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EDITORIAL

DEMONSTRATING THE IMPORTANCE OF SURVEILLANCE

Welcome to the September annual report edition of *Surveillance.* It's been four years now since *Surveillance* moved to become a largely electronic publication. The journal has also seen the scope expanded beyond the traditional focus on animal health to include aquatic, environment and plant health surveillance, reflecting the wider interests of the biosecurity system. Since then we have seen a steady increase in readership year-on-year to the point that it has now almost doubled. I hope that you are still finding this publication informative and relevant to your areas of interest, while it also provides you with some insight into what's happening in these other important areas.

This past year has seen a number of events or activities that have highlighted and demonstrated the importance and value of biosecurity surveillance. These have also served to raise the profile of MPI's exotic pest and disease hotline (0800 80 99 66) and also highlight the importance of early reporting of suspect exotic pests or diseases.

We had two detections earlier this year of the Queensland fruit fly (*Bactrocera tryoni*) in Whangarei. Both detections were of single male flies, in January and April, in pheromone traps used in the National Fruit Fly Surveillance Programme. Intensive surveillance and monitoring combined with trapping results from this ongoing nationwide programme played an essential role in both responses. These responses demonstrated the importance and value of this programme for both early detection and demonstrating that New Zealand remains free from this economically important pest. The high public and industry interest generated also served to reinforce the importance of good biosecurity to New Zealand.

In January this year, while responding to the first Queensland fruit fly detection, another response was initiated following the notification via the exotic pest and disease hotline of a suspected case of disease caused by the neuropathogenic strain of equine herpesvirus 1 (EHV-1). Early notification enabled this outbreak to be effectively managed and contained, preventing spread to other properties and limiting its impact. Again this demonstrated not only the importance and value of surveillance but also the critical role vets play in early reporting of suspected biosecurity issues. In addition, our understanding of the syndrome as a result of the response will be used to inform veterinarians both nationally and internationally for future disease responses to this organism.

During 2013 and 2014 *Theileria orientalis* Ikeda became a significant issue in some regions. While the outcome in this case will not be the eradication of this disease, significant work has gone into developing an increased understanding of the epidemiology of the organism, including its spread and management. This has included co-operation between MPI and other experts to provide information for stakeholders, including a penside card to detect anaemia in cattle (the FANI card), articles in local newspapers, *Vetscript* and recently a handbook to assist veterinarians on control (Theileria Veterinary Handbook or http://www.nzva.org.nz/sites/default/files/domain-0/Theileria%20Handbook.pdf). This has also served to reinforce the importance of surveillance and early reporting through the exotic pest and disease hotline. In addition, ongoing surveillance through spatial mapping and recording the number of cases over time has informed on impact and helped understanding of risk periods and areas most at risk from the disease.

Surveillance has also played a key role in aiding in the prevention of domestic spread of established of pests like the Mediterranean fanworm and the clubbed tunicate *Styela clava.*

Over the last year, MPI has been working with primary livestock industry organisations, central and regional government and tāngata whenua to develop a New Zealand-wide foot and mouth disease (FMD) response to ensure the best outcome for New Zealand's economy, environment and people in the unlikely event of an FMD outbreak. This important piece of work is a response to findings from the Office of the Auditor-General (OAG) audit, learnings from Exercise Taurus and the FMD Joint Working Group report, which highlighted a number of areas where New Zealand's FMD preparedness activities needed to improve.

Already we are seeing benefits from working together in partnership with industry and we're continually gaining a deeper understanding of the issues surrounding a FMD outbreak, which would otherwise only be discovered during a response. If you'd like to keep up to date on MPI's FMD preparedness work, subscribe to our bi-monthly e-newsletter *Viral News: Spreading the word, not the disease I* (subscribe here: "Viral News subscription page" or at http://www.biosecurity.govt.nz/pests/foot-and-mouth).

As part of the FMD preparedness work New Zealand and Australia have partnered up to support an FMD recognition training programme for practising veterinarians and veterinarians based at large meat processing plants, to build our capability and capacity for early detection and management. Ten veterinarians from New Zealand have already participated in an EUFMD training programme in Nepal, giving them real exposure to this disease. Another course is scheduled for early 2015. See a presentation by an MPI participant on their experience (click here to view).

A number of those participating are already part of MPI's Initial Investigating Veterinarian (IIV) network, while others have joined this network since receiving the training. The IIV network consists of veterinarians specially trained for investigation of suspect vesicular disease. Veterinarians from the network are located across New Zealand and are the first port of call when a field investigation is required. A short reporting time of five hours from the point of notification ensures that FMD can be quickly excluded from any suspect cases notified via the MPI hotline.

In a country so reliant on its primary industries, and with lifestyles so intertwined with our natural environment, it is important that we protect our natural assets from biosecurity threats. To do so we must all play an active role and remain vigilant for such threats; and when we suspect an exotic pest or disease we need to report it early to maximise our chances of containing or eliminating the risk.

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NEW ZEALAND DECLARES FREEDOM FROM EQUINE VIRAL ARTERITIS (EVA) TO THE OIE

Self-declaration of New Zealand's freedom from equine arteritis virus (EAV), the cause of equine viral arteritis (EVA), was submitted to the OIE on 24 June 2014 by Dr Matthew Stone, Director Animal and Animal Products and Delegate to the OIE, Ministry for Primary Industries, Wellington. This declaration concludes the control programme initiated in 1989.

HISTORY OF EQUINE VIRAL ARTERITIS IN NEW ZEALAND

EAV was first determined to be present in horses in New Zealand in 1988. The release of the virus was considered to have occurred from horses imported from North America. A serological survey carried out in 1989 showed that the virus had been circulating widely in the Standardbred sector, with 54 percent of Standardbreds testing serologically positive (95 percent CI; range 45–63 percent). A low level of seropositivity (3 percent) was also detected in the Thoroughbreds using the virus neutralisation test (VNT) to antibody for EAV.

IMPLEMENTATION OF CONTROL MEASURES FOR EVA IN NEW ZEALAND

In 1989, soon after first detection of EAV, the disease was made notifiable in New Zealand and an EVA control scheme implemented. The ultimate aim was to eradicate the disease from the horse population in New Zealand. The main component of the scheme was serological testing of breeding stallions, with additional virus culture of semen in cases where the stallion was serologically positive. The scheme involved a number of controls on the use of carrier stallions and included quarantine of inseminated mares.

An estimate of the seroprevalence in New Zealand was updated in 1990 from the results of testing additional stallions under the EVA control scheme. At this time 3 percent (95 percent CI; range 1–5 percent) of Thoroughbred and 37 percent (95 percent CI; range 31–43 percent) of Standardbred stallions were seropositive to EAV using the VNT. Low VNT titres were obtained from the Thoroughbred stallions tested and very high titres from the Standardbreds. All seropositive Thoroughbred stallions were semen-tested using virus culture and none were found to be carriers of EAV. There were no seropositive stallions detected from 121 horses of other breeds tested (95 percent CI; range 0–4 percent). The scheme broke down during the period 1997–98 when a Standardbred stallion previously confirmed as free of EAV, and which had stood at the same stud as a carrier stallion, was determined to be semen-test-positive. It was determined that semen from this stallion had been inadvertently used to service mares outside of the required quarantine regime. A traceback of contacts identified only this one additional carrier stallion. Consequentially the scheme was modified by incorporating controls for the use of semen from shedder stallions and vaccination for EVA of stallions standing alongside carrier stallions.

A summary of testing carried out as part of the EVA control scheme in 2002 showed that from 1989 to 2002, despite the breakdown in 1997–1998, the programme had been effective, with a declining seroprevalence in the horse population as well as a reduction in the number of known EAV carriers. The number of carrier stallions declined from a maximum of 20 in 1991–1992, to three in 2002. In June 2012 the last EAV carrier stallion was euthanased at the age of 20. No stallion known to be a carrier of EAV remains in New Zealand. Clinical signs of disease have not been observed in horses in New Zealand since EVA was first diagnosed in 1988.

EVA MONITORING AND SURVEILLANCE

EVA is a Notifiable Disease under the Biosecurity Act 1993.

TOTAL SEROLOGICAL TESTING

There were 7157 EAV serological test records available for analysis for the seven-year period of interest from January 2005 to November 2011 (McFadden *et al*., 2013). Of these data 283 were from stallions tested as part of the EVA scheme, 6598 were from import/export tests and 276 were from transboundary animal disease (TAD) investigations. An additional 48 records from mares used for test mating of seropositive stallions to confirm their carrier status were not included in this analysis.

There were 29 horse breeds represented in the data. Some of these were not specific breeds but groups of breeds or type of horse, e.g., equestrian, sport horse, Warmblood or Polo pony. The median number of horses within these breed groups was seven (minimum one, maximum 5369). After categorisation of breeds into three categories, the sample size was sufficient to detect a seroprevalence of 1.7 percent or less for each category (**Table 1**).

EVA CONTROL SCHEME

Over an 11-year period (2001–2011) the status of 465 stallions were found to be negative as part of the EVA control scheme. The status of stallions was determined to be negative either through serological testing (n=389) or from negative virus culture of semen where stallions were serologically positive as a result of vaccination (n=93). After categorisation of the 465 stallions into three breed categories, the sample size was sufficient to detect a seroprevalence of between 3 and 9 percent of stallions for the three categories (**Table 2**). The majority of tests for the 'other' category were from the Appaloosa (25 percent, 45/181) and Quarterhorse breeds (36 percent, 65/181). From the 'other' category there were 27 breeds of stallions that had been tested as part of the EVA control scheme. As part of the scheme any stallion found to have positive serology was semen-tested.

The EVA control scheme allowed post-service serological testing of previously seronegative mares if a semen sample could not be collected from a seropositive stallion to determine its EAV shedder status.

In total 93 (20 percent, 93/465) stallions were semen-tested and determined to have a negative virus culture for EAV. Of these, 46 percent (43/93) had been semen-tested in multiple years. Where breed was identified, 93 percent (83/89) of semen samples were from Standardbred stallions, indicating a high rate of vaccination in this breed and therefore the more frequent need to use virus culture as a method of exclusion.

TABLE 1: SUMMARY OF VNTS FOR EQUINE VIRAL ARTERITIS FROM SERUM COLLECTED FROM HORSES GROUPED INTO BREED CATEGORIES, JANUARY 2005–NOVEMBER 2011[1]

BREED CATEGORY	NUMBER TESTED	CONFIDENCE LIMITS AROUND A ZERO PREVALENCE (%)
Thoroughbred	5 369	0–0.1
Standardbred	344	0–1.6
Other (equestrian/sport/ recreation	826	0–0.7
No breed criteria	618	0–0.9
Total	**7 157**	**0–0.1**

[1]Serological data analysed included data from horses tested as part of import and export requirements, the New Zealand EVA control scheme and from transboundary animal disease investigations.

TABLE 2: SUMMARY OF BREED CATEGORIES OF STALLIONS TESTED UNDER THE EVA CONTROL SCHEME, 2001–2011

BREED CATEGORY	NUMBER TESTED	CONFIDENCE LIMITS AROUND A ZERO PREVALENCE (%)
Thoroughbred	57	0–9
Standardbred	117	0–5
Other (equestrian/sport/ recreation	181	0–3
No breed criteria	110	0–4
Total	**465**	**0–1**

TRANSBOUNDARY ANIMAL DISEASE (TAD) INVESTIGATIONS

During 2005–2011 there were 84 equine TAD investigations carried out to exclude EVA. While some of these were initiated because of positive serology, the majority were initiated because of suspicious clinical signs or haematological findings in the affected horse/s. For investigations initiated on these grounds, more notifications were received from the regional veterinary laboratories (74 percent, 48/65) compared to private veterinarians (26 percent, 17/65).

The array of clinical signs apparent in animals where an investigation was undertaken was reviewed. A similar proportion of cases had clinical oedema (55 percent, 38/69) and anaemia (45 percent, 31/69) alone, while 14 (20 percent, 14/69) had both these changes. A small number were reported with respiratory signs (18 percent, 9/49) or a history of recent abortion (8 percent, 6/71). Nineteen horses (30 percent, 19/64) were recorded as being pyrexic, while 37 (54 percent, 37/68) had inflammatory changes evident on a leucogram. Most investigations (91 percent, 70/77) concerned a single affected horse at a property but seven investigations were on properties with more than one animal affected. (The change in the denominator presented in these figures reflects missing data on the presence of clinical presentation in affected horses from some investigations).

The median age of affected horses was four years (mean 6.9 years; range four months to 35 years). The majority of cases investigated were in males (geldings, colts and stallions: 63 percent, 48/76). Of the 56 horses where breed was recorded, there were 35 Thoroughbreds, 11 Standardbreds, four warmbloods, two Arabians, two Clydesdales, one Appaloosa and one Shetland pony.

EVA was excluded from all investigations undertaken.

Where serological results for EAV initiated the investigation, various methods were used to exclude exposure to EAV, including determining vaccination history, re-testing seropositive horses and testing in-contact horses. For stallions, semen testing by VNT and/or PCR was undertaken. In all cases it was determined that these titres were due either to cross-reactions or vaccination before importation to New Zealand. There were 276 sera tested for EAV as part of these TAD investigations, with no evidence of seropositivity to EAV in any horse investigated.

The minimum requirement for horses and equine semen imported into New Zealand is to comply with the requirements of the OIE Terrestrial Animal Health Code for EVA (Chapter 12.9).

VACCINATION

Vaccination of horses for EVA for the purposes of export only is allowed in New Zealand. New Zealand regularly imports stallions for breeding purposes and most of these are vaccinated in their country of origin prior to arrival here. Maintenance of vaccination status enables these horses to be re-exported if sold or being shuttled to studs in other countries. Many New Zealand horse studs export semen. The import health conditions of the importing countries require records showing maintenance of vaccination for EVA as per the manufacturer's recommendations. For this reason, stallions that commence EVA vaccination will have maintained their vaccination status for export purposes. The last year horses were vaccinated in New Zealand for the purposes of disease management was 2003. The last shedder stallion died in 2012.

NEW ZEALAND'S GENERAL SURVEILLANCE SYSTEM

During the time following the described analysis and up to the present time (from 2012 to 2014), the Animal Health Laboratory (AHL) performed 3627 serological tests for EAV. These included 35 exotic disease investigations that accounted for 41 samples, and 3586 samples tested for animal movement purposes (**Table 3**). When routine

import or export testing resulted in a positive serological test result and led to the initiation of a TAD, the methods described above were employed. EAV was excluded in all investigations during that period.

Therefore, considering that:

- no new infections with EAV have been detected for over a decade;
- for this period ongoing import health controls, surveillance and the infection with EAV control scheme measures have prevented further new cases from occurring and provided a means of detecting evidence of EAV if it was present;
- analysis was carried out on the three surveillance streams and serological test data concluded that exposure of horses to EAV if present was less than two percent within each breed category;
- the New Zealand EVA control scheme has focused on detecting and isolating carrier stallions responsible for venereal transmission;
- EVA is a notifiable disease and general serology data supported by TAD investigations have been used to show absence of any transmission in the general horse population; and
- no vaccination has been undertaken for disease control purposes for 10 years,

in accordance with Chapter 2.5.10 of the *Manual of Diagnostic Tests and Vaccines for Terrestrial Animals* 2014 and Chapters 1.4, 1.6, and 12.9 of the *Terrestrial Animal Health Code* (2013), the Delegate of New Zealand to the OIE self-declared freedom from Equine Viral Arteritis on 24 June 2014.

REFERENCE

McFadden AMJ, Pearce PV, Orr D, Nicoll K, Rawdon TG, Pharo H, Stone M (2013) Evidence for absence of equine arteritis virus in the horse population of New Zealand. *New Zealand Veterinary Journal* 61(5) 300–304

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INTERNATIONAL ANIMAL TRADE

RISK ANALYSIS

The Biosecurity Science, Food Science and Risk Assessment (Animals and Aquatic) Team produces science-based risk analyses for border and post-border activities. The primary focus of the team is the analysis of biological risks posed by imported goods. The team also reviews assessments done by other teams and by external consultants.

The standard process in drafting risk analyses includes internal and external expert peer review, with the draft risk analysis including options for risk management for the identified risks, but not risk management recommendations. Draft risk analyses are released for public consultation alongside import health standards, which are subsequently developed from their content.

