sublingual and consisted of diffuse ulceration. One cow had a discrete ulcer in the cheek mucosa. Except in the four affected cows there was no effect on herd milk yield. Exotic disease was ruled out, but investigation of an endemic cause for this presentation continues.

Anthrax ruled out

A South Canterbury veterinarian called the MPI exotic pest and disease hotline to report that seven heifers owned by a client had died within the past week, six of them within the past 2 days. Anthrax caused by *Bacillus anthracis* is a possible cause of sudden death, and was considered an exotic differential diagnosis in this case. Other endemic causes of death in multiple stock include nitrate toxicity, clostridial disease and possibly other toxins. The heifers had been grazing fodder beet for a month before they began dying, but deaths began within days of fenceline movement, which also allowed the stock to access a different variety of beet than previously. Animals had been fully vaccinated for *Clostridium*, making that differential unlikely. There was no history of earthworks in the paddock, and the location in South Canterbury is not a known historic location for infected bone meal (Gill, 1993). Blood smears from two heifers autopsied by the notifying veterinarian tested negative for the characteristic *B. anthracis* spores, although abundant clostridial spores were present. Nitrate testing on ocular fluid was negative. Histology performed on three heifers was impossible to interpret owing to autolysis. In the absence of a meaningful diagnosis, the farmer added a diet of kale to dilute the ration of fodder beet, and there were no more deaths. The investigation was closed.

BSE ruled out

An MPI verification veterinarian called the MPI exotic pest and disease hotline to report abnormal behaviour in a beef animal during antemortem inspection. The animal, an older cow, had abnormal mentation and a hypermetric, ataxic gait. It was removed from the processing chain and autopsied, and the brain was removed for transmissible spongiform encephalopathy (TSE) examination. The New Zealand cattle population is free of TSEs, which are unlikely to occur because of a strict ban on the feeding of animal protein. The brain was negative for TSE by ELISA and the Western Blot test. Likely causes of abnormal mentation are varied, including blood electrolyte imbalances (e.g. hypomagnesaemia, which is possible even in non-lactating animals), bacterial (thrombotic meningoencephalopathy, caused in many cases by *Histophilus somni*), and others. In this case, it is presumed the animal was not abnormal prior to transport, so blood mineral imbalance was the most likely cause, although it was not confirmed. The investigation was closed.

A veterinarian called the MPI exotic pest and disease hotline to report a 4-year-old New Zealand-born Angus bull with neurological signs. The bull had hindlimb ataxia, which progressed to recumbency within 24 hours. A postmortem was performed at the School of Veterinary Science, Massey University. Grossly a massive area of haemorrhage and a large haematoma were found in the base of the brain (**Figure 1**), extending from the medulla oblongata into the cervical spinal cord. On histological examination, degenerative changes consistent with the clinical signs were observed in the spinal tracts. Signs were also attributed to compression of the spinal cord by the brainstem haemorrhage. The cause of the extensive haemorrhage could not be determined grossly or histologically. The lesion was focal and localised to a highly vascularised area in the brain,

Figure 1: Haematoma at the base of the brain from a bull with hindlimb ataxia (Photo courtesy Fernanda Castillo Alcala, School of Veterinary Science, Massey University)

and thus suspected to be the result of a cerebrovascular accident. In cattle, septic emboli are probably the most common cause of central nervous system vasculopathy, but there was no evidence of an active systemic inflammatory process. Cerebrovascular accidents can also be caused by trauma (of which there was no evidence in this case), cerebrovascular malformations and other less common vascular anomalies. With the bull's clinical presentation explained and exotic disease ruled out, the investigation was closed.

Ovine pulmonary adenocarcinoma ruled out

A farm consultant called the MPI exotic pest and disease hotline to report a clinical presentation consistent with ovine pulmonary adenocarcinoma (OPA) in a 2-year-old East Friesian ewe from a 2,700-head dairy sheep flock. OPA is an exotic infectious neoplastic lung disease of sheep resulting from infection with a betaretrovirus called Jaagsiekte sheep retrovirus (JSRV). As the ewe was being prepared for artificial insemination under the supervision of an experienced UK-based veterinarian, 50–100 ml of fluid flowed from the nostrils as her hindquarters were raised and her head lowered. In the UK this is considered a positive "wheelbarrow test", which is pathognomonic for OPA (Scott et al., 2013).

At the request of the duty MPI Incursion Investigator the ewe was euthanased and necropsied by the farm veterinarian. The only notable finding was a large orange-sized heavily encapsulated pulmonary abscess, with associated pleurisy making it difficult to remove the lungs from the chest. Serum and EDTA blood samples from the ewe were submitted to the MPI Animal Health Laboratory (AHL), Wallaceville, while fixed tissues were submitted to a commercial veterinary pathology laboratory. In addition to the chronic focal pulmonary abscess, histopathology identified chronic regionally extensive lymphoplasmacytic interstitial pneumonia – changes that are aetiologically non-specific but could be associated with OPA. The proliferative and interstitial elements can also be present in another exotic condition of sheep, ovine progressive pneumonia (OPP), a chronic pneumonia of older sheep caused by infection with a retrovirus of the lentivirus subfamily. Fixed lung was submitted to an overseas research institution, where OPA was ruled out by immunohistochemistry, the definitive test for OPA. OPP was also subsequently ruled out at the MPI AHL with a serum ELISA test and a Small Ruminant Lentivirus PCR on buffy coat cells. Exotic disease was ruled out and the investigation closed. While nasal discharge as seen in this case may be considered pathognomonic for OPA in the UK, it is not uncommon to see profuse continuous nasal discharge from adult ewes with severe chronic pneumonia or pleurisy in New Zealand (Ginny Dodunski, pers. comm.).

Contagious caprine pleuropneumonia ruled out

A veterinary pathologist called the pest and disease hotline after identifying lung lesions in a 4-year-old milking goat that had been euthanased after non-responsive weight loss. The farm milked about 3,000 goats and occasionally a goat presented with ill-thrift. Histological changes identified a long-standing, active pneumonia with marked interstitial fibrosis, multifocal mineralisation and inflammation. Histology of other organs, including the liver, kidney and gastrointestinal tract, was unremarkable. The lung changes could not be attributed to a single cause, being potentially consistent with a number of agents or contributory factors including endemic and exotic *Mycoplasma* spp. Swabs and formalin-fixed tissues were submitted to the AHL (Wallaceville), where generic and specific *Mycoplasma* assays were carried out. Real-time PCR assays for both the generic *Mycoplasma* species and *M. capricolum* ssp. *capripneumoniae* gave negative results for both swab and wax-block material. Findings were attributed to chronic bronchopneumonia, likely caused by *Pasteurella multocida* or *Mannheimia haemolytica*. Exotic disease was excluded and the investigation was stood down.

EVA and EIA ruled out

A veterinary pathologist called the exotic pest and disease hotline to report a 2-year-old New Zealand-born gelding with a history of weight loss and limb oedema. Haematological examination identified mild anaemia (PCV 0.25; reference range 0.31–0.50) and there was evidence of inflammation. Equine viral arteritis (EVA) is an exotic differential for anaemia and oedema in horses. A serum sample was submitted to the AHL (Wallaceville), where EVA was ruled out by VNT. Exotic disease was ruled out and the investigation stood down.

A veterinary pathologist called the MPI exotic pest and disease hotline to report a 3-year old New Zealand-born colt with a history of fever, weight loss and lethargy over a 2-month period. Haematological examination identified mild anaemia (PCV 0.22; reference range 0.31–0.50). Multiple in-contact horses remained healthy. Oedema was not a clinical feature in this case. Equine infectious anaemia (EIA) is an exotic differential for anaemia in New Zealand horses. A serum sample was submitted to the AHL (Wallaceville), where EIA was ruled out by AGID test. Exotic disease was ruled out and the investigation stood down.