Risk analysis work during 2013 included:

Red meat: This analysis was limited to the description of biosecurity risks from disease-causing organisms associated with the importation of meat and meat products derived from ruminants and swine. The scope in regard to ruminants was restricted to sheep, goats, cattle, buffaloes and deer. The definition of swine included all varieties of the species *Sus scrofa*. With respect to commodity types, the risk analysis covered offal, plus the OIE definitions of meat ("all edible parts of an animal"), meat products ("meat that has been subjected to a treatment irreversibly modifying its organoleptic and physicochemical characteristics") and fresh meat (which includes frozen, chilled, minced and mechanically recovered meat).

An extensive list of organisms that could potentially be associated with meat was collated and filtered through specific criteria to derive a preliminary list of hazards. These hazards were individually identified and the epidemiology of the organism was discussed. Any organisms identified as a hazard were subjected to risk assessment to provide a risk estimate that assesses the likelihood of entry (i.e., likelihood of the disease agent being present in meat at the time of importation), and exposure (likelihood of susceptible animals being exposed and subsequent spread and establishment), and any adverse consequences likely to follow these events.

In total, this risk analysis comprised 34 risk assessments and 13 organisms or disease agents were classified as risks. Risk management options were presented for each of these. The pathogens identified as posing a biosecurity risk when importing meat and meat products derived from ruminants and pigs were:

African swine fever virus

Aujeszky's disease virus

Bacillus anthracis

Brucella spp.

The agent of bovine spongiform encephalopathy

Classical swine fever virus

Coenurus cerebralis

Echinococcus granulosus

Foot and mouth disease virus

Nipah virus

Salmonella spp.

Swine vesicular disease virus

Trichinella spp.

Guinea pigs: A qualitative risk assessment was completed that examined the biosecurity risks involved with the importation of guinea pigs from Australia. An extensive preliminary list of organisms associated with guinea pigs was compiled from several sources including a world authority on guinea pig diseases, standard textbooks, electronic data bases and related MPI risk analyses. As a result of individual risk assessments, weed seeds were classified as risks in imported guinea pigs and risk management options were suggested.

Chicken and duck meat: The biosecurity risks associated with the importation of chilled or frozen meat and meat products derived from chickens (*Gallus gallus*) or ducks (Pekin ducks, *Anas platyrhynchos domestica* or *Anas peking*, Muscovy ducks *Cairina moschata,* or a hybrid of these known as mulard or moulard ducks) have been examined.

From an initial list of 116 organisms or groups of organisms possibly associated with chickens and ducks, 14 were identified as hazards in imported whole chicken carcasses and six of these were identified as hazards in imports limited to chicken meat. Sixteen hazards were identified in imported whole duck carcases and 10 of these were identified as hazards in imports limited to duck meat.

Following a risk assessment for each of these hazards, Newcastle disease virus, highly pathogenic avian influenza virus, infectious bursal disease virus and *Salmonella arizonae* were assessed to be risks in chicken meat. Avian paramyxovirus-2 and exotic strains of infectious bronchitis virus were also assessed to be risks in entire chicken carcasses.

Newcastle disease virus, highly pathogenic avian influenza virus, duck hepatitis virus, Derzsy's disease virus and *Salmonella arizonae* were assessed as risks in imported duck meat, with avian paramyxovirus-2 and duck virus enteritis virus assessed to be additional risks in entire duck carcasses.

Turkey hatching eggs: MPI has previously examined the biosecurity risks associated with the importation of hatching chicken and duck eggs. To develop a generic import health standard for poultry hatching eggs, further work was required to assess the biosecurity risks associated with *Mycoplasma meleagridis* and *M. iowae* in turkey hatching eggs.

As a result of this risk assessment, both *M. meleagridis* and *M. iowae* were assessed to be risks in imported turkey hatching eggs. Options to manage these risks were presented, including restricting imports to countries, zones, or compartments that are free of these diseases, testing the flock of origin, hatching eggs under secure quarantine conditions, and antimicrobial treatment.

Schmallenberg virus in live animals and germplasm: A new disease causing fever, reduced milk production, diarrhoea and abortion emerged in Germany in August 2011. A virus was demonstrated by a newly developed real-time RT-PCR test and named Schmallenberg virus (SBV), after the town in North Rhine-Westphalia where the disease was first described. Since then, disease caused by SBV has been reported throughout Europe.

Although the available evidence indicates SBV may be found in the semen of infected bulls, fetal malformations are only likely to occur if a fetus is infected at a vulnerable stage of pregnancy, estimated to be between day 28 and day 50 in sheep, day 62–110 in cattle, and in goats around day 40. It is therefore very unlikely that foetal malformations would be seen in progeny derived from infected germplasm.

A rapid assessment concluded that there is no justification for any additional risk management measures against SBV in the import health standards for live animals or their germplasm from any country.

Porcine epidemic diarrhoea virus (PEDV): Since porcine epidemic diarrhoea was first identified in May 2013 it has rapidly spread throughout pig farms in North America, causing significant mortalities. A rapid risk assessment was completed to identify pig products that could transmit this disease, and to assess the risk these commodities pose to New Zealand's biosecurity.

Porcine blood products, plasma and offal were identified as hazards and the import health standards they were traded under were either revoked (porcine blood, plasma), or temporarily suspended (offal) as a precaution until further assurances are provided. Of these commodities, only blood products and plasma had been imported since the beginning of the disease outbreak. It was considered that the likelihood of pigs being exposed was negligible, as porcine blood is only permitted for human consumption and plasma is only used in rendered cat food, the processing of which will inactivate any viable virus.

ANIMAL IMPORTS

The Ministry for Primary Industries (MPI) Animal Imports Team is responsible for developing and amending import health standards (IHSs) that outline the biosecurity import requirements for live animals, germplasm and animal products. The team also provides advice on imports to the public and technical advice to border staff.

Some IHSs require that the animal or animal product is accompanied by a current permit to import, to assist with clearance at the border or direct goods to a transitional or containment facility. The Animal Imports Team is also responsible for issuing these permits, and 3532 permits were issued in 2013 (**Table 1**). Note that the number of permits is not necessarily related to the volume of trade: for example, one permit might be issued for several horses.

Numbers of live animal and germplasm imports in 2013 are listed in **Table 2**. These are estimates based on importers' stated intentions and may differ from the numbers actually imported.

The following is a summary of new or amended IHSs issued in 2013.

CATS AND DOGS

The *Import Health Standard for Cats and Dogs* into New Zealand was amended on 4 April 2013 to add working dogs returning from any country after being used in New Zealand Defence Force activities.

CAT AND DOG TRANSITIONAL FACILITIES

The *Standard for Cat and Dog Transitional Facilities* was updated on 16 January 2013 to align with the revised *Import Health Standard for Cats and Dogs*. The formatting was updated to include a guidance document.

BOVINE SEMEN AND EMBRYOS

The *Import Health Standard for Bovine Embryos* and the *Import Health Standard for Bovine Semen* requires the approved exporting country's Competent Authority to negotiate veterinary certificates to meet the IHSs. Veterinary certificates for bovine semen and for bovine embryos from the US and Australia were negotiated and completed on 15 April and 7 March 2013 respectively. The new veterinary certificates were transitioned into use and the import health standards they replaced have been revoked.

ALPACA AND LLAMA FROM APPROVED COUNTRIES

The *Import Health Standard for Alpacas and Llamas* was issued on 8 March 2013. This IHS requires the negotiation of veterinary certificates with the exporting country's Competent Authority. MPI started negotiations with Competent Authorities to develop new veterinary certificates that meet the new IHS. Imports can still occur under old import health standards until veterinary certificates are available.

TABLE 1: NUMBER OF IMPORT PERMITS ISSUED BY ANIMAL IMPORTS TEAM, 2013

CATEGORY	PRODUCT TYPE	
Animal product	Animal feed	22
	Animal product	137
	Animal specimen	1
	Bee	93
	Dairy	4
	Dairy/meat samples	2
	Egg	18
	Egg – albumin	2
	Equine	2
	Fibre	14
	Fish	14
	Hides/skins	8
	Meat	10
	Meat/dairy/poultry/fish	1
	Porcine	22
	Poultry	1
	Semen extender	1
	Wool	1
	Total	**361**
Biologicals	Biologicals – general	418
	Biologicals – restricted	235
	Organisms	2
	Total	**655**
Embryos	Bovidae	19
	Caprine	1
	Total	**20**
Live animals	Bovine	2
	Butterfly	5
	Camelid	13
	Caprine	1
	Dog/cat	43
	Dog/cat – quarantine	1 257
	Equine	29
	Fish	15
	Hatching eggs	3
	Insect	7
	Invertebrate	44
	Laboratory animals	38
	Marine invertebrates	11
	Ovine	6
	Rabbit	5
	Zoological	16
	Total	**1 495**
Semen	Bovine	116
	Canine	3
	Caprine	1
	Equine	4
	Ovine	11
	Porcine	3
	Zoological	5
	Total	**143**
Transit	All	140
	Total permits issues	**3 532**

DEER

The *Import Health Standard for Deer* into New Zealand from Australia was amended and issued on 14 March 2013.

The amendment requires the application of both National Animal Identification and Tracing (NAIT) and MPI ear tags before pre-export isolation in Australia.

PIG MEAT

The Supreme Court ruled in favour of MPI in 2013, dismissing NZ Pork's appeal and allowing the importation of uncooked consumer ready cuts (CRC) of pork from the European Union, Sonora State of Mexico and Canada/USA where Porcine Respiratory and Reproductive Syndrome (PRRS) may be present in pigs. These CRC are subject to inspection to ensure they meet the requirements of the import health standard. The verification process will be ongoing until MPI is satisfied with the performance outcomes.

PIG SEMEN

The generic *Import Health Standard for Pig Semen* was issued on 18 June 2013. This IHS requires the negotiation of veterinary certificates with the exporting country's Competent Authority. No veterinary certificates have yet been negotiated under this IHS. Pig semen can continue to be imported under the current IHSs for pig semen from Australia, Canada/USA, New Caledonia and Norway during the transition period.

LIVE HORSES

The *Import Health Standard: Horses* was amended on 1 February 2013 to reflect changes in recommendations in the OIE code for the importation of live horses and align measures with the code. Negotiation for veterinary certificates under this IHS was postponed pending the outcome of the Australian Department of Agriculture's consultation on reducing the testing requirements for contagious equine metritis.

POULTRY HATCHING EGGS AND SPECIFIC-PATHOGEN-FREE EGGS

The *Import Health Standard for Poultry Hatching Eggs & Specific-Pathogen-Free Chicken Eggs* was first issued on 5 February 2013 and then amended on 12 July 2013. Negotiation is under way for hatching egg veterinary certificates.

ORNAMENTAL PRODUCTS

The *Import Health Standard: Ornamental Products of Animal Origin* was amended and re-issued on 22 November 2013 following a number of border queries. Product definitions were clarified. The requirements for trophy hides and skins in the IHS were aligned to the *Import Health Standard: Hides and Skins.* Fully tanned leather and leather goods are eligible for clearance.

LABORATORY ANIMALS AND LABORATORY ANIMAL GERMPLASM

The *Import Health Standard for Laboratory Animals and Laboratory Animal Germplasm* was amended and re-issued on 4 October 2013. Previously only mice, rats, guinea pigs, rabbits and zebra fish were eligible for importation. In addition to the live laboratory animals, the standard now allows the importation of laboratory animal sperm and embryos.

ZOO TASMANIAN DEVILS FROM AUSTRALIA

This import health standard was developed to allow the importation of zoo Tasmanian devils from Australia into New Zealand zoos. The IHS was issued on 19 November 2013.

Tasmanian devils are facing almost certain extinction in the wild owing to devil facial tumour disease, an infectious cancer. Conservation efforts aim at establishing a large genetically diverse insurance population of captive Tasmanian devils in zoos and wildlife institutions around Australia and now in New Zealand. The insurance population is managed by the Zoo and Aquarium Association. The IHS enables New Zealand members of the association to take part in this conservation programme by establishing more captive populations to help protect the species. To date, three New Zealand zoos have been approved by the Tasmanian government.

ZOO ASIAN ELEPHANTS FROM SRI LANKA AND AUSTRALIA

The *Import Health Standard for Zoo Asian Elephants from Sri Lanka and Australia* was issued on 19 June 2013. Auckland Zoo's application to develop this IHS was a response to the need to obtain a companion for their lone zoo elephant. Auckland Zoo also has longer-term plans to develop a breeding elephant herd. However, Sri Lanka is not free from foot and mouth disease (FMD), which means that risk management needs to include quarantine in an FMD-free country even though the risk of the pathogen entering New Zealand from elephants is remote. These requirements have been built into the import health standard.

TABLE 2: LIVE ANIMAL AND SEMEN IMPORTS BY SPECIES IN 2013

SPECIES	ADULT	DECEASED	EGG	EMBRYO	JUVENILE	LARVAE	PUPAE	SEMEN
Alpaca	119				16			
Antelope								54
Aquatic	229		29	1				
Avian			53 580					
Bovine	2			653				340 293
Caprine				66				60
Cat	1 405	1			164			
Circus/zoo	66				5			
Dog	2 574				553			733
Equine	1 102				295			13 672
Fish	20 861			1 200	12			
Gastropod	2							
Guinea pig					4			
Invertebrate	1 224	2	64		1	1 804	828	
Laboratory animal	9							
Lepidoptera	75			401		530	131 489	
Marine mammal								
Mouse	989				967			
Otter	10							
Ovine	24							5 955
Rabbit	4							
Rat	26							
Reptile	1				5			
Spider	30							
Unknown	124							
Total	**32 276**	**3**	**54 091**	**1 902**	**2 182**	**2 334**	**132 567**	**360 767**

EXPORTS OF LIVE ANIMALS AND GERMPLASM

The major live animal and animal germplasm exports and their destinations in 2013 are presented in **Table 3**. **Table 4** compares volumes of live animal and germplasm exports by commodity since 2005.

TABLE 3: VOLUME OF LIVE ANIMAL AND GERMPLASM EXPORTS TO VARIOUS REGIONS IN 2013

	AFRICA	ASIA	AUSTRALIA	CANADA	CENTRAL AND SOUTH AMERICA	EUROPE	MIDDLE EAST	PACIFIC ISLANDS	UNITED STATES	TOTAL
Cats & dogs	36	314	3 587	108	17	553	25	68	272	5 980
Canine semen	0	4	0	0	0	5	0	0	0	9
Live horses	3	675	2 053	0	0	67	4	16	35	2 853
Equine semen	0	0	3 185	0	0	0	0	0	80	3 265
Live cattle	0	36 573	0	0	0	0	0	0	0	36 573
Live sheep	0	15	287	0	7	71	0	0	0	380
Bovine semen	197 090	43 056	172 784	3 214	473 552	549 585	0	3 750	130 074	1 573 105
Ovine semen	0	0	1 320	0	410	0	0	0	147	1 877
Cervine semen	0	0	0	60	0	265	0	0	0	325
Bovine embryos	21	0	161	3	161	112	0	0	392	850
Caprine embryos	0	0	0	0	171	0	0	0	0	171
Ovine embryos	0	0	1 507	0	160	0	0	0	70	1 737
Poultry (day-old chicks)	0	545 395	0	0	0	0	0	725 308	0	1 270 703
Poultry (hatching eggs)	0	257 040	0	0	0	0	213 300	2 066 225	0	2 536 565
Bee packages (kg)	0	0	0	31 827	0	0	0	0	0	31 827
Bees (queen & bumble)	0	1 200	0	2 545	0	1 165	0	0	0	4 910
Live alpacas & llamas	0	49	14	0	0	93	0	0	0	156
Other birds	0	193	4	0	0	3	0	0	1	201
Zoo animals	0	0	14	0	0	0	0	0	1	15

TABLE 4: COMPARISON OF LIVE ANIMAL AND GERMPLASM EXPORTS FROM 2005 TO 2013

SPECIES/YEAR	2013	2012	2011	2010	2009	2008	2007	2006	2005
Bees (packages (kg), queen and bumble)	36 737	8 776	37 180	37 523	34 621	27 435	20 387	18 520	20 117
Bovine embryos	850	1 801	950	943	1 077	915	574	187	713
Bovine semen	1 573 105	1 160 455	1 085 082	1 073 877	1 237 044	785 939	716 865	680 143	785 217
Canine semen	9	41	12	166	56	48	3	97	27
Cats & dogs	5 980	6 151	5 873	4 247	3 999	5 051	4 797	4 216	3 805
Cervine semen	325	220	275	2 590	3 001	1 833	390	583	0
Equine semen	3 265	3 324	2 362	2 670	5 195	4 214	3 903	4 605	4 506
Ferrets	0	374	760	825	1 397	1 801	2 660	3 449	3 908
Live alpacas & llamas	156	456	404	198	375	353	123	76	0
Live cattle	36 573	39 636	30 499	16 150	12 847	17 075	25 909	31 266	42 677
Live deer	0	65	31	15	46	115	159	1 524	68
Live goats	0	0	979	58	190	6	349	1 664	14
Live horses	2 853	2 886	3 308	2 292	2 469	2 512	2 562	2 990	2 820
Live sheep	380	421	177	307	124	118	34 894	983	4 623
Ovine embryos	1 737	0	320	114	230	1 652	3 751	6 268	8 773
Ovine semen	1 877	7 271	11 819	4 954	10 374	19 921	12 365	17 465	25 720
Poultry (day-old chicks)	1 270 703	1 136 530	1 342 542	1 324 543	1 098 192	854 678	867 573	1 696 320	959 221
Poultry (hatching eggs)	2 536 565	2 365 466	3 173 403	5 185 128	3 860 755	5 275 056	7 471 678	9 021 184	6 433 260

NUMBER OF EXPORT CERTIFICATES ISSUED

During 2013 there were 60 notices containing export requirements and the corresponding export certificate templates were determined and notified under the Animal Products Act 1999.

OFFICIAL ASSURANCE PROGRAMME: REQUIREMENTS FOR EXPORT OF LIVE ANIMALS AND GERMPLASM (OAP)

The OAP document has been replaced by Codes of Practice in 2013. There are four Codes of Practice: General Live Animal Export, Pre-export Quarantine and Isolation, Export Poultry and Export Germplasm.

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Animal and Animal Products Directorate
Ministry for Primary Industries
animalexports@mpi.govt.nz

ANIMAL HEALTH LABORATORY

The year 2013 was challenging and exciting for the Ministry for Primary Industries' Animal Health Laboratory (MPI AHL). Preparedness for a foot and mouth disease outbreak was a key focus of our work plans during the year, with assessment of our capability to respond. The AHL provided diagnostic laboratory support for the MPI response to the Fonterra whey protein concentrate contamination scare by co-ordinating overseas expert laboratory testing and conducting a range of laboratory tests for bacterial identification, including Next Generation Sequencing analysis (NGS). A large animal health response that involved the AHL throughout 2013 was a theileriosis epidemic in the northern New Zealand cattle population. To enable the diagnosis and surveillance of this disease AHL scientists designed real-time PCR assays that could distinguish the pathogenic strain Ikeda from the more commonly found and benign strains of *Theileria orientalis* in NZ. This work is featured in an upcoming special edition of the NZ Veterinary Journal. A major project was initiated during 2013 to improve animal health infrastructure in New Zealand, with a new high-containment laboratory to replace the ageing high-containment laboratory at Wallaceville.

NATIONAL BIOCONTAINMENT LABORATORY PROJECT

The laboratory facilities at Wallaceville are used daily to rule out reports of suspect exotic disease from around the country. This type of surveillance is important for ongoing reassurance of consumers and trading partners. Handling material suspected to carry high-impact exotic diseases such as anthrax and highly pathogenic avian influenza requires extra precautions above those found in normal laboratories. Currently MPI operates a physical containment level 3 (PC3) laboratory with a number of containment enhancements to manage the special risks that these samples pose.

The current facilities are nearing the end of their design life and during 2013 MPI has been progressing work to ensure that this capacity continues into the future. Detailed analysis has been conducted into regulatory requirements, laboratory user needs, biological safety reviews, international best practice and capacity requirements.

In late 2013 an indicative business case was approved by Cabinet, followed by a detailed business case in June 2014. A total of $64.7 million has been set aside for the development, which is expected to be completed and in operation by early 2018. The project is supported by a dedicated internal project team and a number of international expert consultants.

SUPPORTING ACTIVE SURVEILLANCE PROGRAMMES

AHL supports a number of MPI surveillance programmes through laboratory tests to confirm the continuing absence of specific pathogens such as transmissible spongiform encephalopathies (TSE) and arboviruses. AHL also annually samples wild ducks to monitor for the presence of avian influenzas and subtypes that could pose a risk to commercial poultry industries.

The AHL performs specific pathogen testing requested by stakeholders, for example testing bees from the Pacific Islands as part of a bee health monitoring programme.

FACILITATING TRADE

One of the core functions of the AHL is diagnostic testing to facilitate and support export and import trade for NZ's primary industries. In 2013 more than six and a half thousand diagnostic tests were performed to directly facilitate and support export and import of products (**Table 1**). The laboratory also supports trade by performing diagnostic tests to support veterinary exotic disease investigations and responses, and for active surveillance programmes. Importantly, our testing serves as a resource for passive surveillance, providing continued assurance to our trading partners of our claims of freedom from specific unwanted diseases. **Table 1** shows numbers and types of tests performed by the AHL in 2013.

As the national veterinary reference laboratory for NZ, the AHL performs many tests unavailable elsewhere in NZ, often because they require special expertise and facilities. We perform a broad range of such tests in both PC2 and enhanced PC3 laboratory facilities to maintain adequate biosecurity containment. We also have close working relationships with a wide range of OIE and reference laboratories around the world that help with testing when required.

The AHL is a centre of science excellence and maintains its accreditation and certification under the MPI Export Laboratory Programme, the Laboratory Approval Scheme (Animal Products Act 1999) and by operating to the exacting standards of AS/NZS 2243.3 and ISO/IEC 17025.

New Zealand is free of equine viral arteritis (EVA) and has recently declared this in a letter to the OIE. However, the AHL is still responsible for performing virus neutralisation tests (VNTs) for EVA to demonstrate freedom from disease, to comply with the import/export health standard for international movement of horses. Numerous EVA VNTs performed each year by AHL are all negative, confirming our freedom from this disease.

THROUGHPUT

The AHL is divided into four science disciplines: virology, immunology, bacteriology and aquatic animal diseases. Each team consists of expert senior scientists, scientists and technicians capable of carrying out the complex, diverse analyses and investigations required daily.

More than 450 test methods are maintained across the science disciplines by AHL, many of which are uniquely offered within NZ and include high-

throughput testing capability for high-priority animal diseases. These tests range from classical and well-established techniques such as virus isolation, virus neutralisation, ELISA and microscopy/pathology, to molecular analysis and state-of-the-art technologies such as real-time PCR, NGS and bioinformatic analysis. Some testing cannot be offered in New Zealand, in which case the AHL subcontracts the work overseas to suitably accredited reference laboratories.

As shown in **Table 1,** the AHL processed about 32 000 tests in the 2013 calendar year, using a large proportion of the test methods we offer. As a national reference facility, the AHL is constantly working to enhance diagnostic capability by implementing new or improved tests to ensure we lead the way in veterinary laboratory diagnostics in NZ.

TABLE 1: SUMMARY OF TEST NUMBERS AND DESCRIPTION OF WORK CONDUCTED BY AHL, 2013

PURPOSE OF TESTING	NUMBER OF TESTS PERFORMED/ ACCESSIONS MANAGED	DESCRIPTION OF WORK
Exotic diseases and pests (investigations to rule in or rule out)	4029/286	(1) Tests to rule out the presence of exotic pathogens (2) Fish pathology (3) Identification of reptiles and amphibians that cross our borders
Cost-recovery diagnostics	3804/174	Cost-recovered diagnostic testing and project work, much of which uses capability not available elsewhere
Surveillance projects (Crown-funded)	15 345/139	Includes TSE, arbovirus and avian influenza surveillance
Import/export/trade (cost recovery)	6715/790	(1) Import and export testing to maintain overseas trade for primary industries (2) Trade in companion animals and animal travel overseas (e.g., racehorses) (3) Quality assurance reference testing for industry partners
Artificial breeding (AB)	382/124	Seven percent of accessions received are for AB purposes, e.g., tests for Brucella abortus, infectious bovine rhinotracheitis, bovine viral diarrhoea type 2 (by virus isolation on bull semen), and leptospirosis by MAT test on serum
Quality assurance	1697/261	As part of our ISO 17025 accreditation we are required to ensure our testing is robust. We participate in 64 programmes of inter-laboratory proficiency testing through eight international authorised reference partners in Australia, North America and Europe

SUPPORTING INCURSION INVESTIGATIONS

The following examples highlight the diversity of laboratory testing undertaken during 2013.

BEE PATHOGENS

Laboratory tests were conducted on bees showing a range of clinical signs. Investigations for the presence of European foulbrood, Israeli acute paralysis virus, acute bee paralysis virus and chronic bee paralysis virus were all negative.

AVIAN

Specimens from backyard and commercial poultry flocks showing respiratory, neurological or immunosuppressive clinical signs, or unexpected deaths, were tested throughout the year for Newcastle disease, infectious bursal disease, avian influenza, Marek's disease, *Ornithobacterium rhinotracheale* and *Pasteurella* spp., all with negative results. Wild finches found dead in the grounds of a hospital were submitted for *Salmonella* spp. screening. ESR subsequently identified isolates for AHL as *Salmonella* Typhimurium phage type 56.

AQUATIC

Submissions from hatchery-reared salmon were investigated for cold water disease and the causal agent *Flavobacterium psychrophilum* was isolated and identified by PCR and DNA sequence analysis. Phylogenetic analysis from whole-genome sequencing revealed this was not a recent incursion. Routine testing of salmon kidneys in the "MAF Standard Health Surveillance in Approved Establishments for Export of Salmon for Human Consumption to Australia" scheme excluded *Yersinia ruckeri, Aeromonas salmonicida* and *Renibacterium salmoninarum*, but a different bacterial isolate was noted. This was identified as *Carnobacterium piscicola (C. maltaromaticum*), which has previously been reported in NZ as a contaminant in packaged meat. This is the first record of the bacterium associated with clinically normal salmon in NZ, but the species has been associated with fish mortalities overseas.

Farmed paua (*Haliotis iris*) were submitted for screening for *Perkinsus* spp. parasites. Three samples tested positive for *Perkinsus olseni* by PCR. Paua is a new host for the parasite, and on-farm is a new location for the infection.

Grey mullet (*Mugil cephalus*) with petechiae and raised scales were submitted to AHL for testing. *Myxobolus* spp. encysted in the skin were identified by wet smear and PCR was used to confirm the species. *M. episquamalis* has been reported to cause this condition in mullet in Australasia, but not previously in NZ.

BOVINE

An extensive presentation of anaemia in cattle in Northland farms spread south to other areas and our investigations identified the cause to be *Theileria orientalis* Ikeda, a strain of *Theileria* not previously found in New Zealand. This finding became the subject of a significant response by MPI to support the beef and dairy industries in managing the disease. AHL scientists designed a real-time multiplex PCR to differentiate Ikeda from other strains. The results of this test contributed information to describe the epidemiology of the disease. The test has subsequently been distributed to Gribbles Veterinary Pathology and New Zealand Veterinary Pathology to support clinical diagnosis.

An outbreak of pneumonia in calves caused by a *Pasteurella*-like organism was identified as *Mannheimia haemolytica*. Particular serotypes of this organism in the USA cause shipping fever, but the serotypes present in NZ do not.

Through the year, cases were investigated and tested for bovine *Pasturella multocida,* anthrax (*Bacillus anthracis*), Q fever (*Coxiella burnetii*), *Mycoplasma* spp. and *Escherichia coli*.

CANINE

A case of suspect *Brucella canis* epidymitis was investigated by serology, and was negative. Unusual skin lesions found in two dogs were submitted

for *Histoplasma* spp. testing, and *Microsporum canis* was isolated in both dogs.

CAPRINE

A number of specimens were submitted through the year for *Mycoplasma* testing by culture and molecular methods.

EQUINE

Routine testing of 10 horses from the US held in quarantine gave a single "not negative" result with a screening generic influenza A PCR. Follow-up testing with subtype-specific PCRs and a second molecular target for generic influenza PCR gave negative results. This shows the importance of being able to test for a pathogen with multiple independent assays. The influenza real-time PCR is a very specific and robust assay, but our experience is that sporadic non-specific cross-reactions can occur, which are suspected to be associated with a specimen taken shortly after theoretically unrelated vaccinations.

OVINE

Three blood samples from 32 sheep on a milking goat farm (600 goats) were found to be positive by caprine arthritis encephalitis (CAE) ELISA by NZVP. The serological test does not differentiate CAE from maedi visna virus (MVV), an exotic pathogen, hence the submission of sera to AHL for further testing. The goat herd is known to be CAE-positive and goat colostrums and milk were fed to the lambs, so a known mechanism of transmission was present. There was no clinical evidence of MVV and sera were sent to a reference lab overseas for testing. An MVV-specific PCR has been developed at AHL to enhance our capability.

PORCINE

As part of our role as the national reference laboratory we are sometimes asked to confirm human clinical findings, in this case identification of *Brucella suis* biovar 1, which was isolated from a Tongan immigrant shortly after knee surgery. This was most likely a latent infection acquired in Tonga and re-activated by the surgery.

In the same role, the AHL received a sample from a suspect *Haemophilus* spp. infection in pigs, for identification. The isolate was identified as *Haemophilus parasuis*.

ZOO ANIMALS

Samples from tuatara (*Sphenodon punctatus*) and bearded dragon (*Pogona vitticeps*) from Auckland Zoo were submitted to test for a suspect fungal infection, *Paranannizziopsis australiensis* (PA), formerly known as the *Chrysosporium* anamorph of *Nannizziopsis vriesii* (CANV). No CANV was isolated on this occasion but later submissions did isolate PA/CANV from fungal culture, and sequence analysis of PCR products confirmed the presence of PA/CANV.

A kiwi (*Apteryx* sp.) was found to have died from toxoplasmosis and the parasite was identified as a European genotype of *Toxoplasma gondii*.

Mycoplasma lipofaciens was isolated and identified from the lung of a Fiordland crested penguin after it died from pneumonia. This is a first report of this organism in NZ and it was reported to the MPI exotic disease hotline, but was not regarded as a new incursion.

OTHER SUBMISSIONS

An animal limb found in palm kernel expeller (PKE) on a farm was submitted for identification. DNA was extracted and analysed by "DNA barcoding", enabling sequence analysis to identify it as *Ovis aries.* The sheep limb was most likely an on-farm contaminant. In another incident, an unidentifiable mummified animal found in PKE was identified by DNA barcoding to be *Bos taurus*, most likely an aborted foetus introduced to the PKE feed on the farm.

Shisha or "wetted tobacco" from the UAE was submitted from the Border/ITOC Border Clearance Services after it was noted that the ingredients listed honey as a wetting ingredient. AHL identified an AsureQuality lab that would be able to carry out testing to establish whether honey was present, which would represent a risk to New Zealand; or molasses, which would not.

EXOTIC DISEASE PREPAREDNESS

The AHL has further enhanced its preparedness for exotic disease investigations and responses. Significant effort has been invested in advancing preparedness for foot and mouth disease (FMD), including review of the AHL FMD laboratory plan, reviewing the laboratory capability and processes, and training another AHL scientist in FMD diagnostics at the World Reference Laboratory in Pirbright, UK (four AHL scientists have attended this training course over the last four years.) The AHL now participates in a large number of test panels in FMD international proficiency testing schemes.

AHL scientists are leading a collaborative project with the National Centre for Foreign Animal Diseases, Winnipeg, Canada, to establish the diagnostic capabilities for detecting FMD in red deer. The "Establishing Critical Capability for Foot-and-Mouth Disease in Deer – Project" (in short the FMD in Deer Project) is a prestigious project funded by the MPI Science and Risk Assessment Directorate under their operational research programmes. The project evaluated FMD test methods for use on red deer, the main deer species farmed in NZ, and will play a part in developing MPI's FMD preparedness programme.

The AHL continues to invest in new technology and staff training to improve testing efficiency and the quality of scientific data. NGS was used to analyse the whole genome of the bacterium isolated from the whey protein concentrate that caused the *Clostridium botulinum* contamination scare. NGS analysis revealed the bacterial strain had the greatest homology to *Clostridium sporogenes*. The non-toxic-non-haemagglutinin (NTNH) gene was absent and none of the sequencing reads mapped to *C. botulinum* toxin genes A, B, C, D, E, F and G. These findings were corroborated by whole-genome-sequencing analysis at Massey University and National Veterinary Services Laboratories (NVSL), US Department of Agriculture, Ames, Iowa.