A veterinarian notified MPI via the exotic pest and disease hotline of a 20-year-old gelding recently imported from Australia that presented with weight loss and a mild cough and mucopurulent nasal discharge, although it was not pyrexic. The horse had arrived a few days earlier from Queensland, travelling by boat along with three others. The other horses had also lost weight during the journey but were otherwise clinically healthy. Routine haematology identified a mild inflammatory leucogram but fibrinogen levels were within the normal range. Acute and convalescent serum samples were submitted to the AHL (Wallaceville), where the exotic differentials equine viral arteritis and equine infectious anaemia were excluded after negative VNT and AGID test, respectively. The gelding recovered uneventfully after antibiotic treatment, with no further cases identified. Exotic disease was excluded and the investigation was stood down.

Brucella canis excluded

A veterinarian called the exotic pest and disease hotline to report epididymitis in a 10-year-old dog. The dog was New Zealand-born but its contact history was vague. *B. canis* is an exotic differential for epididymitis in dogs. A serum sample was submitted to the AHL (Wallaceville), where *B. canis* was ruled out by a *B. canis* card test. The investigation was closed.

A veterinarian contacted MPI after examining a pyrexic dog with scrotal

swelling that had arisen over the previous 24–36 hours. The dog was a 9-year-old New Zealand-bred English Bull Terrier and had not been used for breeding. Ultrasound examination identified an abscess within the scrotal tissues between the testicles. Both testicles were compressed but appeared to be otherwise normal, with no apparent testicular or spermatic cord involvement. Blood (serum and EDTA) and urine samples were submitted to the AHL (Wallaceville). *B. canis* was excluded after serum tested negative in the *B. canis* RSAT, and molecular assays of blood and urine gave negative results. Exotic disease was excluded and the investigation was stood down.

Avian mortalities investigated

A backyard flock owner with about 40 mixed-aged layer chickens and about 150 Muscovy ducks reported intermittent deaths that were initially attributed to access to a rat-bait station a few weeks prior. About 50 birds died in the ensuing few days. Although there was no standing water on the property, wild mallard ducks visited the property regularly. A few weeks later, a further 12–15 deaths followed over a few days. The birds showed predominantly leg weakness with slow mobility, progressing to hindlimb paresis and an inability to stand, followed by death over 36–48 hours. In the later stages, birds also had drooping wings and exhibited head-flicking behaviour, but were able to hold their heads upright. There were no apparent respiratory, ocular or central nervous signs. The owner delivered five freshly dead birds (a chicken and four Muscovys) to a veterinary pathology lab in Auckland for postmortem, histology and sample collection to exclude endemic and exotic diseases. Gross post-mortem findings were unremarkable and histology identified non specific changes only. Oropharyngeal, cloacal and visceral tissue samples from each bird were negative for influenza A and *Chlamydophila psittaci* by RT-PCR. However, RT-PCR for avian paramyxovirus type 1 (APMV-1) gave a weak (high ct = 37) positive reading for the oropharyngeal and intestinal samples from one of the five birds. This was confirmed as a low-pathogenic strain of APMV-1 and considered to be an incidental environmental exposure associated with visiting wild mallard ducks that sometimes mingled with the farmed ducks. An avian veterinary specialist visited the site and carried out post-mortem examinations of a chicken and two ducks that had hindlimb weakness. No significant gross abnormalities were identified, although in the chicken there was evidence of a mild sinusitis that was considered incidental as it yielded a scant mixed growth of coliforms and *Staphylococcus* spp. Examination of intestinal scrapings from six birds (three affected and three that had been euthanased earlier and stored frozen) failed to reveal any intestinal parasites. There was no evidence of ingestion of maggots or rotten material to support botulism as the potential aetiology, and there were no changes to support the involvement of an infectious agent. Although the investigation was unable to determine the cause of the paralysis syndrome, exotic disease was excluded and the investigation was stood down.

A veterinarian called the exotic pest and disease hotline after examining a chicken (~1 year old) that presented with weight loss and nervous signs including torticollis and nystagmus. The chicken was from a flock of 12 otherwise healthy backyard birds kept at a petting zoo. It did not respond to routine antibiotic and supportive care, and after it was was euthanased a postmortem was undertaken and samples were collected and submitted to the AHL (Wallaceville). During the following week a second and a third chicken 6–8 weeks old presented with similar signs. One recovered but the other was euthanased and submitted to Massey University for postmortem and sample collection. Histology identified a necrotising bacterial encephalitis and enteric coccidiosis in both euthanased birds. No gross abnormalities were identified and no significant underlying infection or inflammatory lesions were identified in any other organs. The route of entry of the bacteria causing the encephalitis was not obvious, but intestinal damage associated with the coccidiosis may have enabled bacteria to enter the systemic circulation before localising to the brain. The absence of haemorrhage or inflammatory lesions in target organs excluded the involvement of exotic viral diseases, and this was confirmed by negative results from RT-PCR tests for avian influenza and avian paramyxovirus at the AHL. Exotic disease was excluded and the investigation stood down.

A veterinarian informed MPI of an upper respiratory condition affecting a commercial poultry breeder flock. Birds in only one of the seven sheds on the farm were affected, with signs including conjunctivitis and facial swelling, which progressed to gasping with a productive cough that included blood-tinged mucus over 24–48 hours. Mortality was marginally raised (0.7 percent weekly). Clinical signs subsided over the following 2–3 days, with the birds returning to normal lay over 7–10 days. Oropharyngeal swabs were collected from the affected and unaffected sheds and submitted to the AHL (Wallaceville). Molecular testing excluded avian influenza, avian paramyxovirus, *Ornithobacterium rhinotracheale, Avibacterium paragallinarum, Pasteurella multocida, Mycoplasma gallisepticum, M. meleagridis* and *M. iowa* in both affected and unaffected sheds. Eleven of 13 swabs from the affected shed were positive by PCR for both infectious laryngotracheitis (ILT) and *Mycoplasma synoviae*, while swabs from the unaffected sheds were negative for ILT but also positive for *M. synoviae*. Histology identified acute stomatitis and laryngotracheitis with epithelial loss, necrosis and squamous metaplasia. Sloughed epithelial cells sometimes formed syncytia, and eosinophilic intranuclear inclusion bodies consistent with ILT virus were rarely present. Clinical and epidemiological findings were consistent with the introduction of ILT virus by "spiker" male birds added a few weeks earlier to the shed. The male birds were sourced from the North Island, where routine ILT vaccination using attenuated live virus is carried out. Exotic disease was excluded and the investigation closed.

Acarapis woodi excluded

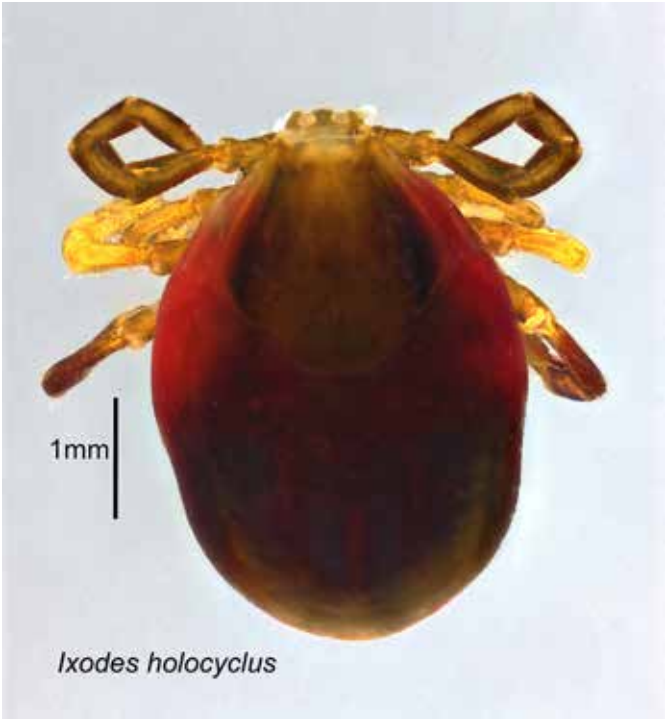
A beekeeper called the exotic pest and disease hotline to report that most of the bees from one of his hives had disappeared. As part of general surveillance for bee exotic agents, a sample of bees was tested for tracheal mites (*Acarapis woodi*). All bees tested negative.