NATIONAL AND INTERNATIONAL CONNECTIONS

The New Zealand Veterinary Laboratory Network meeting was hosted by New Zealand Veterinary Pathology in Palmerston North during 2013. The meeting was chaired by MPI's Animal Health Laboratory Manager, with participants representing AgResearch Ltd, AsureQuality, Gribbles Veterinary New Zealand, MPI, New Zealand Veterinary Pathology, Livestock Improvement Corporation, Poultry Veterinary Services, Tegel Ltd and Massey University.

The International Knowledge-Based Bio-Economy (KBBE) Forum, a collaborative initiative between the EU, Australia and New Zealand, organised a workshop on mollusc disease diagnosis in Geelong, Australia, from 21 to 24 October 2013, which was attended on behalf of MPI by Brian Jones and Eugene Georgiades.

AHL experts represent New Zealand on the following multinational animal disease working groups:

- International Veterinary Biosafety Workgroup, an international working group involved in setting standards for high-containment veterinary laboratories worldwide (Joseph O'Keefe);
- FluLabNet, an EU-organised collaborative network on influenza (Wlodek Stanislawek);
- Sub-committee on Aquatic Animal Health Standards, an Australian and New Zealand committee that provides technical advice on aquatic animal health issues in support of policy planning (Brian Jones); and
- Sub-committee on Animal Health Laboratory Standards, an Australian and New Zealand committee that seeks to protect market access for animals and animal products by applying internationally accepted best practice, especially for emergency animal disease diagnosis and management (Wendy McDonald).

TABLE 2: STAFFING AND STRUCTURE

Director, Investigation and Diagnostic Centres	Veronica Herrera (Wellington)
Director, National Biocontainment Laboratory Project	Joseph O'Keefe
Animal Health Laboratory Manager	Wendy McDonald (Acting)
Bacteriology and Aquatic Animal Diseases	
Manager	Brian Jones (Acting)
Aquatic Animal Diseases Principal Adviser	Brian Jones
Fisheries Forensic Analysts	Graeme Bremner (0.6 FTE), Henry Lane (0.4 FTE)
Scientists	Jenny Draper, Hye Jeong Ha, Sharon Humphrey, Cara Brosnahan, Milica Ciric
Technical staff	Taryrn Haydon, Henry Lane (0.6 FTE), Katy Booth
Immunology	
Team Manager	Richard Spence
Immunology Principal Adviser	Reinhold Kittelberger
Scientists	Rick Clough, Rudolpho Bueno
Techincal staff	Michaela Hannah, Richard Swainsbury, Courtney O'Sullivan, x1 vacancy
Technical Resource Co-ordinator	Judy Jenner
Biosafety Officer	Kanishka Fernando
Virology	
Manager	Grant Munro
Scientists	Wlodek Stanislawek, David Pulford, Della Orr, Edna Gias
Technical staff	Mike Hansen, Ickel Marie Bueno, Mary Ann Tuboltsev, Smritri Nair, Sylvia Ohneiser, Maree Joyce
Technical assistants	Barbara Black, Mary Mewett
Containment Laboratory	
Supervisor	Bryan Schroeder
Quality Assurance	
Adviser	Irina Bolotovski

STAFF PUBLICATIONS IN SCIENTIFIC AND TECHNICAL JOURNALS

Brosnahan C, Keeling SE, Johnston C (2013). Juvenile oyster mortality response: a laboratory perspective. *Surveillance* 40(2), 25–27.

Buckle K, Draper J, Humphrey S, Hunter S (2013). First isolation in New Zealand of *Mycoplasma lipofaciens*, from the lung of a Fiordland crested penguin/tawaki with pneumonia. *Surveillance* 40(2), 5–7.

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Keeling SE, Brosnahan CL, Johnston C, Willis R, Gudkovs N, McDonald WL (2013). Development and validation of a real-time PCR assay for the detection of *Aeromonas salmonicida*. *Journal of Fish Diseases* 36(5), 495–503.

Kittelberger R, McFadden AMJ, Kirkland PD, Hannah MJ, Orr D, Bueno R, Swainsbury R, Keen D, Jenner J, French J, Pigott CJ (2013). Evaluation of two commercial enzyme-linked immunosorbent assay kits for the detection of serum antibodies against Akabane virus in cattle. *Journal of Veterinary Diagnostic Investigation* 25, 645–648.

Lawrence K, McFadden A, Pulford D (2013). *Theileria orientalis* (Ikeda) associated bovine anaemia: the epidemic to date. *Vetscript* 26(10), 12–13.

McFadden A, Gias E, McFadden FS, Pulford D (2013). Risks of outbreaks of anaemia associated with *Theileria orientalis* Ikeda in cattle. *Vetscript* 26(11), 32–33

Peacock L, Kittelberger R, Green O, George S (2013). Arbovirus surveillance programme. *Surveillance* 40(3), 30–31.

McFadden AMJ, Pearce PV, Orr D, Nicoll K, Rawdon TG, Pharo H, Stone M (2013). Evidence for absence of equine arteritis virus in the horse population of New Zealand. *New Zealand Veterinary Journal* 61, 300–304.

Spence RP, Demchick P, Hornitzky M, Pharo H, Peacock L, McFadden A, Stone M (2013). Surveillance of New Zealand apiaries for *Paenibacillus alvei*. *New Zealand Entomologist* 36(2), 82–86.

Stanislawek W, McFadden A, Tana T (2013). Avian influenza surveillance programme. *Surveillance* 40(3), 19–22.

Tompkins D, Johansen C, Jakob-Hoff R, Pulford D, Castro I, Mackereth G (2013). Surveillance for arboviral zoonoses in New Zealand birds. *Western Pacific Surveillance and Response Journal* 4(4), doi: 10.5365/wpsar.2013.4.3.002.

Vink D, Kittelberger R (2013). Transmissible spongiform encephalopathies (TSE) surveillance programme. *Surveillance* 40(3), 27–29.

Watts J, Pulford D (2013). *Theileria*: the risks of ticks. *Vetscript* 26 (10), 9–11.

ANIMAL HEALTH SURVEILLANCE

The following tables present animal health data collected by MPI from various sources in 2013.

Table 1 is a summary of the numbers of laboratory submissions from sick farmed animals, of cases of surveillance interest to MPI, from the major livestock and avian populations.

Table 2 lists the number of *Salmonella* serotypes by animal species diagnosed by veterinary pathology laboratories.

Table 3 presents a summary of the results for the salmon surveillance programme. This testing programme is run annually for health surveillance in approved establishments for export of salmon for human consumption to Australia. Testing is conducted by the Animal Health Laboratory (AHL) Wallaceville.

Table 4A presents a cumulative list of investigations conducted by the MPI Incursion Investigation (Animals and Marine) Team more than once during the period 2008–2013 that have resulted in exclusion of OIE-notifiable diseases or other selected significant exotic diseases.

Table 4B presents a list of significant investigations conducted during 2013 by the MPI Incursion Investigation (Animals and Marine) Team into suspected exotic or emerging diseases that have been confirmed as positive. These include exotic disease incursions or newly emerged diseases, occurrences of diseases in new host species, first detections of disease agents established in New Zealand, and interceptions with no resulting transmission or establishment of organisms.

TABLE 1: NUMBER OF CASES AND DIAGNOSES RECEIVED FROM VETERINARY DIAGNOSTIC LABORATORIES DURING 2013

CATTLE	
Total sick animal cases	**17 629**
Abnormalities of reproductive system	**303**
Neospora caninum	18
C. fetus ssp. venerealis	0
Pestivirus infection	4
Abortion	**704**
Neospora caninum	150
Mycotic abortion	0
Pestivirus infection	10
Leptospira spp.	10
Congenital defects	**15**
Ill thrift/diarrhoea	**8 592**
Pestivirus infection	248
Gastrointestinal parasitism	75
Johne's disease – suspicious and confirmed	1709
Trace element deficiency	384
Yersinia spp.	381
Rotavirus	427
Nervous signs	**480**
Listeria monocytogenes	9
Hepatic encephalopathy	0
Metabolic disease	74
Malignant catarrhal fever	8
Polioencephalomalacia	11
Histophilus somnus	1
Sudden death	**1 093**
Clostridium spp.	6
Respiratory disease	**676**

PIGS	
Total sick animal cases	**55**
Abortion	**1**
Ill thrift/diarrhoea	**17**
Nervous signs	**2**
Sudden death	**14**

SHEEP	
Total sick animal cases	**1543**
Abnormalities of reproductive system	**168**
Brucella ovis	12
Abortion	**265**
Campylobacter fetus spp. *fetus*	39
Other *Camplyobacter* spp.	13
Toxoplasma gondii	17
Salmonella Brandenburg	33
Congenital defects	**1**
Ill thrift/diarrhoea	**412**
Johne's disease	65
Trace element deficiency	14
Gastrointestinal parasitism	46
Nervous signs	**90**
Listeria monocytogenes	22
Polioencephalomalacia	3
Clostridium spp	2
Respiratory disease	**43**
Sudden death	**359**
Gastrointestinal parasitism	15

FARMED DEER	
Total sick animal cases	**184**
Abortion	**1**
Congenital defects	**0**
Ill thrift/diarrhoea	**100**
Johne's disease	13
Trace element deficiency	15
Yersinia spp.	9
Nervous signs	**9**
Malignant catarrhal fever	1
Sudden death	**63**
Gastrointestinal parasitism	3
Malignant catarrhal fever	1

HORSES	
Total sick animal cases	**5921**
Abortion	**53**
S. zooepidemicus	*0*
Circulatory disease	**309**
Ill thrift/diarrhoea	**1 147**
Gastrointestinal parasitism	8
Nervous signs	**207**
Respiratory disease	**618**
Streptococcal infection	59
Sudden death	**36**

LAMOIDS	
Total sick animal cases	**190**
Abortion	**1**
Ill thrift/diarrhoea	**79**
Gastrointestinal parasitism	5
Nervous signs	**12**
Respiratory disease	**6**
Sudden death	**19**

AVIAN SPECIES	
Total number of submissions	**664**

GOATS	
Total sick animal cases	**381**
Abortion	**7**
Ill thrift/diarrhoea	**166**
Gastrointestinal parasitism	6
Respiratory disease	**26**
Nervous signs	**21**
Listeria monocytogenes	1
Caprine arthritis encephalitis	2
Sudden death	**63**
Clostridium perfringens D (enterotoxaemia)	0
Gastrointestinal parasitism	8

TABLE 2: *SALMONELLA* SEROTYPES ISOLATED FROM ANIMALS DURING 2013

SEROTYPES	BOVINE	EQUINE	OVINE	CAPRINE	PORCINE	AVIAN	CANINE	FELINE	REPTILE
Unspecified	7	0	0	0	0	0	0	0	0
Agona	2	0	0	0	0	0	0	0	0
Anatum	1	0	0	0	0	0	0	0	0
Brandenburg	24	0	33	0	0	0	0	0	0
Bovismorbificans	2	0	0	0	0	0	0	0	0
Emek	1	0	0	0	0	0	0	0	0
Enteritidis	3	0	0	0	0	0	0	0	0
Hindmarsh	2	0	28	0	0	0	0	1	0
Infantis	1	0	1	0	0	0	0	0	0
Johannesburg	0	0	0	0	0	0	1	0	0
Kentucky	1	0	0	0	0	0	0	0	0
Lexington	0	0	0	4	0	0	0	0	0
Montevideo	1	0	0	0	0	0	0	0	0
Potsdam	0	0	0	0	0	0	0	0	1
Ruiru	1	0	0	0	0	0	0	0	0
Saintpaul	3	0	1	0	0	0	0	0	0
Senftenberg	2	0	0	0	0	0	0	0	0
Typhimurium	112	13	5	0	0	2	3	12	0
Total	**163**	**13**	**68**	**4**	**0**	**2**	**4**	**13**	**1**

TABLE 3: SALMON SURVEILLANCE DURING 2013

Number of salmon farms visited	17
Number of farms with significant mortalities	0
Number of farms where significant infectious disease was found	0

LABORATORY EXAMINATIONS	NO OF FARMS	NO OF SAMPLES	NO OF POSITIVES
Viral cultures	17	1 800	0
Myxobolus cerebralis	9	540	0
Yersinia ruckeri	17	1 800	0
Aeromonas salmonicida	17	1 800	0
Renibacterium salmoninarum	8	480	0

TABLE 4A: CUMULATIVE LIST OF SIGNIFICANT(*A) NEGATIVE INVESTIGATIONS OF SUSPECTED EXOTIC DISEASES 2008–2013

DISEASE AGENTS INVESTIGATED AND CONFIRMED AS NEGATIVE	2008	2009	2010	2011	2012	2013	Total
Abalone virus ganglioneuritis	1		1				2
African horse sickness						2	2
Africanised honeybee (*Apis mellifera scutella*)/ Cape bee (*Apis mellifera capensis*)		2	1	1			4
Akabane virus	1	1		2	1	1	6
Anaplasmosis					5	3	8
Anthrax	1	3	4	1	1	3	13
Aujeszky's disease		3	1				4
Avian influenza: highly pathogenic notifiable avian influenza and Newcastle disease[2, 3, 4]	9	3	10	7	8	4	41
Avian influenza: low-pathogenicity notifiable avian influenza[2, 3, 4]	1				6	2	9
Avian malaria *B	1	1	1				3
Avian polyomavirus *B		2			1	2	5
Avibacterium paragallinarum (infectious coryza)				*B 1		1	2
Babesia canis, B. gibsoni, B. felis	1	3	5		5	2	16
Bluetongue				4	6		10
Brucella abortus	1		2	2	3	2	10
Brucella canis	11	9	4	6	8	6	44
Brucella melitensis					2		2

DISEASE AGENTS INVESTIGATED AND CONFIRMED AS NEGATIVE	2008	2009	2010	2011	2012	2013	Total
Bovine herpes virus type 5				1	1	2	
Bovine theileriosis/babesiosis (exotic strains) [5]	1	1		2	3	6	13
Bovine viral diarrhoea type II		1	1	3	2		7
Canine distemper virus		1	1		1	1	4
Canine influenza [6]	1		1	1			3
Canine transmissible venereal tumour				2			2
Classical swine fever [7]		3	1	1			5
Chlamydophila abortus (enzootic abortion)		4		1	1		6
Colony collapse disorder	1		4	2			7
Contagious agalactia		1		2			3
Contagious bovine pleuropneumonia		1	1		2	1	5
Ehrlichia canis	6	3	7	3	1	1	21
Equine babesiosis/theileriosis/ehrlichiosis		6	8	5	2	3	24
Equine herpesvirus type 1 (abortion strains, neuropathogenic strains)			2		3	1	6
Equine infectious anaemia/Equine viral arteritis	10	11	14	7	14	17	73
Equine influenza [8]	2			2	1	2	7
European foulbrood (bees)	3	3	4	4	4	3	21
Exotic ticks	2	3		6		3	14

Continued p. 20

TABLE 4A: CUMULATIVE LIST OF SIGNIFICANT[*A] NEGATIVE INVESTIGATIONS OF SUSPECTED EXOTIC DISEASES 2008–2013 (*continued*)

DISEASE AGENTS INVESTIGATED AND CONFIRMED AS NEGATIVE	2008	2009	2010	2011	2012	2013	Total
Fish mortality (wild or managed, marine) – exclusion of exotic and novel infectious disease agents		3	6	4	6	5	24
Haemogregarine parasite (reptiles)	4	1					5
Haemorrhagic septicaemia (*Pasteurella multocida* – toxogenic strains) [9]		7	4	9	7	3	30
Heartworm (*Dirofilaria immitis*)	2	2		3	2	1	10
Hydatids (*Echinococcus* spp.)	1	1	3	1	1		7
Infectious bovine rhinotracheitis (exotic strains)	1			1	4	1	7
Infectious bursal disease	1	1	4	3	2	5	16
Infectious haematopoietic necrosis (fish)	1				1		2
Iridovirus (fish)					3		3
Israeli acute paralysis virus (bees)		2	2	2	3	1	10
Leishmaniasis	2		1	1	2	1	7
Leptospira spp. (exotic strains)	4	2	1	1	2	1	11
Mycoplasma bovis		1	3	4	3	1	12
Mycoplasma mycoides mycoides (Large Colony)	2			1	2		5
Myxomatosis		1		1	1	2	5
Nematodirus battus		1	1				2
Nosema ceranae (bees)		3	*B	1	1	1	6
Ornithobacterium rhinotracheale		1	2		2	1	6
Perkinsus marinus/P.olseni (molluscs)		3		2	1	2	8
Pilchard herpesvirus	1	1	1				3
Porcine reproductive and respiratory syndrome	1	3	2	1			7
Poxviruses (Sheep, goats, deer, camelids)					3	1	4
Psittacine herpesvirus (incl. Pacheco's disease)	1					2	3
Pulmonary adenomatosis virus					2		2
Q fever (*Coxiella burnetti*)		4			3	1	8
Rabies		4	1		1	1	7
Rinderpest	1			1	2		4
Ross river virus				1	1		2
Salmonella spp. (exotic strains)	5	5	2	2	4	5	23
Small hive beetle (*Aethina tumida*) (bees)	3	1	2	5	1		12
Slow paralysis virus, Acute bee paralysis virus (bees)		2	2				4
Swine influenza	1	1					2
Tracheal mite (*Acarapis woodi*) (bees)	1	6	2	3	2	1	15
Transmissible spongiform encephalopathy agents (scrapie; BSE; chronic wasting disease; FSE) *C					3	4	7
Trichinella spiralis			1			1	2
Tropilaelaps clareae (bees)	5	5	2	3	3	1	19
Viral encephalopathy and retinopathy (fish)	1				1		2
Viral haemorrhagic septicaemia (fish)	1				1		2
Viral vesicular disease [10]	5	2	6	12	7	5	37
West Nile virus	1	1	1	2	1		6
Total	**98**	**129**	**122**	**130**	**159**	**115**	**753**

TABLE 4B: LIST OF SIGNIFICANT POSITIVE INVESTIGATIONS OF SUSPECTED EXOTIC DISEASES 2013

DISEASE AGENTS INVESTIGATED AND CONFIRMED AS POSITIVE[1]	2013
Acanthamoeba sp. pneumonia (cattle)	1
Aspergillus terreus (dog)	1
Babesia felis *D	1
Bovine papillomatous digital dermatitis	1
Cervine papillomavirus	1
Dirofilaria immmitis *D	1
Echinococcus granulosus (hydatids) *D	1
Equine multinodular pulmonary fibrosis (equine herpesvirus 5)	1
Exotic ticks *D	2
Flavobacterium psychrophilum (fish)	1
Mycoplasma haemolamae (camelids)	1
Mycoplasma lipofaciens (penguins)	1
Mycoplasma ovis (goats)	2
Perkinsus olseni (farmed paua)	1
Sporadic bovine encephalomyelitis (*Chlamydophila pecorum*)	2
Starling circovirus	1
Theileria orientalis Ikeda strain [11]	*E
White spot syndrome virus (crustaceans) *D	1

NOTES TO TABLES 4A AND 4B

*A The investigations listed in Table 4A are those that have resulted in exclusion of an OIE-notifiable disease or other significant diseases investigated more than once in the time period. This is not a definitive list of all investigations conducted. Some investigations resulted in multiple exclusions using specific laboratory methods, and these are recorded against each disease. The data were retrieved and analysed from the Notification and Investigation Manager Application database. Regular quarterly reports are published in *Surveillance*.

*B These previously exotic disease agents have become established in New Zealand, either during the year if indicated in a time column, or previously if indicated next to the disease agent name. They may remain the subject of exotic disease investigation for the purpose of describing an emerging disease, owing to their having been found in new animal host species or as suspected new incursions.

*C Investigation of transmissible spongiform encephalopathy (TSE) agents reported here is in addition to the testing occurring in the TSE surveillance programme. See Watts J, Kittelberger R (2012), *Surveillance* 39(3), 27–28 for a review of the TSE surveillance programme.

*D These confirmed disease agents in Table 4B may involve interception at the border or soon after entry into New Zealand. Transmission and establishment of organisms has not occurred.

*E An outbreak investigation consisting of multiple individual investigations was conducted.

REFERENCES TO TABLES 4A AND 4B

(1) See Bingham P (2013), *Surveillance* 40, 2–4 and 41(1) 2014, quarterly reports of investigations of suspected exotic disease and suspected exotic marine and freshwater pests and diseases, for summary investigation reports for confirmed disease agents and negative disease investigations.

(2) See Rawdon TG *et al.*(2007), *Surveillance* 34(3), 10–17, for a report on MPI investigations of avian mortality including risk profiling, and analysis of spatial and temporal trends.

(3) See Frazer J *et al.* (2008), Surveillance 35(2), 14–16 ; Frazer J *et al.* (2009), *Surveillance* 36(2), 17–18 ; Frazer J *et al.* (2010), *Surveillance* 37(2), 20–22; Stanislawek W et al. (2011), *Surveillance* 38(3), 19–22; Stanislawek W *et al.* (2012), *Surveillance* 39(3), 20–23; Stanislawek W *et al.* (2013), *Surveillance* 40(3), 19–22, for reports on New Zealand's avian influenza surveillance programme.

(4) See Zheng T *et al.* (2010), *New Zealand Veterinary Journal* 58(2), 74–80, for a cross-sectional survey of influenza A infection and management practices in small rural backyard poultry flocks in New Zealand; and Rawdon TG *et al.* (2010) *New Zealand Veterinary Journal* 58(6), 292–98, for a paper describing a cross-sectional survey for avian influenza subtypes H5 and H7 in chickens and turkeys farmed commercially in New Zealand. See also Rawdon T *et al.* (2011), *Surveillance* 38(2), 12–19 and (2012) 39(1), 7–11, for a two-part report into disease risk pathways associated with backyard poultry keeping in New Zealand.

(5) McFadden AMJ *et al.* (2011) An outbreak of haemolytic anaemia associated with infection of *Theileria orientalis* in naive cattle. *New Zealand Veterinary Journal* 59(2), 79–85.

(6) See Potter KA *et al.* (2009), *New Zealand Veterinary Journal* 57(1), 70, for an abstract describing the investigation of an outbreak of severe tracheobronchitis in racing greyhounds in New Zealand.

(7) Bingham PC, McFadden AMJ, Wang J, Kittelberger R, Clough RR, Tham KM (2010) Investigation of a pig herd with animals seropositive for classical swine fever and where porcine circovirus-associated disease had been diagnosed. *New Zealand Veterinary Journal* 58(5), 253–59.

(8) See McFadden AMJ *et al.* (2007), *Surveillance* 34(4), 4–8, for a report on MPI's response to manage the risk of equine influenza in horses imported from Australia during the 2007 Australian epidemic.

(9) McFadden AMJ *et al.* (2011) Outbreaks of pleuritis and peritonitis in calves associated with *Pasteurella multocida* capsular type B strain. *New Zealand Veterinary Journal* 59(1), 40–45.

(10) See McFadden A (2011), *Surveillance* 38(1), 8–20, for methods and summaries of four clinical and epidemiological investigations into vesicular disease.

(11) See McFadden AMJ, Marchant R (eds). *Theileria* Veterinary Handbook. Wellington: Ministry for Primary Industries, ISBN No. 978-0-478-43272-5, 2014. http://www.nzva.org.nz/sites/default/files/domain-0/Theileria%20Handbook.pdf. Accessed DATE

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AVIAN INFLUENZA SURVEILLANCE PROGRAMME

New Zealand's avian influenza surveillance programme is multi-faceted, incorporating active surveillance of resident and migratory wild birds, and enhanced passive surveillance. New Zealand has never had a case of highly pathogenic avian influenza in wild birds or poultry, or a case of low-pathogenic avian influenza in poultry (World Organisation for Animal Health, 2014).

WILD BIRD SURVEILLANCE

From 2004 to 2013, the Ministry for Primary Industries (MPI), in conjunction with the New Zealand Fish and Game Councils, the Department of Conservation and other stakeholders, carried out surveillance for avian influenza on targeted migratory birds, in particular the bar-tailed godwit (*Limosa lapponica*), and red (lesser) knot (*Calidris canutus*), on their arrival from late September to November, at Miranda, their main North Island arrival site. These birds were targeted because of their migration pathway, along which avian influenza (AI) viruses may be present: directly from Arctic regions of Asia and North America in the case of the godwit, and from Arctic regions via the Pacific coast of Asia in the case of the knot. The surveillance indicated that migratory birds pose a very low risk for the introduction of AI to New Zealand, as no AI virus was isolated in the six years of sampling. Subsequently, in 2010 to 2013 surveillance has focused on resident birds, mainly waterfowl.

New Zealand is not on a migration pathway for waterfowl as observed in the northern hemisphere, although vagrant waterfowl from Australia are occasionally encountered. Nevertheless, since 2004, non-migratory waterfowl, predominantly mallard ducks (*Anas platyrhynchos*) have also been sampled in the summer months throughout New Zealand, with a particular focus on coastal areas where they might have had contact with migratory shorebirds.

In 2013, cloacal and oropharyngeal swabs were collected from 960 healthy resident mallard ducks. Individual bird samples were tested by the influenza A real-time RT-PCR TaqMan (Spackman *et al.,* 2003). Positive or suspect samples were then tested using real-time H5 and H7 RT/PCR TaqMan (Slomka *et al.*, 2007; Sidoti *et al.,* 2010) and conventional H5, H7 RT-PCRs. The H5-positive samples were tested with conventional RT/PCRs to obtain genomic information. All H5-positive samples were subjected to virus isolation (Stanislawek *et al.,* 2002) and partial genomic sequencing.

Influenza A RNA was detected in 47.5 percent of ducks (either cloacal or oropharyngeal or both collected samples). Influenza subtype H5 RNA was confirmed in 49 samples from two locations and H5N2 virus was only isolated once. No influenza subtype H7 was found in samples collected in 2013.

All H5 RNA-positive samples were examined and some were selected for sequencing. The amino acid pattern of the HA cleavage site of all examined samples was consistent with low-pathogenic H5 strains. In addition to the H5N2 isolate a number of viruses (subtypes H3, H4 and H10) were isolated from influenza A RT/PCR-positive randomly selected samples in all three locations. The results of wild bird surveillance are summarised in **Table 1**.

ENHANCED PASSIVE SURVEILLANCE

MPI operates a 24/7 toll-free exotic pest and disease emergency hotline and receives calls relating to sick and dead wild and domestic birds from members of the public, veterinarians, regional laboratory pathologists and others.

A rapid field service is in place for sample collection and submission of unexplained bird deaths (Rawdon *et al.,* 2007), using MPI-approved suppliers. A standardised investigation protocol, co-ordinated by MPI's Investigation and Diagnostic Centre at Wallaceville, is applied to submissions. The investigation protocol includes necropsy and sample collection for histology, bacteriology and virology. The presence of avian influenza is assessed using influenza A real-time RT-PCR TaqMan (Spackman *et al.,* 2003), with follow-up using real-time H5 and H7 RT/PCR TaqMan assays to exclude H5 and H7 subtypes (Slomka *et al.*, 2007; Sidoti *et al.,* 2010). Virus isolation is performed on samples that are positive in PCR assays (Stanislawek *et al.,* 2002).

Reports on avian disease and mortality investigation are published quarterly in *Surveillance* as part of the IDC report of suspected exotic disease investigations. In 2013, six such investigations were conducted (**Table 2**). No H5 or H7 viruses were isolated from any of the samples submitted for the investigations listed in Table 2 and exotic disease was ruled out in all cases.

TABLE 1: ACTIVE SURVEILLANCE FOR AVIAN INFLUENZA VIRUSES IN WILD BIRDS, 2013

LOCATION	NUMBER OF BIRDS SAMPLED AND SPECIES	NUMBER OF SAMPLES TESTED (CLOACAL & OROPHARYNGEAL)	NO. OF RT/PCR POSITIVES		CONFIRMED H5 OR H7 ISOLATES
			H5	H7	
Turua, Piako River, Coromandel	320 mallard ducks	640	5	0	0
Mouth of Kaituna River; Reporoa, Bay of Plenty	400 mallard ducks	800	44	0	H5 x 1
Lake Te Roto Kare, Hawke's Bay	240 mallard ducks	480	0	0	0
Total	**960**	**1 920**	**49***	**0**	**H5 x 1***

*The amino acid pattern of the HA cleavage site was consistent with low-pathogenic H5 viruses in all of the examined samples.

TABLE 2: AVIAN MORTALITY REPORTS AND INVESTIGATIONS, 2013

MONTH	REPORTS	INVESTIGATIONS
January	3	2
February	6	1
March	0	0
April	0	0
May	0	0
June	2	1
July	3	1
August	0	0
September	1	0
October	2	1
November	2	0
December	0	0

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WILDLIFE DISEASE SURVEILLANCE

Wildlife surveillance is an important part of New Zealand's national surveillance system for exotic and emerging pests and disease. The purpose of the Ministry for Primary Industries' (MPI's) wildlife surveillance programme is to:

- facilitate early detection of exotic and emerging diseases;
- support New Zealand's statements of freedom from specific pests and diseases;
- provide baseline information on endemic disease occurrence in New Zealand wildlife; and
- support fulfilment of New Zealand's international reporting obligations.

The MPI national exotic pest and disease notification system provides for the reporting and investigation of unusual disease events in all animals, including wildlife. The MPI pest and disease emergency hotline (0800 80 99 66) assists New Zealanders to meet their obligations under section 44 of the Biosecurity Act 1993, which requires every person to report to MPI any suspected cases of organisms not normally seen or otherwise detected in New Zealand. This enables the appropriate investigation of suspected cases of exotic or emerging diseases identified in wildlife by organisations or individuals outside of MPI surveillance programmes.

In addition to investigating reported events, MPI undertakes monitoring to detect changes in disease occurrence that may indicate an emerging disease requiring further investigation. As well as using MPI's own data, this work also draws on key disease occurrence information created by other organisations undertaking surveillance in, or working with wildlife, in particular the Department of Conservation (DOC). Routine disease diagnoses in wildlife by veterinary diagnostic laboratories are also monitored. Results from testing samples from feral animals, captive or wild native animals meeting a sick animal case criterion that are submitted to diagnostic laboratories by veterinary practitioners, DOC field workers, research workers or others, are provided to MPI as anonymous summary data.

Reports of particular interest are summarised in the *Quarterly review of diagnostic cases* article in each edition of *Surveillance*. In addition, causes of mortalities of threatened or critically endangered native species are monitored. As part of a DOC contract undertaken by Wildbase Pathology (part of the Institute of Veterinary, Animal and Biomedical Sciences (IVABS), Massey University, Palmerston North), animals found dead in the field or in captive facilities are sent for post-mortem examination by veterinary wildlife pathologists. Since 2012, MPI has provided ancillary laboratory testing to help determine the cause of death in these cases.

Details of wildlife cases held in the Huia database and investigated by MPI disease investigators are discussed below.

WILDLIFE CASES PROCESSED BY VETERINARY LABORATORIES

Records of wildlife mortality and morbidity records are held in the Huia database, which is jointly owned by DOC and Massey University and maintained by Wildbase Pathology at IVABS. Most of the cases involve mortalities in indigenous birds, particularly threatened species submitted by DOC for diagnosis by Wildbase Pathology. The database also holds some case records from surveillance activities, private veterinary laboratories and researchers. **Figure 1** shows avian cases compared to cases involving other types of wildlife over the period 2009–2013. The number of cases in 2013 increased slightly compared to 2012 but there were fewer than in 2011 when more than 300 oiled seabirds were examined after the container ship *Rena* was wrecked in the Bay of Plenty.

In 2013, birds comprised 91 percent of submissions with lizards 2.5 percent, tuatara (*Sphenodon punctatus)* 2 percent, cetaceans (whales and Hector's dolphins, *Cephalorynchus hectori*) 2 percent and pinnipeds 1.5 percent, while amphibians, fish, bats and other wild mammals totalled less than 1 percent. During January and February there were significant mortalities in adult yellow-eyed penguins or hoiho (*Megadyptes antipodes*) and towards the end of 2013 there was a recurrence of diphtheritic stomatitis in yellow-eyed penguin chicks on their mainland breeding grounds in coastal Otago. In the latter part of the year mortalities were also seen in some non-target avian species following aerial drops of 1080 and brodifacoum during pest eradication programmes.