Exotic ticks investigated

Staff at a Canterbury medical clinic

called the exotic pest and disease hotline to report a tick on a patient who had recently returned from northeastern New South Wales. The tick was submitted to the Plant Health & Environment Laboratory in Christchurch, where it was identified as an adult female *Ixodes holocyclus*, the Australian paralysis tick (**Figure 2**). This is the tick most commonly encountered on humans returning from Australia, where its normal range spans almost the entire east coast. Rarely is more than one tick found on a returning traveller. However, the tick's strict bioclimatic requirements mean that even if there was more than one of them, or fertilised tick eggs were present on the traveller's personal items, survival or establishment would be highly unlikely (Heath & Hardwick, 2011). Therefore, after destruction of the tick the investigation was stood down.

I. holocyclus can cause life-threatening paralysis in domestic animals through envenomation. In humans it can cause reactions ranging from localised swellings to anaphylaxis and tick paralysis, and can also transmit *Rickettsia australis*, the agent of Queensland tick typhus, and *R. honei*, the agent of Flinders Island spotted fever. Recent research has identified it as a carrier of two novel "*Candidatus Neoehrlichia*" species and a novel *Ehrlichia* species (Gofton et al., 2015). While the patient did not report any illness or reaction to the tick, the medical practice was advised to raise any concerns with a Medical Officer of Health.



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Quarterly report of investigations of suspected exotic marine and freshwater pests and diseases

Exotic marine and freshwater pest and aquatic disease investigations are managed and reported by MPI Diagnostics & Surveillance Directorate, Wallaceville. The following is a summary of investigations of suspected exotic marine and freshwater diseases and pests during the period from July to September 2018.

Pyura on a vessel, Wellington

A diving company called the MPI exotic pest and disease hotline to report a sea squirt on a vessel hull. It was suspected to be *Pyura dopplegangera*, an aggressive competitor for space that has the potential to significantly alter the composition of intertidal communities. The divers took samples and photos and submitted them to the Marine Invasives Taxonomic Service (MITS) at NIWA. MITS confirmed that the samples were *P. dopplegangera*. The vessel was cleaned under border direction and the biosecurity risk was mitigated.

Algal bloom, Awanui

A fisherman contacted MPI about a strange-looking alga growing in Awanui Harbour, Northland. The alga was dark brown in colour. He had first noticed it a year earlier, but observed that it was growing rapidly. A sample was sent to MITS and identified as *Ectocarpus* sp. but taxonomists were unable to identify it to species level, owing to a lack of sequence data and the fact that species boundaries are not always clear within this genus. However, they were confident that this was an indigenous species because the sequence was nearly identical to that of a specimen collected at Kaka Point in South Otago. As there was no biosecurity risk the investigation was stood down.

Farmed paua mortalities, Ruakaka

An employee called the MPI exotic pest and disease hotline to discuss mortalities at a paua farm. The paua (*Haliotis iris*) were showing sign of Perkinsus infection. *P. olseni* is an exotic OIE-listed disease and has previously been recorded in paua at this location. It typically presents a spike in mortality over the summer, when water temperatures increase. Samples sent to the MPI Animal Health Laboratory tested positive for *P. olseni* and negative for *P. marinus*. As this event was attributed to a recurring disease it did not present a biosecurity risk and the investigation was closed.

Yersinia ruckeri in salmon

A Palmerston North veterinary laboratory contacted MPI regarding a suspected case of Yersinia ruckeri infection in salmon from a South Island hatchery. The serotype 01b (Biotype 1) of *Y. ruckeri* is considered endemic in New Zealand and has been isolated from salmon hatcheries on the east coast of the South Island. It is generally considered a production disease and an indicator of underlying environmental or husbandry issues, which can be addressed by improving water quality and reducing stress in fish. Endemic *Y. ruckeri* is generally confined to salmon cultured in fresh water and is not considered a threat to marine systems. Exotic strains including the Hagerman strain are Unwanted Organisms under the Biosecurity Act 1993, so cultures were sent to the MPI Animal Health Laboratory to rule out exotic strains. Testing of one bacterial culture on blood agar was subcontracted to the Australian Animal Health Laboratory for *Y. ruckeri* serotyping. The culture morphology was homogenous and consistent with control cultures. The isolate was examined directly by macroscopic agglutination against cross-absorbed rabbit antisera for *Y. ruckeri* serotypes 01a and 01b. Control isolates *Y. ruckeri* ATCC 29473T (01a Type strain) and *Y. ruckeri* 88:8181-5A (01b Aust. field isolate) were tested in parallel. No significant agglutination was observed with the test isolate in 01a antiserum. Strong agglutination was observed with the test isolate in 01b antiserum. Therefore it was concluded that the test isolate was serotype 01b (the endemic strain). The results were reported back to the hatchery and the investigation was stood down.

Kokopu egg mortalities, Warkworth

A kokopu (whitebait) farmer called the MPI exotic pest and disease hotline to report large mortalities of kokopu eggs at his whitebait farm, although the adult fish appeared healthy. The notifier was uncertain whether the cause was a pathogen or husbandry issues. He had been in contact with NIWA, who were undertaking tests, and was referred to MPI for more refined diagnostic testing. Samples were sent to the MPI Animal Health Laboratory for disease testing. Histology revealed some fungal and bacterial growth in the eggs as well as some thinning of the vitelline membrane. The significance of this was unclear but the growth was inconsistent and not suggestive of a primarily pathogenic process. Bacteriology and mycology identified several bacteria and fungi, none of which was considered likely to be pathogenic, but more likely generic environmental species. Virology did not reveal any significant viruses. A second lot of samples was submitted to investigate the thinning in the vitelline membrane and to rule out *Saprolegnia*, which does not present under normal mycology testing. The second round of histology showed inconsistent bacterial and fungal growth in the eggs and significant variability in the vitelline membranes across samples. The results were all negative for *Saprolegnia*. These combined results suggested that the cause of the egg mortalities was not a primarily pathogen-driven process. It is more likely that there was a husbandry-related issue causing the low survival of eggs, either through a secondary bacterial and fungal degradation process, or by predisposing the eggs to infection from

environmental bacteria and fungi. It was concluded that there was no biosecurity risk and the investigation was closed.

Suspected tail-fan necrosis, Wairarapa

A rock lobster caught on the Wairarapa coast had small lesions on the tail, which were suspected to be the early onset of tail-fan necrosis (TFN), an emerging syndrome of rock lobster that has only previously been reported in the Gisborne region. No similar signs were seen on one other male lobster of similar size collected at the same site and two more from further up the coast. The affected lobster was refrigerated and taken to the MPI Animal Health Laboratory.

The results of pathology testing showed that the observed symptoms were not specific to tail-fan necrosis and that the lesions were more likely associated with a cuticle-degrading infection secondary to tail damage. Bacteriology of the haemolymph showed the presence of Pseudomonas and *Vibrio* spp. but the significance of these bacteria is unknown as they can be pathogenic or commensal. Given the low level of infection, it is likely that these findings were not significant. It was concluded that the lesions were caused by a small wound infection and that this was not a case of TFN. As there was no biosecurity risk the investigation was closed.

Spat mortalities, Nelson

The Cawthron Aquaculture Park reported to MPI a recent mortality event in greenshell mussel spat (*Perna canaliculus*). The mortality event was first noted in a small portion of 1–2-month-old spat retained at the hatchery after most of the batch had earlier been deployed to sea. Supplementary algal paste was being fed at relatively high doses when the mortality event developed, but this was not expected to be harmful. The mortality rate appeared to have declined rapidly (based on shell washout) and there was no indication of ongoing mortality in the remaining spat, which appeared healthy. No significant pathogen or disease agents were identified and no clear cause was found. Potentially harmful ammonia concentrations were detected in some tanks, but it is not clear whether this was a cause or a result of the mortalities. Spat from the same batch held in experimental tanks in the same room did not show such mortalities. They received water from the same source and live algal food, but a higher water replacement rate and no algal paste supplement. This suggests that environmental conditions or the algal paste were potential causes of the mortality event. Larvae in a separate part of the hatchery building were unaffected, ruling out a generic water quality issue.

Cockles, Whangateau Harbour

MPI received an email from a member of the public who was concerned about recurring shellfish mortality events in Whangateau Harbour. In 2009 there was a large cockle (*Austrovenus stutchburyi*) mortality event associated with a coccidian parasite and a mycobacterium, resulting in about an 80 percent reduction in the cockle population. Three sampling rounds were undertaken and some *Perkinsus* sp. and *Rickettsia*-like organisms were detected at a very low prevalence. Some cockles also showed a low prevalence of *Digenea* metacecaria, and spores indicative of coccidians (apicomplexans) infection. Brown cells associated with gonad absorption were common. Prior infections by apicomplexans, mycobacteria (acid-fast bacteria) and even cnidarians (possibly opportunistic invaders) were also evident. Bacterial culture yielded only common environmental bacteria. Although some of these bacteria could act as pathogens, their low prevalence indicated that they were not a primary pathogen. It was concluded that there was no biosecurity risk and the investigation was stood down.

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Myrtle rust diagnosis

Myrtle rust, the plant disease caused by the fungus *Austropuccinia psidii*, was first found at the remote Raoul Island (1,000 km northeast of the North Island) in March 2017 and soon after at Kerikeri in May 2017. It has since been found across most of the North Island and the north of the South Island, including most of the areas where modelling predicted that it would thrive.

When myrtle rust was first detected in Australia in 2010, MPI (then MAF) established a myrtle rust preparedness working group to prepare for its arrival to New Zealand. In the past, many rust fungi from the east coast of Australia have spread to New Zealand within a few years, likely on the trans-Tasman wind. Therefore it was highly likely that myrtle rust would sooner or later reach New Zealand and establish here, especially considering its ability to infect the wide range of Myrtaceae (plants of the myrtle family) growing here. The MPI Plant Health and Environment Laboratory (PHEL) used funds from the MPI Operational Research Programme to develop a range of new diagnostic tools to ensure that the laboratory was prepared to identify myrtle rust in case of an incursion in New Zealand. One of these tools was a new real-time PCR test that is much faster and more sensitive than previously available tests. The method was developed at PHEL and validated by a robust inter-laboratory validation process, including tests on known infected plant material in Australia. Since this new method was published in a peer-reviewed journal in 2016 (Baskarathevan et al.) it has also been adopted in the diagnostic protocol for myrtle rust by the International Plant Protection Convention (IPPC), the highest international standard that is equivalent to the World Health Organisation for human health. In addition, PHEL collaborated with Scion to build the first flowering-plant-family-specific DNA barcoding database in New Zealand, covering more than 100 species of Myrtaceae (Quinn & Buys, 2014).

During the myrtle rust response in New Zealand, PHEL was able to swiftly confirm the first detections of this unwanted pathogen using the new real-time PCR test, which provided results on the same day. As the number of samples was set to soar, PHEL developed a field sampling protocol to minimise accidental spread of this airborne disease during sampling in the field, transport and testing in the laboratory. The protocol included sampling of plant tissues into sealed tubes from a DNA extraction kit in the field (**Figures 1 & 2**). These tubes, pre-loaded with DNA extraction reagents, were brought back to the laboratory. Once the DNA was extracted and any myrtle rust propagules present in the tubes were no longer viable, the extractions could be taken out from the high-containment laboratory. DNA from symptomatic tissues was tested in-house for myrtle rust using the real-time PCR test, and DNA from healthy tissues was sent to Scion to confirm the identification of the host plant by DNA barcoding. This field sampling methodology is to be published in a scientific journal.

Figure 1: Field sampling of plant material infected with myrtle rust

In addition to providing diagnostic services, the laboratory also handled notifications of suspect myrtle rust finds. Shortly after the first mainland find, in Kerikeri, a team was set up at PHEL to process further finds from members of the public, the MPI myrtle rust surveillance team, the Department of Conservation, regional councils and posts on the NatureWatch New Zealand website (now merged with iNaturalist https://www.inaturalist.org). A large amount of valuable information about the distribution of the pathogen, its host range and symptoms was gathered through these notifications (**Figure 3**), enabling MPI to better understand the impact of the disease in New Zealand. Over a 14-month period, 3,764 notifications were processed and 1,218 of these were positive for myrtle rust.

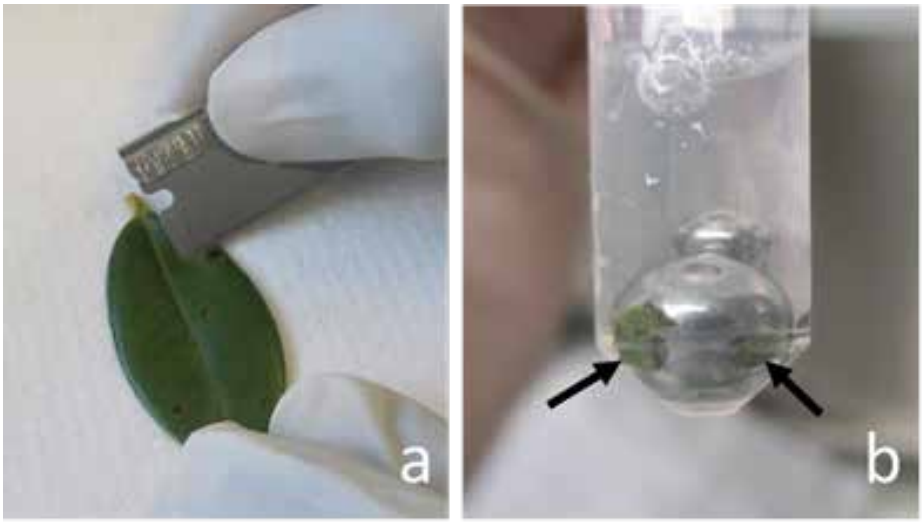

Figure 2: Sampling method to minimise the spread of myrtle rust. Symptomatic areas of the leaf were cut out (a) and placed in sealed tubes containing the reagents and metal beads (b) to homogenise the sample for DNA extraction upon arrival at the laboratory.

Figure 3: Myrtle rust symptoms on brush cherry (*Syzygium australe*) (a), strawberry myrtle (*Ugni molinae*) (b) and small-leaved ramarama (*Lophomyrtus* × *ralphii*) (c)

Since myrtle rust has been found to be widespread, MPI has scaled back the activities in surveying and managing the pathogen and is now focusing on long-term monitoring and research programmes to develop new management approaches to reduce the impacts of myrtle rust.

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Thick as thieves: the elusive thief ant in New Zealand

MPI staff were relieved to find that *Solenopsis* ants found in a sampling pottle during routine sampling at the FBA Consulting laboratory were a harmless local species and not one of the fire ant species that present a major environmental and economic risk.

The ants were found during sampling for the National Invasive Ant Surveillance (NIAS) programme in one of 212 samples collected from the Ports of Auckland on 24 January 2018.

The larger species can form very big colonies. The workers are aggressive surface foragers, commonly known as fire ants because of the intense burning sensation caused by their stings. Some are important pest species and include the better-known invasive species, the red imported fire ant (RIFA), *Solenopsis invicta,* and tropical fire ant, *Solenopsis geminata* **(Figure 1)**.

The NIAS programme itself was instigated following the discovery and subsequent eradication of a nest of red imported fire ants found at Auckland International Airport in 2001. Finding *Solenopsis* ants of any kind rightly causes alarm bells to ring at MPI, owing to the potentially huge economic and environmental threat posed by the pest species in this group.

What is less well known is that most *Solenopsis* species are minute and subterranean. They can live within the colonies of other larger species of ants or termites, stealing food and resources from the parent nest – hence the common name of thief ant. Thief ants are cryptic, even in their native range, and unlike their larger relatives the fire ants, are not considered to be pests.

Just one undescribed species of thief ant has been previously recorded in New Zealand. The earliest record, a single queen, was found in a fruit-fly surveillance trap in St Heliers, Auckland, in April 2002. Pitfall trapping and litter extractions in the surrounding area in 2003 revealed a further 10 workers. A queen was also collected at a swimming pool in Royal Oak in 2004, and others from the Auckland Domain in 2004 and 2012. Further worker specimens were found in Devonport in 2005, Westhaven Marina in 2010, Epsom in 2015 and Western Springs in early 2018.

Comparison of the find with specimens of the locally known species of thief ant showed the two were indeed consistent with each other **(Figure 2)**. A few days later, this latest find was finally confirmed by DNA sequencing to be the harmless local species.