Disease surveillance in highly threatened species such kakapo

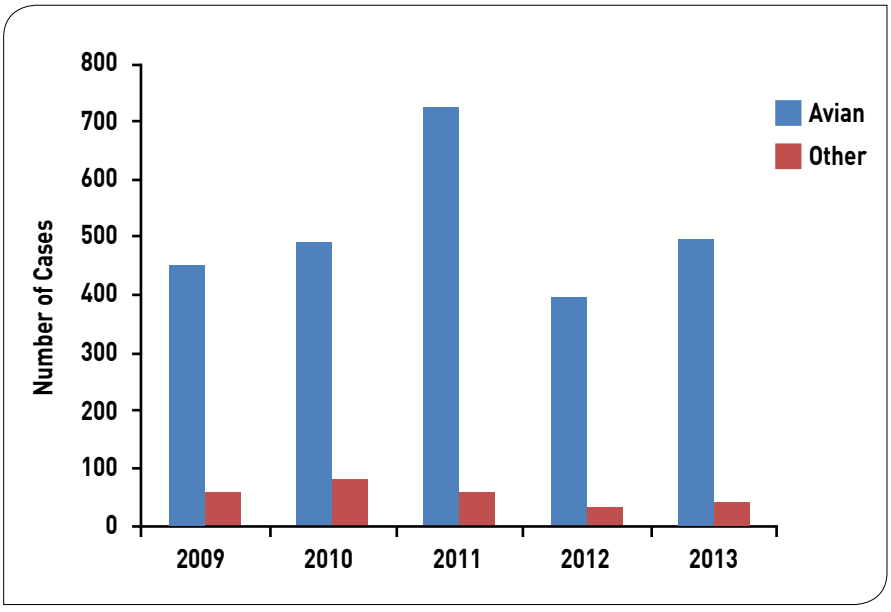

Figure 1: Numbers of wildlife cases in birds and other taxonomic groups recorded in the Huia database, 2009–2013

(*Strigops habroptilus*), black stilt (*Himantopus novaezelandiae*), hihi/stitchbird (*Notiomystis cincta*) and the endangered varieties of kiwi (*Apteryx* spp.) continued throughout the year. A small number of wild introduced birds were examined because of the interest in preventing transmission of diseases such as malaria, beak and feather disease and salmonellosis from introduced birds to native species.

The geographic distribution of avian wildlife cases examined in 2013 is shown in Figure 2. The highest numbers of cases submitted were from the Manawatu/Whanganui and Otago regions. The Manawatu/Whanganui cases included those from National Wildlife Centre at Mt Bruce/Pukaha and from Tongariro National Park. The Otago submissions included those from the highly endangered population of yellow-eyed penguins of coastal Otago. The Canterbury region contains the Mt Cook National Park as well as captive breeding centres for threatened species at Willowbank and Peacock Springs. Many cases submitted from the Auckland region were of threatened species on offshore islands such as Tiritiri Matangi, Rotoroa, Great Barrier and Little Barrier. Locally administered wildlife sanctuaries such as those at Bushy Park, Mangatautari, Cape Kidnappers and Zealandia-Karori also contributed a significant number of cases.

WILDLIFE CASES OF SPECIAL INTEREST IN 2013

MORTALITIES IN ADULT YELLOW-EYED PENGUINS

In late summer 2013 more than 66 adult yellow-eyed penguins from coastal areas on Otago Peninsula died over a two-month period and 24 of these were examined at Wildbase Pathology. The birds were usually in good body condition, with weights ranging from 4.5 to 5.7 kg. Most were found dead on the beach but those found alive often showed abnormal behaviour including ataxia and disorientation. After capture the birds' condition deteriorated rapidly and they developed laborious open-mouth breathing and died within 24 hours. At necropsy there was very little to be seen in the way of gross lesions and the gastrointestinal tract contained little or no recently ingested food. Microscopically, all cases showed evidence of increased pulmonary, hepatic and splenic erythrophagocytosis and associated with this there was moderate deposition of haemosiderin pigment within pulmonary macrophages, Kupffer cells and splenic histiocytes. Although these changes are non-specific they indicate red-cell damage, but PCR analysis revealed no evidence of protozoal parasitism and no evidence of heavy metal or biotoxin poisoning could be found. The cause of this disease syndrome remains undetermined, but it has very similar characteristics to the outbreak of mortalities among adult yellow-eyed penguins reported in the summer of 1990 by Gill and Darby (1993), in which 150 adult birds from the same region died but no causative agent could be identified.

AVIAN MALARIA IN LITTLE BLUE PENGUINS

Two cases of malaria were diagnosed in little blue penguins (*Eudyptula minor*) from the Wellington region. The first bird was found underweight on a beach after being bothered by a dog. It was taken into care and appeared to be doing well until it began regurgitating, before becoming lethargic, weak and moribund. The second case from the Wellington Zoo showed inappetance and anaemia, and blood parasites were seen within red cells during haematology. These parasites were about half to one and a half times the size of the cell nucleus but did not displace the nucleus and were morphologically typical of *Plasmodium elongatum*. Hydropericardium and subcutaneous oedema were seen at post-mortem examination in both birds. The spleen and liver of the second bird were moderately enlarged and the lungs were oedematous. Histopathology in both cases confirmed the presence of intracytoplasmic plasmodium-like organisms in pulmonary endothelial cells, Kupffer cells, and splenic histiocytes. Both birds showed an interstitial pneumonia, which was particularly severe in the second case.

ERYSIPELAS IN KIWI

Infection with *Erysipelothrix rhusiopathiae* in wildlife is often associated with the marine environment, having been seen recently in yellow-eyed penguins and in translocated juvenile kakapo (*Strigops habroptilus*) that had had access to decomposing seabird carcasses (Gartrell *et al*., 2005). Other critically endangered birds such as takahe (*Porphyrio mantelli hochstetteri)* from Fiordland and black stilts (*Himantopus novaezelandiae*) from South Canterbury have also been affected, but the disease has not previously been reported in kiwi in New Zealand.

Both cases occurred during May 2013 on the west coast of the South Island. The first was in a great spotted kiwi (*Apteryx haastii*) that was found dead in a burrow it was sharing with another kiwi. The bird had been raised in captivity and had done well since its release six months previously. It had several small patchy areas of haemorrhage and recent bruising in the skin of the ventral midline of the abdomen, extending toward the cloaca. The heart showed a small amount of pericardial effusion and there were several foci of haemorrhage over the epicardial fat. The lungs were congested and slightly firmer than usual and both the liver and spleen were slightly enlarged.

The second case occurred three weeks later in a juvenile Haast tokoeka (*Apteryx australis*). The bird had been released a month previously on Rona Island in Lake Manapouri, after having been raised in captivity at Franz Josef. When found dead it weighed 684 g and was in poor to moderate condition, having lost more than 200 g since release. The skeletal muscle mass was reduced but there were still clearly visible subcutaneous and intracoelomic body fat reserves, which were partially utilised. In both cases Gram-positive bacteria resembling *Erysipelothrix* were present microscopically in many capillaries throughout the heart and lungs, as well as in liver sinusoids, Kupffer cells and splenic arterioles. Also present in the lung were moderate numbers of macrophages, and heterophils were scattered throughout the interstitium. *E. rhusiopathiae* was isolated from the liver of both birds. Because of its island habitat, the second bird may have had access to seabird carcasses and the body weight loss since release was consistent with severe stress.

NON-TARGET MORTALITIES FOLLOWING PEST ERADICATION OPERATIONS

The control and eradication of introduced pests and predators is a major activity throughout New Zealand and has resulted in huge benefits to

endemic wildlife when the operation has been carried out efficiently (Empson & Miskelly, 1999). However, accidental poisoning of non-target species is sometimes an unfortunate consequence of aerial application of toxic baits such as 1080 (sodium monofluoroacetate) and brodifacoum. In winter of 2013, five kea were found dead after a poisoning operation on the west coast of the South Island. All were fitted with radio transmitters that showed the time of death was two to four days after an aerial 1080 drop in the region. All birds were in moderate to good condition and showed no gross abnormalities apart from bright, unnatural green discoloration of the crop and gizzard linings. All birds had toxic levels of 1080 in their muscle tissue and low (non-toxic) levels of lead in their livers.

At about the same time a pest eradication operation was begun on Rotoroa Island in the Hauraki Gulf as part of a restoration programme to develop the Island as an open sanctuary integrating conservation, recreation, education, art and heritage. In this case brodifacoum was used as an aerial bait at a higher than standard rate,to target both rats and mice. During the month following the first bait drop, the carcasses of 54 protected native birds of five species were recovered. Some were examined at Wildbase Pathology and it was found that six of eight weka (*Gallirallus australis*) necropsied had anticoagulant poisoning. Five dead pukeko (*Porphyrio porphyrioshag*) sent for necropsy were also confirmed as having anticoagulant poisoning, as were four of five paradise shelduck (*Tadorna variegata).*

In anticipation of the expected weka mortalities, 40 weka were captured from the island and held at Auckland Zoo for re-release after completion of poisoning operations. Previous reports on the effects of Talon drops on resident pukeko have shown mortality rates ranging from 49 percent on Motuihe Island to 90 percent on Tiritiri Matangi Island. However, both pukeko and paradise shelduck are productive breeders and are known to recover quickly following pest eradication (Veitch, 2002).

JUVENILE SHAG MORTALITIES

During June 2013, pied shags (*Phalacrocorax varius*) and some other seabirds were found dead on the shoreline at Mangere near Auckland and a few days later more than 30 juvenile spotted shags (*Stictocarbo punctatus*) were found dead on the beach at Kaka Point near Catlins, South Otago. All 13 birds examined showed emaciation and moderate to heavy nematode burdens in the proventriculus. Similar mortalities have been seen in juvenile shags at this time in previous years. Studies of juvenile mortality of European shags (*Phalacrocorax aristotelis*) have found that when they first become independent, juveniles are much less efficient foragers than adults. The decreasing daylength with the onset of winter may then severely limit foraging time. Inexperienced birds have poorly developed prey capture and handling skills and higher parasite loads than adults, and these are likely to be compounding factors (Alley & Hunter, 2013).

WILDLIFE CASES NOTIFIED VIA THE MPI 0800 EXOTIC DISEASE HOTLINE

Exotic causes of disease were ruled out in all wildlife investigations conducted by MPI in the past year. Avian investigations included but were not limited to testing for avian influenza, West Nile virus and Newcastle disease.

In a finch mortality event reported to the exotic disease hotline, *Salmonella* Typhimurium phage type 56 (formerly phage type RDNC) was identified. This bacterium is frequently isolated from small numbers of New Zealand poultry. *Salmonella* outbreaks are not uncommon among wild passerine birds in New Zealand and worldwide. In this case the occurrence was reported from the grounds of a hospital, making the event a possible public health concern. Contact with the hospital was initiated as soon as salmonellosis was suspected, and follow-up with a hospital coordinator indicated that no clinical signs of salmonellosis had occurred in staff members of the branch closest to the area of the die-off.

In other investigations into diseases not previously found in New Zealand, bornaviral infection (proventricular dilatation disease) was ruled out on testing of blood and feather samples by PCR in a black cockatoo, and chelonian herpesvirus was ruled out in a tortoise.

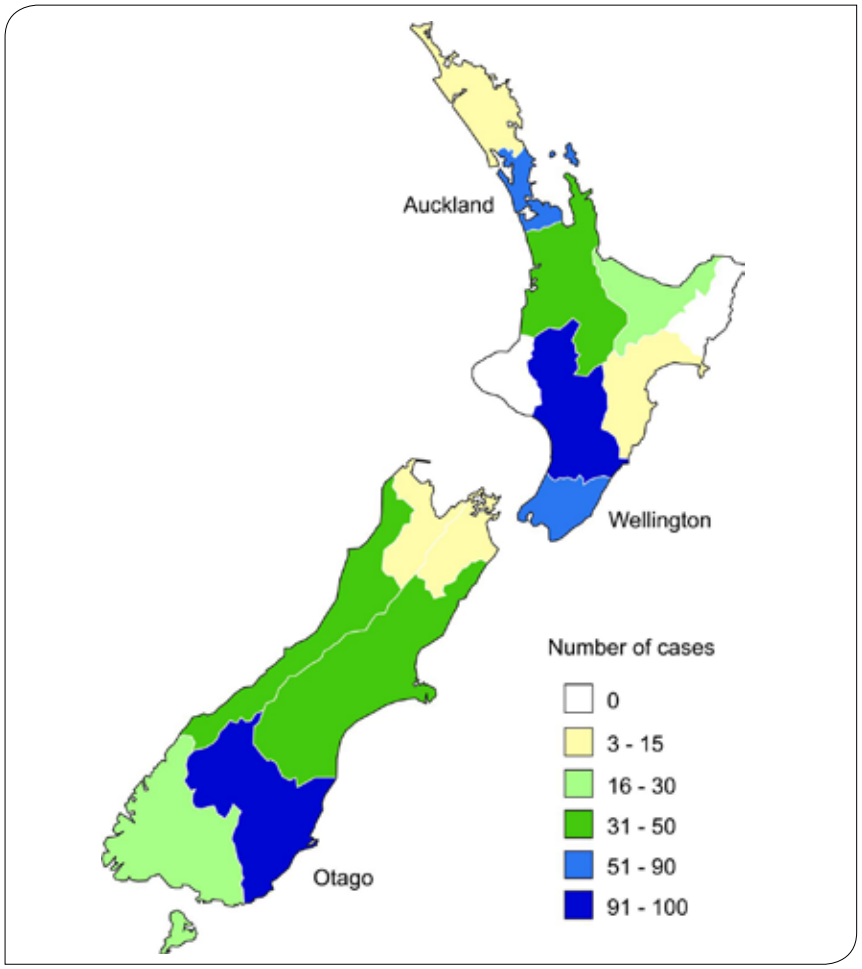

Figure 2: Map of number of bird cases recorded in the 'Huia' database for 2013 by region

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TRANSMISSIBLE SPONGIFORM ENCEPHALOPATHIES (TSE) SURVEILLANCE PROGRAMME

New Zealand is free from bovine spongiform encephalopathy (BSE), classical scrapie of sheep and goats, and chronic wasting disease (CWD) of deer. The TSE risk management measures implemented in New Zealand have been described in previous annual reports (e.g. Vink & Kittelberger, 2013). Passive and active surveillance activities are performed. New Zealand performs type B surveillance for BSE as specified by chapter 11.5 of the World Organisation for Animal Health (OIE) Terrestrial Animal Health Code (OIE, 2013). BSE points have been accumulated since 2005 and New Zealand has consistently maintained well in excess of the required 150 000 points. BSE testing in 2013 generated 40 285 BSE points (**Table 1**) and all tests were negative. Surveillance for CWD is not mandated by the OIE, and is partly funded by industry; it is carried out to assure New Zealand's trade partners of freedom from this disease. The TSE surveillance programme will continue to be refined in accordance with new knowledge, tests, standards and market access needs.

The passive surveillance programme consists of a targeted, incentivised scheme under which veterinary practitioners submit brain material from animals showing clinical signs of neurological disease. In addition, samples from all imported cattle, sheep, goats and deer are tested for TSE on brain tissue after they die or are culled. Testing by both histopathology and a rapid TSE test was performed up to 2011; subsequently, rapid TSE tests are only performed when histopathology either cannot rule out a TSE diagnosis or has not been done. The numbers of samples submitted have declined since the early 2000s, but have remained more or less stable since 2009 (**Figure 1**). Although samples are submitted year round, there is a clear seasonal trend, with a peak from July to September (**Figure 2**).

A number of innovations have been carried out in recent years, specifically regarding diagnostic testing for scrapie and CWD.