It is not known from where or when the thief ant first arrived in New Zealand, but it was probably before 2002 – before the NIAS programme was in place – and it is probably an undescribed Australian species. At the moment it appears to be restricted to central Auckland and the southernmost part of the North Shore, but the increasing number of sightings over the past few years indicates it is likely spreading and becoming more locally common around Auckland.

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Figure 1: Thief ants in a NIAS sample pottle

Figure 2: Thief ant, *Solenopsis* sp. Photo: www.AntWeb.org

Better biosecurity through connectedness

The Plant Health and Environment Laboratory (PHEL) is part of MPI's Diagnostics and Surveillance Directorate (DSD) and is responsible for providing high-quality diagnostics with suspect new pests and diseases affecting plants and the environment. PHEL identifies insects, mites, fungi, bacteria, phytoplasmas, viruses, viroids and plants, and subcontracts nematode identification. We frequently work with the Biosecurity Surveillance & Incursion and Biosecurity Readiness & Response teams to respond to new and invasive organisms that may pose a risk to New Zealand's economy and environment.

Over the past few years we have been working to improve our response preparedness. During a response, the laboratory is under pressure to process a large number of samples in a short time. Staff need to be flexible enough to work on different tasks and often work long hours for extended periods. PHEL has also expanded its connections with other scientific organisations in order to access other expertise.

The recent responses to myrtle rust, *Potato mop top virus* (PMTV) and Queensland fruit fly have emphasised the increasing need for the laboratory to be prepared for larger-scale plant pest and disease responses. Diagnostics plays a key role in all responses, and rapidly providing accurate results is critical to support response decisionmaking and to minimise biosecurity and reputational risks. To manage the high workload, PHEL has benefited from co-opting staff from other organisations to help process large numbers of samples during responses. For example, in the 2015 Queensland fruit fly response in Grey Lynn, Auckland, about 4,500 kg of fruit was received for screening. External staff were employed to enable fast sample processing and early detection of immature stages of fruit flies, to help prevent further spread of the pest. This significantly helped MPI to meet the response objectives and to eradicate the fruit fly.

Diagnostic response work requires specialised skills and experience in containment laboratories. As part of the preparedness project, a number of organisations were contacted including Manaaki Whenua – Landcare Research, AsureQuality, Scion, the Bio-protection Research Centre, Plant and Food Research, and Hill Laboratories, to access staff able to help with diagnostic testing at PHEL when needed. After identifying suitably qualified staff, PHEL organised a training workshop in May 2018, with presentations about the preparedness project and MPI response work. We were able to introduce them to the laboratory's containment and quality systems, and they received hands-on training in sample processing (**Figure 1**). All attendees provided positive feedback on the training day and said that they were looking forward to an opportunity to work for PHEL during future responses.

Figure 1: Training participants to process plant samples during the 1-day response diagnostics workshop at PHEL

The training programme has already paid off, with some staff from the above organisations being brought in to help with molecular testing of potatoes for *Potato mop top virus* during the most recent response. We tested 5,863 tubers and completed 1,546 nucleic acid extractions (**Figure 2**). With the extra staff we were able to better manage staff rosters and meet our objectives even when several hundred tubers were received in one day.

Figure 2: Sample processing in the lab during the *Potato mop top virus* response at PHEL

PHEL plans to build on this success, for example with a yearly refresher course for a core of suitably qualified personnel and a formal agreement with the other organisations so we can access response help when necessary. All the organisations involved have agreed that national connectedness is a key to future success when tackling biosecurity incursions.

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Plant health surveillance and incursion investigation report

Ministry for Primary Industries (MPI) Incursion Investigators received 201 plant and environment notifications during the 3-month period July to September 2018. The investigators immediately stood down 64 notifications where the presence of biological risk was ruled out. The 201 notifications represented a 5 percent decrease compared with the same quarter in 2017 (212). Although notifications decreased for this reporting period, there was a notable increase in the number of cases (122) that required further investigation to determine the magnitude of the risk, compared with July–September 2017 when 79 investigations resulted from the 212 notifications.

Of the 122 cases investigated, a biological risk was found in 42 (34 percent) and of those investigations that required urgent measures to contain and manage that risk, 46 were negative for a biological risk and 19 were inconclusive with no further investigation warranted. The remaining 15 investigations were still in progress at the end of the reporting period. Following are some examples of the investigations during this quarter.

Investigation positive; establishment prevented through urgent measures

These investigations found organisms that were not known to be present in New Zealand, and in circumstances that enabled treatments to be applied and biosecurity mitigation confirmed. They typically involved imported goods and containers.

Mexican sour gherkin, a plant not permitted entry to New Zealand

The Administrator of the NZ Vege Growers Facebook Forum recognised a picture of Mexican sour gherkin (*Melothria scabra*) on their web page. They reported the page to MPI because the picture was accompanied by the message "Dragons eggs. I'll wait and see what hatches", and other members of the Facebook forum had expressed interest and asked for seed. This plant is also known as cucamelon and is in the family Cucurbitaceae (melons, pumpkins and cucumbers). It is regulated and not permitted entry into New Zealand. Furthermore, the seeds may be a disease risk. The Facebook member was contacted and asked to destroy the seeds. MPI confirmed the plant had been destroyed by grinding.

Carpenter ants in ceramic tiles from China

Ants were found in a pallet of ceramic tiles from China, and the importer advised MPI Border Clearance Services. Staff at the retail store in Auckland were instructed to spray the pallet with knock-down insecticide, six-side shrinkwrap it, then spray the surrounding area. An MPI Quarantine Officer inspected the site the following day and only dead ants were found. The remainder of the consignment at the distribution warehouse was also inspected and no live ants were seen. Specimens were submitted to MPI's Plant Health & Environment Laboratory (PHEL), where entomologists identified them as carpenter ant (*Camponotus* sp.), a regulated organism. Some species of *Camponotus* are known to damage structural timber, so an ant-control specialist was contracted to check the two sites. The first treatment was not completely effective and an active nest containing more than 50 workers and winged queens was found in the original pallet. Residual contact insecticide was applied at both sites to kill the colony and eliminate any residual risk. Dome traps were also deployed and no further ants were found on subsequent inspections. The two sites have been added to the 2018–2019 National Invasive Ant Surveillance programme.

Crazy ants in a container from Taiwan

A number of crazy ants (*Paratrechina longicornis*), a regulated pest, were found inside a container of chemicals shipped from Taiwan. The container was devanned at a Transitional Facility in Lower Hutt before being returned to Wellington Port. Port surveyors opened the container and discovered live ants swarming inside the door lashing. They acted quickly to contain the spread by spraying the ants, the external gasket and corner castings of the container with insecticide, before reporting their find to MPI. MPI Quarantine Officers (QOs) inspected the site and submitted an ant to the MPI PHEL where the identification was confirmed and MPI directed that the container be fumigated. A QO also inspected the devanned cargo at the Transitional Facility and no more ants were found.

After fumigation a QO inspected the container and removed all potential ant habitat (leaves and debris). Dead ants from were submitted to MPI to see whether a colony might be present, and a single queen was found, along with many workers and larvae. Given the uncertainty as to whether ants had escaped during devanning, MPI took further precautionary measures. Toxic bait was laid and visual surveillance undertaken at Wellington Port and the Transitional Facility, but no live exotic ants were found. Residual insecticide was applied everywhere the container had been, i.e. Wellington Port, the Transitional Facility and the truck depot used for container deliveries between these two sites. These places will also be surveyed as part of the National Invasive Ant Surveillance programme in early 2019 to rule out any residual risk that crazy ant may have persisted.

Organic oyster mushroom growing kit

MPI was notified that an Australian company was selling oyster mushroom (*Pleurotus ostreatus*) growing kits on Trademe. The MPI National Operations Centre was notified and contacted Trademe to request withdrawal of the auction and to request details of the sales history. One growing kit had been sold in New Zealand, and when the buyer was contacted they said that the mushrooms had not thrived and any that had grown had already been eaten. The growing medium had been disposed of with household rubbish, and it was concluded that this had mitigated any risk. The Australian seller was told that these kits were not permitted to be imported into

New Zealand and could not be sold through Trademe.