TABLE 1: NUMBERS OF SAMPLES TESTED FOR TRANSMISSIBLE SPONGIOFORM ENCEPHALOPATHIES (TSEs) IN 2013, BY PASSIVE AND ACTIVE SURVEILLANCE

			SOURCE OF TEST TISSUE		SURVEILLANCE STREAM
SPECIES	TISSUE	TEST TYPE	ROUTINE SURVEILLANCE	IMPORTED ANIMAL	
Cattle	Brain	Histopathology	134*	–	Passive
		IDEXX TSE ELISA	12	3	Passive (rule-out)
Deer	Brain	Histopathology	9	–	Passive
		IDEXX TSE ELISA	2	0	Passive (rule-out)
	MRLN†	IDEXX TSE ELISA	328	–	Active
Sheep	Brain	Histopathology	16	–	Passive
		IDEXX TSE ELISA	1	4	Passive (rule-out)
	MRLN	IDEXX TSE ELISA	324	–	Active

*This level of testing earned 40 285 surveillance points for BSE in accordance with Chapter 11.5 of the 2013 OIE Terrestrial Animal Heath Code. Only cases where the veterinary practitioner submits a TSE submission form are reported here and counted for BSE points.

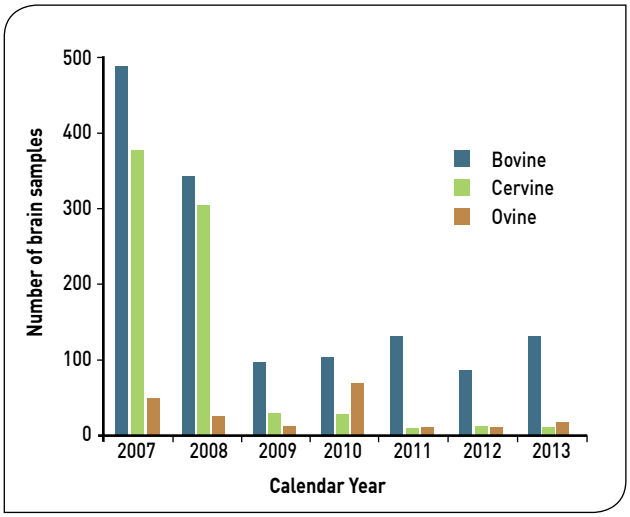

Figure 1: Numbers of brain samples tested for BSE, scrapie and CWD under the incentivised passive surveillance scheme from 2007 to 2013

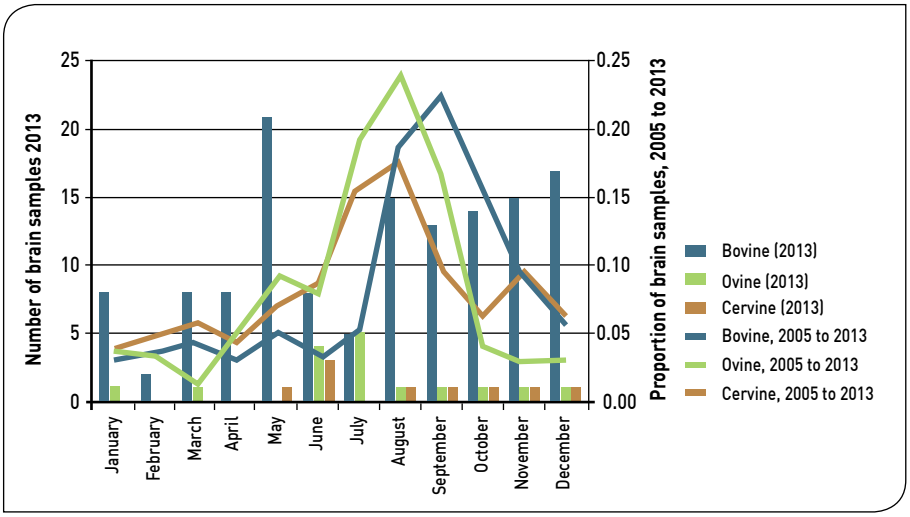

Figure 2: Numbers of brain samples tested for BSE, scrapie and CWD under the incentivised passive surveillance scheme during 2013 (left axis), and trend by calendar month of samples submitted from 2005 to 2013 (right axis)

In October 2009, MPI announced the finding of the first confirmed case of atypical scrapie/Nor98 in a New Zealand-born sheep (Kittelberger & McIntyre, 2009; Kittelberger et al., 2010). MPI strongly supports the view of the World Organisation for Animal Health (OIE) that atypical scrapie is "clinically, pathologically, biochemically and epidemiologically unrelated to 'classical' scrapie, may not be contagious and may, in fact, be a spontaneous degenerative condition of older sheep" (OIE, 2013). It is therefore considered to be a negligible biosecurity risk (Vink & McIntyre, in press). The sensitivity of detection of the prion causing classical scrapie is higher in lymphoid tissue than in brain tissue, whereas the atypical scrapie/Nor98 prion is not detected in lymphoid tissue (Meloni et al., 2012). In combination with the labour-intensive and costly nature of testing brains, this led to research being initiated in 2010 at the Investigation and Diagnostic Centre (IDC), Wallaceville, to evaluate the validity of testing medial retropharyngeal lymph nodes (MRLNs) from sheep and goats (McIntyre, 2011) with rapid TSE tests as an alternative diagnostic procedure for the detection of classical scrapie. This work showed that the IDEXX BSE–scrapie test (IDEXX Laboratories Inc., Westbrook, Maine, USA) had high diagnostic sensitivity and specificity (Kittelberger *et al.*, 2014).

Passive surveillance for CWD has been carried out since the early 2000s. However, the number of submissions of deer brains by veterinarians declined sharply in 2008 following the imposition of a maximum of two submissions per farm per year. To inform the feasibility of supplementary active surveillance, a research project was initiated in 2009 to evaluate whether lymphoid tissue could be used with confidence. No difficulties were encountered that would preclude the testing of MRLNs.

These developments led to the implementation since 2010 of an active surveillance programme for classical scrapie and CWD to complement the passive surveillance activities. Samples from normal adult animals sent to slaughter were routinely collected from meat processing plants across the country. In 2013, 324 sheep and 328 deer were tested; these numbers were based on a sample size calculation designed to detect disease at a low prevalence in the population. Although the farms of origin of the sampled deer demonstrated reasonable geographic spread, sheep from the northern part of the North Island were under-represented (**Figure 3**). MRLN samples of sheep and deer were tested at the IDC; in addition, brain samples were taken of the sheep for confirmatory testing. In 2013, the IDEXX BSE–scrapie test was used, rather than the previous rapid TSE test (Bio-Rad TeSeE ELISA ruminants). All samples tested negative.

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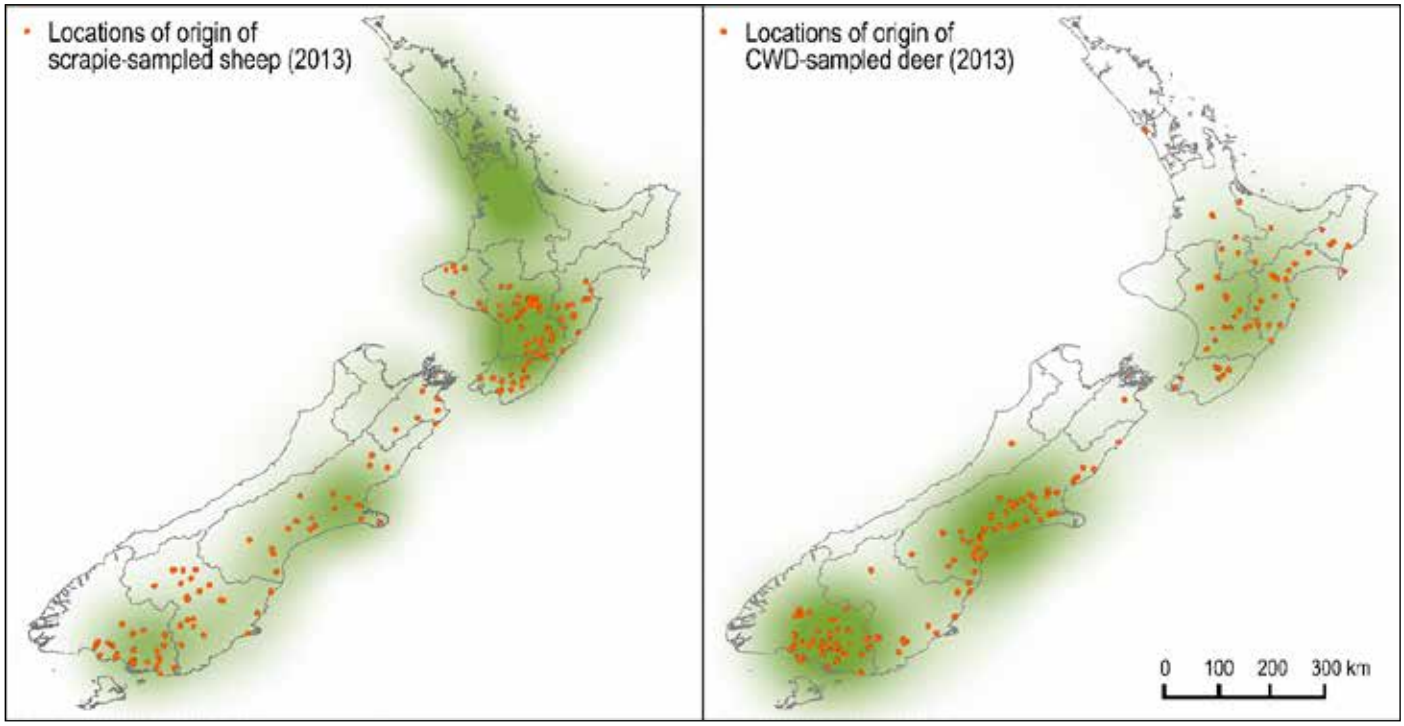

Figure 3: Locations of farms submitting sheep samples for classical scrapie (left; n=155) and deer samples for CWD (right; n=167) during 2013. In most cases, two animals were sampled per location. The underlying heatmap represents the density of sheep and deer farms respectively (source: FarmsOnLine)

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ARBOVIRUS SURVEILLANCE PROGRAMME

INTRODUCTION

The arbovirus surveillance programme was instigated in 1991 to provide assurance of New Zealand's freedom from arboviruses, particularly bluetongue virus, which affects sheep and cattle. Other arboviruses of veterinary concern include epizootic haemorrhagic disease virus and Akabane virus.

Arboviruses are taxonomically diverse and their general characteristics include that they infect vertebrates. They replicate in and are spread by biting midge vectors of the genus *Culicoides* (Diptera: Ceratopogonidae) (Ryan *et al*., 1991). In New Zealand, *C. brevitarsus* and *C. wadai* are of particular importance owing to their tolerance of colder environments (Ryan *et al*., 1991).

The surveillance strategy has three components:

- an early warning system for reporting suspicious cases;
- sentinel herd testing; and
- insect vector surveillance.

EARLY WARNING SYSTEM

MPI maintains an exotic pest and disease hotline that enables early reporting of suspected new to New Zealand pests and diseases. Exotic animal disease investigations are managed by MPI's Investigation and Diagnostic Centre (IDC), Wallaceville.

SENTINEL HERD TESTING

Blood was collected from 18 cattle from each of 18 established herds (**Figure 1**). These herds are located in districts that are considered to be most favourable for survival and establishment of *Culicoides* spp. that may arrive in New Zealand by being blown over from Australia. Blood samples were taken for serological testing prior to December 2013, and after the possible period of virus transmission (June 2014).

INSECT VECTOR SURVEILLANCE

On 11 of the 18 sentinel cattle farms, light traps that attract *Culicoides* spp. were placed adjacent to the herd (**Figure 2**). For the second time, this season green light-emitting diodes (LEDs) were used in the traps. Previously the programme used incandescent white light bulbs, but studies in Australia have indicated a far greater trapping efficiency with green light (Bishop *et al*., 2004 and 2006). The green LEDs are proving their worth here as many native Ceratopogonidae are seen among the by-catch, indicating that the traps are effective in attracting biting midges in this family, to which *Culicoides* spp. belong. (The genus *Culicoides* is not present in New Zealand.)

Figure 1: Location of blood sampling and light trapping for *Culicoides* midges, 2013–2014

Insect vector surveillance is undertaken from the start of February until the end of April each year, during which period conditions are considered to be most favourable for *Culicoides* spp. activity. Ideal trapping nights are when the overnight temperature remains above 14°C. Traps are not deployed during weeks of the full moon, whose light would compete with the light attractant.

The light traps are run on three consecutive nights of each selected week.

Figure 2: Typical green LED light trap with suction fan that draws insects into a jar of ethanol at the base of the trap. Photo: Peter Goldsbury, AsureQuality

RESULTS

The aim of sentinel herd testing is to detect serological evidence of exposure to bluetongue, epizootic haemorrhagic disease and Akabane viruses. All blood samples sent to Investigation & Diagnostic Centres & Response Wallaceville tested negative for antibodies to bluetongue virus and epizootic haemorrhagic disease virus by the agar-gel immunodiffusion test. They also tested negative to the Akabane virus by VNT.

In all, 108 insect trap samples were received from AsureQuality field staff and processed by the Investigation and Diagnostic Centres and Response (IDC&R) laboratories in Auckland and Christchurch.

It was estimated that 238 313 insects were trapped, but no *Culicoides* spp. were found. The number of native midges in the family Ceratopogonidae trapped increased from 73 last year to 91 for this season. While this suggests the traps are likely to catch *Culicoides* spp. if these are present, it also still implies that the use of green LEDs has improved the sensitivity of vector trapping.

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HONEY BEE EXOTIC PEST AND DISEASE SURVEILLANCE REPORT

This report summarises surveillance activities for the year 1 July 2013 to 30 June 2014.

Honey bee exotic disease surveillance is conducted by AsureQuality Limited on behalf of the Ministry for Primary Industries (MPI). It is a multifaceted programme consisting of:

- hive inspection and sampling;
- maintaining records of beekeepers, apiaries, hives and bee diseases in an apiary database;
- carrying out beekeeper extension and education;
- screening and investigating exotic bee disease enquiries; and
- reporting on activities and findings.
- Surveillance is conducted for the following exotic honey bee diseases and pests:
- European foulbrood (*Melissococcus plutonius*);
- small hive beetle (*Aethina tumida*);
- the parasitic fly (*Braula coeca*);
- tracheal mite (*Acarapis woodi*);
- Asian mites (*Tropilaelaps clareae* and *T. koenigerum*);
- African and Africanised honey bee (*Apis mellifera scutellata*);
- Cape honey bee (*Apis mellifera capensis*); and
- other exotic *Apis* species (e.g., the Asian honey bee, *Apis cerana)*.

HIVE INSPECTION AND SAMPLING

The hive inspection and sampling programme has three components:

- high-risk-area inspection and sampling;
- sampling of adult bees from apiaries supplying bees for export; and
- investigation of suspect exotic honey bee diseases.

HIGH-RISK AREAS

Throughout New Zealand, 19 geographic areas – 12 in the North Island and seven in the South Island – have been classified as high risk because they have the greatest potential for entry of exotic honey bee diseases and pests. They include ports, airports, Transitional Facilities, cities and tourist destinations. Four of these high-risk areas (Auckland, Wellington, Christchurch and Dunedin) have received further analysis and had "elevated risk zones" identified within the high-risk area. In these four areas, at least 50 percent of targeted apiaries are located in these elevated risk zones.

The target is to inspect and sample a total of 350 apiaries from the high-risk areas. All hives in each apiary are:

- inspected for signs of exotic bee diseases and pests, with any suspicious bees or larvae and pupae and suspect life stages of small hive beetle and *Braula* being taken for testing and lab diagnosis;
- sampled by taking at least 80 bees from each hive and testing some for internal mites using the tracheal sectioning method; and
- tested for external mites by applying a 24-hour miticide treatment and a sticky board.

In total, 348 apiaries were inspected as part of the high risk site surveillance, against a target of 350 apiaries. These apiaries were all inspected by Authorised Persons – Level 2 (AP2s). While the total number of apiaries inspected was an improvement over last year, it is disappointing that the target of 350 apiaries was not reached. A number of sites visited did not have hives at the time of inspection, which cost AP2s extra time and expense. This year a number of beekeeper inspectors were unavailable to carry out inspections and others committed to inspections that were not subsequently carried out. This was frustrating as targets would likely have been met if inspection co-ordination staff could have reallocated the work to other inspectors in a timely manner.

EXPORT APIARIES

Each beekeeper who supplied bees for export had to provide a sample of bees from up to 25 of their supply apiaries. This was the low-risk component of the programme. The bees were tested for external and internal mites, with a target of 300 samples.