Borer in furniture from Egypt

In Christchurch, a full container of used furniture from Egypt was heavily infested with borer, with some items seriously damaged and disintegrating. The goods had been cleared by MPI because a treatment certificate had been provided by the importer, and the extent of the borer damage only became evident when the goods were unloaded. Although no live borer were seen, abundant frass suggested they were still present so the consignment was fumigated.

Seeds purchased online

A person in Hamilton ordered seeds through the online store wish.com, and on receiving the consignment, realised that they had not been correctly imported and contacted MPI, who took the seeds and destroyed them.

"Blue strawberry" seeds sold online

The Incursion Investigation Plant Health (IIPH) team was notified of a Trademe listing for "blue strawberry seeds". No such species exists, but so-called "blue strawberry" seeds have been sold on line, backed by a false story involving genetic modification using anti-freeze genes from an Arctic flounder. Strawberry imports to New Zealand must comply with an Import Health Standard (IHS) that requires 6 months' active growth in the highest level (3b) of post-entry quarantine. In addition, imported strawberry plants and seeds must have phytosanitary certification for the absence of regulated pests and diseases as specified in the IHS. Whatever the "blue strawberry seeds" actually were, the investigator considered it was highly unlikely that they met any of these requirements.

At MPI's request Trademe withdrew the auction and notified the seller accordingly. The seller then informed Trademe and Television New Zealand (Seven Sharp), that he had previously seen "blue strawberries" growing in New Zealand, although MPI had no record of them.

The IIPH investigation revealed that the seller had incinerated the seeds because of the biosecurity issue. The seller advised that he had received one hermetically sealed bag of about 30–40 seeds 5–6 years ago. The seeds had not been distributed nor sown and back-tracing did not yield any further information.

As a result of the TV coverage, a member of the public contacted Seven Sharp and sent them some "blue strawberry" seeds that he had purchased from an e-commerce site. Seven Sharp delivered the seeds to MPI and the Plant Health and Environment Laboratory (PHEL) extracted DNA to carry out gene sequencing in order to use this opportunity to raise public awareness of non-compliant e-commerce trade. DNA sequencing identified the plants as *Potentilla indica* (also known as *Duchesnea indica* and *Fragaria indica*), a member of the family Rosaceae commonly known as Indian strawberry or mock strawberry because the fruit closely resembles edible species of the strawberry genus, *Fragaria*. *P. indica* originates from India and east Asia, and is widely naturalised in New Zealand. The fruit is drier than a true strawberry, almost inedible, with little flavour and is not blue. *P. indica* is closely related to another naturalised exotic species, *P. vesca* (synonym *Fragaria vesca*), the alpine strawberry, which is more common as a weed in NZ gardens and often eaten. *P. indica* is listed in MPI's Plant Biosecurity Index (PBI) under the synonym *Duchesnea indica* as "basic", i.e. does not require additional testing or a phytosanitary certificate for importation. True *Fragaria* spp. are listed in the PBI and may be imported under the Seed for Sowing IHS 155.02.05 under the *Fragaria* schedule. The forensic results were forwarded to Seven Sharp, who did a follow-up story highlighting the risks and uncertainties of purchasing seeds online from non-reputable sources.

Sweet pea seeds not meeting import requirements

MPI was notified of a promotion in the *NZ Herald* where "seed pencils" were part of a prize pack. Follow-up revealed the supplier of the prize had been in contact with MPI's Plant Imports Team regarding the importation of the pencils. The supplier imported a range of non-alcoholic beverages and had received about 400 pencils as merchandising material from their head office in England. The pencils had been sent via express courier and not been intercepted at the border. They had a gel cap that contained sweet pea (*Lathyrus odoratus*) seeds and "wood flour". Sweet pea seeds are "basic" under the IHS for seeds for sowing, but need to be correctly labelled and either accompanied by a phytosanitary certificate or inspected on arrival. The pencils were neither correctly labelled nor inspected and therefore unauthorised goods so MPI removed and destroyed all the seeds and wood flour and returned the pencils to the importer.

Investigation positive; urgent measures limit harm

These investigations resulted in detection of organisms that are not known to be present in New Zealand and in circumstances enabling treatments to be applied to all retrievable items, usually recent imports. There may be some residual risk associated with items that cannot be retrieved.

Regulated exotic plants for sale on Trademe

A person from Whangarei reported the exotic plants, cucumber tree (*Dendrosicyos socotrana*) and socotran dragon tree (*Dracaena cinnabari*), for sale on Trademe. Both are considered rare in their native countries and are not listed on the Plant Biosecurity Index (PBI) so they are not allowed entry to New Zealand. The seller advised that the seeds had been imported from hobby groups in the US and France, and that they were labelled correctly and accompanied by appropriate declarations at the time of import through the mail pathway. The person removed the plants from the pots and submitted them and the seeds to MPI for identification and destruction, and the soil and pots were double-bagged for disposal by MPI Quarantine Officers in Whangarei. PHEL Botany confirmed *D. cinnabari* and *D. socotrana,* and identified two more species, *Bursera fagaroides* (torchwood copal) and *Pachypodium brevicaule*, both listed as "basic" on the PBI and requiring declaration and inspection at the border. The importer was not aware that even small quantities of seeds require a phytosanitary certificate. On previous occasions seeds had been inspected by MPI at the border and released. Relevant sections from the MPI Import Health Standard 155.02.05 "Seeds for sowing" were provided. The importer apologised for this mistake and volunteered to

educate his hobby group, clubs and societies to avoid a recurrence.

Imported maize and wheat contaminating bulk salt

An MPI Quarantine Officer at Ports of Tauranga was contacted by an importer to report maize and wheat grain contamination in piles of bulk salt on the wharf. The source of the contamination had been traced back to machinery used to unload bulk grain from ships. The grain had been imported under the Grain Import Scheme (GIS), which requires thorough cleaning of machinery handling grain, but this had not been done properly. The salt importer was concerned about the possible presence of genetically modified organisms (GMOs) and gluten in the grain, which was destined for processing. However, the maize had a GMO-free certificate from the exporting country, and gluten is a normal constituent of wheat and was therefore certain to be present. Seed samples were submitted for 7-day germination tests and no seedlings emerged. The non-compliance for the machinery cleaning was managed under the GIS requirements and the MPI quarantine audit programme.

Mango seed weevil

MPI was contacted by a Wellington resident who found a live insect larva inside the seed of a green mango imported from Fiji. Green mangoes (used to make chutney) have an immature seed, unlike mature fruit where the seed is hard to split open. Photos of the larva and seed were requested to rule out exotic fruit fly, though mangoes imported from Fiji must have a phytosanitary certificate confirming that they have undergone an agreed treatment that is effective against fruit flies. The photos were consistent with the larva of the mango seed weevil (*Sternochetus mangiferae*), which is often found in imported mangoes. This weevil poses a low biosecurity risk to New Zealand as it requires growing mango fruit to lay its eggs and complete the lifecycle.

Investigation positive; no action taken

These investigations resulted in detections of organisms that were not previously known to be present in New Zealand, but no action was taken. Reasons for taking no action vary according to the case. Typically, they include cases where a risk assessment indicates that a new to New Zealand organism (or a newly described indigenous organism) has become well established and is considered unlikely to damage economic, environmental, social and cultural values. Alternatively, the organism may be established and causing problems and is already under management as a pest by MPI and/or regional and local authorities.

New to NZ booklouse in Dunedin

A company importing basketware from China received a complaint from a Dunedin customer that a basket was infested with borer insects. PHEL Entomology examined the basket and no borers were found, but two species of psocids (booklice) were present: *Liposcelis pearmani* and *Liposcelis decolor* (Psocoptera: Liposcelididae). *L. pearmani* had not previously been reported in New Zealand, but *L. decolor* is present. The imported baskets had received heat treatment before entry, and it was therefore concluded that the customer's home was the most likely source of these insects, as they are commonly found in houses. Other species including *L. decolor* have been first found in New Zealand by non-targeted collections and without any association with imported goods. Owing to their small size, cryptic habits, similar general appearance between species, lack of study, and worldwide distributions, they can be difficult to identify, so it is hard to be certain as to which species are actually present in each country. The biosecurity risk posed by *L. pearmani* is considered most likely similar to that of other *Liposcelis* spp. present in New Zealand, and no further action was considered necessary.

New to NZ fungi

Manaaki Whenua Landcare Research (MWLR) maintains living cultures of fungi and bacteria, which together with other collections provide the basis for listing and describing microbial taxa present in New Zealand. As many taxa were originally identified by their morphology, MWLR routinely reviews such identifications by molecular diagnostic techniques. When this was undertaken for the ascomycete fungus *Cylindrocarpon destructans* (Dothideomycetes: Hypocreales), a pathogen known to cause black foot disease in New Zealand grapevines, three additional new species were identified (based on ITS and H3 sequences) from different isolates of this entity. These were *Ilyonectria capensis*, *Ilyonectria* sp. 2, and *Neocosmospora rubicola*. Although these three are species not previously considered present in New Zealand, collection data show the isolates have been present at least since 2009, 2007 and 2005 respectively, and likely longer. The change in these isolates' taxonomic status has not changed their biosecurity risk or any other attribute. No further action was required except to confirm the taxonomic changes and update databases.

The fungus *Didymella segeticola* (syn. *Phoma segeticola*) (Dothidomycetes: Pleosporales) was found on leaves of the native tree *Lophomyrtus bullata* (ramarama) collected by DOC staff from the Pelorus Bridge Scenic Reserve, a sparsely populated area on State Highway 63 between Havelock and Nelson. This fungus has not previously been recorded as present in New Zealand. The find suggests populations of *D. segeticola* may exist in the reserve and surrounding native forests. The samples were submitted because they exhibited red-leaf-spot symptoms, and the fungus *Pseudocercospora* sp. (Dothidomycetes: Capnodiales) was consistently isolated from the leaf spots and was considered the causative agent. Very limited information is available on *D. segeticola*, though some *Didymella* species cause leaf spots, and *D. segeticola* may cause minor leaf spotting on some plants in New Zealand. However, there is no evidence that this fungus causes leaf-spot symptoms on ramarama. *D. segeticola* was originally described in 2015 (as *Phoma segeticola*) and in China is known to cause leaf spots on *Cirsium segetum* (a plant absent from New Zealand). It has also been found on plant litter collected from fresh water in Korea.

Previously this fungus had not been previously reported to be associated with any plant hosts in New Zealand. This detection is not believed to be associated with any disease symptoms and it is considered most likely an incidentally present organism colonising the plant either as an endophyte or saprophyte. It is unlikely to be associated with biosecurity risks, but rather has gone undetected owing to very limited mycological surveys of the microbial communities in

native forests, and because *Phoma* spp. are difficult to identify to species without using DNA sequencing. Although the Pelorus reserve is popular with tourists, there is nothing to suggest *D. segeticola* has recently arrived in New Zealand and that *D. segeticola* populations are confined to this locality. Rather, it is more likely that populations exist elsewhere within the Richmond Range, and possibly beyond. Diagnostic results were provided to DOC, who administer the Pelorus reserve, but no further action was considered necessary by MPI.

The fungus *Xenodidymella saxea* (syn. *Phoma saxea*) (Dothidomycetes: Pleosporales) was found during routine water-quality testing in a concrete storage tank supplying water to a Gisborne fruit packhouse. This fungus has not previously been recorded in New Zealand, and is consequently a new organism under the Hazardous Substances and New Organisms Act (1996). Little information is available on this species, but it is not a plant pathogen (though related to known plant pathogens) and is associated with stone or rock. Apart from its formal description, the only available reference mentioning *X. saxea* associated it with the degradation of marble in a 500-year-old building in Spain, which may be consistent with its being found in a concrete tank. The investigation concluded this organism posed no plant biosecurity risk. The ecology of this organism is somewhat unusual and NIWA and ESR were consulted to determine whether the find was of interest to them. No new information was received to alter MPI's determination and no further action is planned.

A fungus not previously considered present in New Zealand was found in *Pinus radiata* trees at a Western Springs public reserve owned by Auckland Council. *Postia balsamea* (syn. *Oligoporus balsameus*) (Polyporales: Fomitopsidaceae) is a bracket fungus known to cause rot in the heartwood of *Pinus* species (including *P. radiata*), macrocarpa (*Hesperocyparis macrocarpa*) and other amenity and forest production trees. Although reported from North America, Europe, Hawaii, Russia, Japan and China, it is not commonly encountered. The little published literature on its biology and impact suggests it to be associated with already damaged or otherwise compromised trees, and not an aggressive pathogen capable of colonising and establishing in healthy trees. A similar heart-rot fungus, *Phlebiopsis gigantea*, is present in New Zealand and acts in this manner; it attacks late-mature *Pinus radiata* but is not known to attack production-forest *P. radiata*, which are typically harvested when aged 25–35 years. The 203 pine trees in which the rot was found were 95 years old, dying of old age, and their removal was planned for public safety reasons. Whether *P. balsamea* might infect native plants and ecosystems is largely unknown. Based on known impacts of the only similar heart-rot fungus long established in New Zealand (*P. gigantean)* no significant impacts are expected. Neither the entry pathway of *P. balsamea,* nor how these pines became infected is known, so the investigation concluded that the initial infestation was elsewhere and that other undetected populations must exist. Discussions with New Zealand polypore fungal specialists, forestry industry representatives and Auckland Council staff concluded that no further action was justified.

Ladybirds on grapes from Mexico

Two ladybirds found in Mexican grapes purchased from an Auckland supermarket were identified as the seven-spot ladybird, *Coccinella septempunctata*. This aphid predator is not regarded as present in New Zealand though it was introduced several times in the 1970s in an attempt to establish a population. It is not an Unwanted Organism and, given its history, it likely poses a low risk of establishment. Tracing established that all the grapes from this consignment had been sold and no further information was available.

Fungi identified on butter production line

Environmental hygiene swabs taken from surfaces of a butter-packing machine at a dairy factory tested positive for fungal contamination. Swabs are routinely taken from machinery for quality assurance and traceback testing for yeast and moulds, to identify possible sources of contamination that could affect butter quality. Company scientists cultured the contaminants on petri plates and provided these to AsureQuality scientists, who isolated pure fungal cultures for identification.

The fungi were identified as *Scedosporium minutisporum* and *Exophiala oligosperma,* and AsureQuality notified the MPI PHEL because these species were not recorded as present in New Zealand. The cultures were received by PHEL and the identifications confirmed. There are no records of these fungi causing diseases in plants and they are not Unwanted Organisms in terms of the Biosecurity Act 1993. Consultation with the Animal Health Team suggested no animal disease risk. However, like many others that are ubiquitous, these fungi could cause issues for people who are immunocompromised. In the past it has been difficult to identify such fungi, but with the ever-increasing records available and ease of access to DNA barcode technology there are many "new" records available for reference.

Investigation for high-impact pests: negative

These investigations resulted from reports of suspected high-impact pests or diseases that were proven not to be present.

Suspect *Ceratocystis* sp. on pohutukawa

Rapidly declining health and apparent death of a pohutukawa (*Metrosideros excelsa*) tree was observed at a Waiheke Island property. Samples sent to PHEL Pathology did not enable the cause of the decline to be determined. As there was concern that a high-risk invasive pathogen of the genus *Ceratocystis* was involved, the site was visited to collect representative soil, trunk and branch samples. This genus includes a number of high-risk internationally emerging pathogens that are causing significant damage overseas, including to kiwifruit in Brazil and ohi'a lehua (*Metrosideros polymorpha*) in Hawaii. Molecular testing for *Ceratocystis* was negative but two well-established pathogens, *Phytophthora cinnamomi* and *P. multivora*, were found in the samples and were likely to have caused the problem.

Suspect brown marmorated stink bugs (BMSB)

Eight investigations involved BMSB (*Halyomorpha halys*) but only one required urgent action. The remaining cases involved pentatomid species already present in New Zealand.

A single lethargic BMSB was found by a loader driver on the tarmac outside the mail interchange at Auckland International Airport, 50–100 m from the International Mail Centre (IMC) and about 3 m from the mail interchange exit. The surrounding area was immediately inspected by airport staff and no more BMSB were found. Surveillance at the detection site and in nearby vegetation by MPI staff, a BMSB detector dog and handler was negative. The specimen was delivered to MPI and confirmed to be a live mated female BMSB with fully developed eggs in both lateral oviducts. This suggested that the bug could lay fertilised eggs but it was not known whether it had already done so. Although there was no way to tell whether the eggs were the insect's first batch or otherwise, it was considered highly unlikely that an adult mated female with well-developed eggs could be produced in July by a New Zealand population, based on BMSB reproductive biology, winter temperatures and daylength in Auckland. The BMSB had most likely come from the northern hemisphere, where in July BMSB are in an active reproductive phase. The investigation was closed.

Suspect fruit fly

MPI frequently receives reports of fruit fly that turn out to be common locally present caterpillars and flies. This requires significant effort by MPI, particularly in the late summer and when events such as responses lead to publicity through the news media. There were four cases during the reporting period: two from Auckland, one from Hamilton and one from Waihi.

The two cases in Auckland involved moth caterpillars that were likely guava moth (*Coscinoptycha improbana*), in citrus. The Hamilton case was a three-lined hover fly (*Helophilus trilineatus*), which is endemic and common in New Zealand. The Waihi case was inconclusive but highly unlikely: a look-alike fly was found inside a house and reported. A photograph was requested but not received despite several reminders and eventually MPI was told the specimen had been destroyed. In this case, apart from the report about the fly, there was no other evidence that further follow-up would be needed.

Inconclusive investigations

Possible new to NZ *Phytophthora* in soil samples

A plant pathologist at Scion has detected a possible new to New Zealand *Phytophthora* species in soil samples collected in Rotorua, as part of a collaborative project with overseas pathologists to look at oomycete diversity. Oomycetes (fungus-like microorganisms, some of which are serious pathogens) are often cryptic and can remain undetected for a long time until signs of disease appear in susceptible plants, but there are now methods to detect them in the absence of these signs. Working with PHEL Mycology, the organism was identified as *Phytophthora amnicola*: *Phytophthora* taxon Pgchlamydo. Landcare Research had previously isolated *P. amnicola* from another location in New Zealand, but this information was not available on the Landcare database at the time Scion submitted isolates to MPI for validation. To identify these cultures by sequence analysis, PHEL Mycology collaborated with Scion and Landcare Research. Landcare Research submitted three isolates that were suspected to be *P. amnicola*. The isolates appeared to be hybrids, and gene sequences were sent to Oregon State University in the US for evaluation by a *Phytophthora* hybrid expert. They recommended cloning and sequencing the nuclear genes to determine the potential parents of the isolates. After extensive consultation and diagnostic tests, it was concluded that the *Phytophthora* cultures belonged to clade 6 and they were suspected to be hybrids or a different species. Since there was no specific identification or association with any plant disease or plant hosts, the investigation was stood down. However, work to identify the organism is continuing and further reports can be anticipated. There is strong interest in the genus *Phytophthora* because of its importance as a plant pathogen, and researchers are conducting surveys that may lead to further new to New Zealand reports.

Spiders in wood packaging from Peru

Live spiders were found in the packaging of a ride-on mower purchased in Dunedin. The mower had been imported from Peru 6 months previously so the presence of live spiders was not considered a high biosecurity risk. The notifier reported that the packaging included a wooden pallet that revealed wood borer when cut up for firewood. It was not possible to determine whether live borer had been seen, and efforts to trace the origin of the mower were unsuccessful. Since the pallet had been burnt no further action was required.

Unusual disease symptoms in monkey-puzzle tree

Unusual ill-thrift symptoms were observed in a monkey-puzzle tree (*Araucaria araucana*) during MPI's High Risk Site Surveillance (HRSS) at Hanmer Springs in North Canterbury. Survey notes and photos taken at the time suggested the tree was badly affected and might die. Few records could be found of plant pathogens attacking this species in New Zealand, so the decision was made to collect samples to rule out the presence of a new exotic pathogen. As the tree was in a prominent location in Hanmer Springs village, the Hurunui District Council wanted trunk sampling limited to a single 20 x 20-mm sample. Under those circumstances the likelihood of a useful diagnostic outcome was considered low. The overall risk of a new exotic species being present was considered low and instead of sample collection and laboratory analysis, surveillance of the tree by HRSS staff is planned. If the tree dies, Hurunui Council staff will remove it and MPI may then be able to more fully investigate the causal agent. In general, investigations of tree death are time-consuming, expensive and frequently not productive, particularly when they involve isolated localities throughout New Zealand. In respect to case-by-case probability, involvement of new exotic diseases is likely to be low, so when deciding whether or not to investigate it is necessary to take into account all the circumstances, including history and locality.

Caterpillar found on imported ginger

A live caterpillar was found on raw ginger (*Zingiber officinale*) imported from Australia. The ginger had been

stored in a bowl with home-grown fruit, a possible source of the caterpillar. PHEL Entomology examined the damaged specimen, which could only be identified to the family Tortricidae (Tortix moths). This family includes more than 10,000 species, some of which are significant pests such as leaf rollers and codling moth. Some leaf rollers and codling moth are present in New Zealand. The single isolated caterpillar had been destroyed, thus mitigating the risk.

Fungus in timber from Peru

In Tauranga, garapa (*Apuleia leiocarpa*) timber decking imported from Peru was reported to have internal and external black and green fungal growth after it was brought out of storage to build a deck. PHEL Mycology confirmed that a sample of timber had superficial black-green discolouration, but there was no sign of fungal growth. Some pieces of wood were plated onto agar and others were kept in high humidity, but no fungal growth was observed after 7 days' incubation. This indicated the absence or lack of viability of fungal organisms. The discolouration may have been caused by sap-staining fungi that were devitalised when the timber was kiln-dried.

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PEST WATCH: 25 July – 22 October 2018

Biosecurity is about managing risks: protecting New Zealand from exotic pests and diseases that could harm our natural resources and primary industries. MPI's Diagnostics and Surveillance Directorate (DSD) 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 25 July to 22 October 2018. 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	*Acremonium egyptiacum* no common name	*Vitis vinifera* grape	Hawke's Bay	(General Surveillance) PHEL	A common soil fungus, it has been found as an endophyte in *Quercus ilex* and *Vitis vinifera.*
fungus	*Didymella segeticola* no common name	*Lophomyrtus bullata* ramarama	Marlborough	(General Surveillance) PHEL	This fungus was isolated from ramarama leaves in association with a *Pseudocercospora* sp. *D. segeticola* is not considered to be associated with disease symptoms.
fungus	*Phaeoacremonium viticola* no common name	*Vitis vinifera* grape	Marlborough	(General Surveillance) PHEL	Isolated from symptomatic vines, which indicates it could be a pathogen of grapes.
fungus	*Postia balsamea* no common name	*Pinus radiata* radiata pine	Auckland	(General Surveillance) PHEL	This wood decay fungus is associated with old and damaged trees and not known to affect healthy living trees.
fungus	*Xenodidymella saxea* no common name	inanimate	Gisborne	(General Surveillance) PHEL	Isolated from a water sample. There are no records of this fungus being associated with any plant material.
insect	*Edwardsiana geometrica* leafhopper	*Alnus sp.* Alder	Waikato	(General Surveillance) S Thorpe	A species known from Europe.
insect	*Pachycolpura manca* coreid bug	inanimate	Auckland	(General Surveillance) PHEL	In appearance similar to *Acantholybas brunneus.* Examination of specimens in collections indicates it has been in NZ since at least 1998.
mite	*Mecognatha sp.* no common name	*Banksia* sp.	Auckland	(High Risk Site Survey) PHEL	Predator. Found on the underside of leaves.
virus	Potato mop-top virus (PMTV)	*Solanum tuberosum* potato	South Canterbury	(General Surveillance) PHEL	A biosecurity response was initiated.

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

- 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

SVS LABORATORIES

- HAMILTON
  PO Box 10304
  Hamilton 3241
  Ph: 0800 SVS LABS (0800 787 522) or 07 444 5101
  Fax: 07 444 5102
  Email: info@svslabs.nz

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

Biosecurity New Zealand
Ministry for Primary Industries
Manatū Ahu Matua