Samples from 460 low-risk apiaries that supply bees for export contributed to the programme this year, which was similar to the numbers received last season. The MPI Investigation Diagnostic and Response laboratory at Tamaki has committed to testing all additional samples above the target numbers, which increases the overall sensitivity of the programme. No exotic mites were found.

INVESTIGATION OF SUSPECTED EXOTIC HONEY BEE DISEASES

Each year MPI and AsureQuality Ltd receive calls from beekeepers reporting suspected exotic bee diseases or unusual symptoms in hives. AsureQuality worked with MPI's Investigation Diagnostic Centre at Wallaceville to screen these calls and determine whether sampling was justified. Seven calls were received that resulted in further sampling. Four of the calls were regarding suspect European foulbrood, one was a suspect external mite and two were suspect imported pollen investigations. A number of other calls were also received and on interviewing the callers it was determined that the observed symptoms could be explained by endemic bee diseases. All tests were negative for exotic pests and diseases in the seven cases investigated.

RESULTS

All hives inspected, sampled and tested for the listed exotic pests and bee diseases were negative.

REPORTS

Each year, AsureQuality Limited, on behalf of MPI, reports on exotic surveillance activities in *Surveillance* and in *The New Zealand Beekeeper* magazine. These reports are used to meet international reporting requirements with regard to New Zealand's bee health status, and for keeping New Zealand beekeepers informed about surveillance activities.

TABLE 1: NUMBER OF APIARIES SURVEYED AND SAMPLES TAKEN IN 2013–2014

SAMPLES TESTED	ROUTINE SAMPLES (APIARIES)	SUSPECT SAMPLES*	RESULTS	MPI SPECIFICATION FOR ROUTINE SAMPLES
Internal parasites	348	0	All negative	350
External parasites	348	1	All negative	350
European foulbrood	348	4	All negative	350 inspections, with any suspect larvae sampled for laboratory diagnosis
Small hive beetle	348	0	All negative	350 inspections, with any suspect beetle larvae sampled for laboratory diagnosis
Exotic bee species	348	0	–	350 inspections, with any suspect bees sampled for laboratory diagnosis

* Two investigations related to the suspected importation of pollen. These investigations ultimately concluded that there had been no breach of the import health standard and as a result, no samples were taken.

APIARY DATABASE

AsureQuality Ltd maintains an apiary database that contains information on beekeeping enterprises in New Zealand. As at 30 June 2014 there were 4814 beekeepers managing 507 247 hives on 30 668 apiaries. New beekeepers are entering the industry at record rates, with 857 new beekeeper registrations in the 12 months to 30 June. With almost 20 percent of participants in the industry having less than one season of beekeeping experience, the need to provide on-going education in exotic disease identification is paramount to increasing the efficacy of the passive surveillance programme. By educating the industry in the identification of exotic pests and diseases, the chances of finding an incursion early are greatly increased. This is because far more hives can be inspected by an educated industry than through targeted surveillance at high-risk sites.

It is a legal requirement that all beekeepers are registered and provide the location of their apiaries. Apiaries are geo-referenced, which enables planning of detailed disease surveys. Beekeepers are required to inspect their hives annually and report any cases of American foulbrood (*Paenibacillus larvae larvae)* and suspect exotic honey bee diseases. They must also furnish a return each year updating all apiary records and stating that their hives have been inspected.

BEEKEEPER EXTENSION AND EDUCATION

As in previous years, five articles were written for publication in *The New Zealand Beekeeper* magazine, on surveillance issues relating to exotic bee pests and diseases and their relevance to the New Zealand beekeeping industry. These articles covered small hive beetle (*Aethina tumida),* European foulbrood disease (*Melissococcus plutonius),* and tracheal mites (*Acarapis woodi)*. An overview article is published at the beginning of the field season, outlining the plan for the current season and drawing particular attention to changes from previous years. At the end of the field season a summary article is written reporting on the results of surveillance activities.

During the 12-month period, AsureQuality Apiculture Technical Advisers (ATAs) were invited to a number of hobby clubs, beekeeping meetings and commercial beekeeper field days. ATAs take these opportunities to provide information on exotic pests and diseases of honey bees. Additionally, our trading partners are increasingly requiring greater assurance of the disease-free status of exported live bees. To help provide this assurance, ATAs train Inspecting Beekeepers, who clear apiaries for export, in the identification of apiculture pests and diseases.

TECHNICAL DEVELOPMENT

To ensure that technical development of the surveillance programme is maintained, relevant national and international literature on surveillance techniques and exotic bee diseases and pests was reviewed. Additionally, the annual half-day technical meeting was held for apiculture officers as part of their technical up-skilling.

AsureQuality Ltd maintains a group of apicultural technical experts who are competent in bee disease recognition and control.

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ANNUAL REPORTS FROM NATIONAL PEST MANAGEMENT STRATEGIES: BOVINE TUBERCULOSIS

Mycobacterium bovis, the causative agent of bovine tuberculosis, is a notifiable organism under the Biosecurity (National Bovine Tuberculosis Pest Management Strategy) Order 1998. In December 2011 the national infected herd period prevalence rate fell below 0.2 percent, a level that was originally set to be achieved by 30 June 2013. The key objective of the TB strategy as proposed in 2001 was thus achieved 18 months early. However, owing to the upsurge in infected herds in the VFA during 2012–2013, the annual infected herd period prevalence rate rose to 0.21 percent. Most of these herds were still classified as infected at the start of the 2013–2014 financial year so New Zealand's infected herd period prevalence for 2013-2014 remains at 0.21 percent. In order to meet the World Organisation for Animal Health (OIE) classification as a country that is officially free from bovine tuberculosis, New Zealand will need to reduce its infected herd period prevalence rate to 0.2 percent or less and hold it there for the next three years.

TUBERCULOSIS IN CATTLE

At 30 June 2014, 69 cattle herds (0.09 percent) were classified as infected with bovine tuberculosis (TB). During the preceding 12 months, of the 115 infected herds that were in a position to have their infected status revoked, 76 (66 percent) tested clear. Of the 67 346 clear-status herds, 60 (0.09 percent) were identified as infected during 2013–2014. The 12-month infected-herd period prevalence to 30 June 2014 was 0.22 percent.

During the 12 months to the end of June 2013, 4.21 million cattle (2.93 million dairy cattle and 1.28 million beef cattle) were tested with the intradermal caudal fold tuberculin test (CFT). Of these, 231 skin-test-positive animals were identified and slaughtered.

An additional 8193 cattle that were considered to have been non-specific responders to the CFT test were given an ancillary serial test (standard or special antigen, gamma-interferon [Bovigam™]). There were 377 reactors (5 percent) to these ancillary serial tests and they were all slaughtered. Ancillary parallel testing (gamma-interferon) was undertaken on 42 873 caudal-fold-test-negative cattle from infected herds. There were 167 reactors to the parallel tests and all were slaughtered.

In total, 775 reactor cattle (two per 10 000 tested) were slaughtered, of which 107 (14 percent) either had visible lesions of tuberculosis, or *M. bovis* was cultured from samples taken from them.

A further 59 tuberculous cattle (2.5 per 100 000 slaughtered) were detected during routine meat inspection of the 2.23 million cattle sent for slaughter during the previous 12 months.

The 12-month period prevalence of tuberculosis in cattle (107 tuberculous reactors and 59 infected cattle found during routine slaughter) for the 2013–2014 financial year was two per 100 000 cattle (base cattle population = 10 million).

TUBERCULOSIS IN DEER

At 30 June 2014, three deer herds (0.11 percent) were classified as infected with tuberculosis. During the preceding 12 months, of the five infected herds that were in a position to have their infected status revoked, two (40 percent) tested clear. None of the 2614 clear-status herds were identified as infected. The 12-month infected-herd period prevalence to 30 June 2013 was 0.19 percent.

During the 12 months to the end of June 2014, a total of 252 682 deer were tested with the mid-cervical intradermal tuberculin test (MCT). Of these, 165 test-positive animals were identified and slaughtered.

An additional 1760 deer considered to have been non-specific responders to the MCT test were given an ancillary serial test with either the comparative cervical test (CCT) or the IgG1 ELISA Test (ETB and Modified ETB). There were 66 reactors (4 percent) to these ancillary tests and all were slaughtered. No ancillary parallel testing (IgG ELISA test) was undertaken in 2013–2014.

In total, 231 reactor deer (nine per 10 000 tested) were slaughtered, of which none had visible lesions of tuberculosis.

No TB lesions were detected during routine meat inspection of about 470 700 deer sent for slaughter during the preceding 12 months. The 12-month period prevalence of tuberculosis in farmed deer for the 2013–2014 financial year was zero (base farmed deer population = 1 million).

PREVALENCE OF TUBERCULOSIS

The point prevalence of infected cattle and deer herds at 30 June 2014 was 0.1 percent and the 12-month period prevalence for 2013–2014 was 0.21 percent.

TUBERCULOSIS IN WILDLIFE

Tuberculous possums and occasionally other wildlife (pigs, deer, cats, ferrets, stoats, hedgehogs and hares) have been identified in 32 separate areas of New Zealand in association with persistent infection in cattle and deer herds. Areas containing wildlife maintenance hosts of TB are classified as Vector Risk Areas (VRAs). Possums (*Trichosurus vulpecula*) are considered to be the main tuberculosis maintenance host as well as the main wildlife vector for TB in cattle and farmed deer. However, there are a number of VRAs where ferrets (*Mustela furo*) are also regarded as an important vector. As a result of intensive possum control over a number of years, tuberculosis has been eradicated from both wild and domestic animals in 15 small VRAs, leaving 17 VRAs where tuberculous wild animals remain.

At June 2013, VRAs covered about 36 percent of New Zealand's land area. During the 2013–2014 financial year TB was declared eradicated from about 306 500 ha including one VRA (Whareorino). Thus at June 2014, there were 17 VRAs in New Zealand with a combined area of 9 322 500 ha. The VRAs contain 84 percent of infected cattle herds, 100 percent of infected deer herds, and produced 83 percent of all tuberculous cattle in 2013–2014.

As a result of finding infection in herds within Vector Free Areas (VFAs), wild animal surveys were undertaken on and around the infected properties at Awanui, Waiuku, Waitoa, Hauturu, Te Puke, Inglewood, Opunake and Rangitata. A total of 2299 possums, 24 feral pigs, eight ferrets, six stoats and four feral cats were killed and necropsied. So far TB has not been isolated from any of these animals, indicating that infection in these herds has largely been caused by movement of cattle.

Vector Free Areas account for 65 percent of the total land area and in 2013–2014 contained 16 percent of infected cattle herds.

TBFREE NEW ZEALAND

On 1 July 2013, OSPRI New Zealand (OSPRI) was established as a new organisation. OSPRI's mission is to be the organisation of choice for delivering creative operational solutions for New Zealand's primary industries. At the same time as OSPRI was established, TBfree New Zealand took over from the Animal Health Board (AHB) as the agency responsible for implementing the National Pest Management Plan for bovine tuberculosis. OSPRI's role is to manage and deliver the TBfree New Zealand TB control and the National Animal Identification and Tracing (NAIT) programmes. While OSPRI will continue to deliver these programmes, its wider mandate is to use the expertise already within TBfree New Zealand and NAIT to develop, assist or manage opportunities in areas such as:

- the development of strategies and planning to further enhance New Zealand's primary industries;
- the delivery of pest management and other operational-based programmes;
- the smart use of data;
- avoiding duplication of resources in the primary production sector;
- the design and delivery of additional partnership programmes between government and industry; and
- risk management.
- TBfree New Zealand's current National Pest Management Plan (NPMP) for TB control was introduced in July 2011. Its primary objectives, to be achieved by 1 July 2026, are:
- eradication of TB from wildlife over at least 2.5 million hectares of VRA, including two extensive forest areas representing relatively difficult operational terrain; and
- continued freedom from infection in wildlife vectors in existing VFAs and areas where eradication is considered to have been achieved.

A secondary objective is to maintain the national infected herd period prevalence level below 0.4 percent during the term of the plan.

In the 2013–2014 financial year, in work undertaken to meet these objectives, possums were controlled on 4 million ha of land (3.55 million ha ground control and 0.45 million ha aerial control), with a cumulative area under vector control of about 8.8 million ha (33 percent of New Zealand's land area).

RESEARCH

Given its very challenging strategic objectives and limited funding, TBfree New Zealand relies on sound and innovative research outcomes. These assist it to make the right technical decisions and provide practical solutions to issues that arise, and enable it to continuing making cost-effective and positive gains to meet its objectives.

When deciding whether to undertake a particular research project or programme, it is necessary to determine how long the research will take, its likely cost and potential value. This requires planning that starts with identifying TBfree New Zealand's research priorities for the coming year. Some research highlights from the last 12 months are summarised below. For further information, see AHB's Annual Research Report for 2012–2013 (published in November) or visit www.tbfree.org.nz

USING TECHNOLOGY TO EVALUATE FREEDOM FROM TB

The most cost-effective means of eradicating TB from possums in a VRA is to drastically reduce possum numbers and maintain them at a low, even density for up to 10 years while ensuring minimal immigration.

For the past six years we have worked with Landcare Research to develop and implement a system to determine the probability that TB has been eradicated from the possum population in a defined part of a VRA. The system has two components: the Spatial Possum Model (SPM) and the Proof of Freedom (POF) tool.

The SPM provides epidemiological evidence for TB freedom by using estimates of possum density following control, along with expected patterns of movement, survival and disease transmission, to simulate the probability of TB persisting in an area. While this is an indirect measure of freedom from TB, it also informs the surveillance-data Bayesian analyses undertaken with the second component, the POF tool.

The POF tool uses vector and livestock surveillance data to calculate the probability of freedom from TB in both wild and domestic animals in a defined area. Unlike the SPM, it incorporates direct data on the TB status of sentinel wild animals, along with presence/absence data from possum surveys and data from possums killed. To accept that TB had been eradicated from a possum population requires a POF median probability ≥ 0.95 and a credible interval value ≥ 0.9.

In 2014, detailed reports were provided on 28 vector control zones (VCZs)

where, based on a range of quantitative and qualitative factors, Area Disease Managers considered that TB had been eradicated from the possum population. Summaries of these reports were reviewed by a panel of five reviewers (three senior TBfree New Zealand technical staff and two external reviewers with knowledge of TB control in wildlife and who understand the workings and outcomes from the SPM and POF utility). A summary of each of the three major components (qualitative; quantitative, ie., outputs from the SPM and POF tool; and an assessment of the cost of making the wrong decision) for each VCZ case was reviewed. Reviewers collated and discussed all pertinent information to make a collective decision on the probability that TB had been eradicated from the possum population in a VCZ. In general, reviewers were looking for consistency between the qualitative and quantitative data, as well as assessing the risk associated with making a wrong decision.

After studying summary documents, case reports, and where necessary additional analysis, the review panel were satisfied that, based on the information provided, TB had been eradicated from the possum population in 28 VCZs with a combined area of 306 429 ha. However, the panel considered that there was insufficient information on the TB status of wildlife along the western aspect of two of the VCZs in North Canterbury. They thus recommended that each of these two zones be divided in half and agreed that there was sufficient data to revoke the VRA status of the eastern part of each zone. The panel requested that the western components be reclassified as Free Area Protection. This would enable further information to be collected on the status of wildlife in these areas, and also enable possum control to be undertaken if required. Subsequently the OSPRI board accepted the recommendation to revoke the VRA status of the 28 VCZs (apart from the western half of the two aforementioned VCZs).

Since 1 July 2011, TB has been eradicated from possum populations in 828 000 ha or about 33 percent of the 2.5 million ha proposed in the strategy objective.

OPTIMISING THE POSSUM SURVEILLANCE THRESHOLD

Landcare Research was also contracted to investigate techniques to develop a user-friendly decision-making process for determining the economically optimal level at which to stop wildlife surveillance. This has resulted in a paper (Gormley *et al.*, 2014) that explores the cost of an erroneous conclusion that TB has been eradicated, or of continuing to undertake control after TB has been eradicated, from the possum population. Currently TBfree New Zealand uses a panel of experts to review quantitative outputs from the PoF tool, qualitative information and then assess the risk of making the wrong decision and its costs. This paper uses decision theory to provide a framework for selecting a stopping threshold. It combines potential costs associated with TB surveillance and re-control with the calculated probability of being TB-free derived from the PoF utility. The paper describes a method for selecting an optimal stopping rule based on minimising expected costs while also taking account of the risk tendencies of the decision makers. Thus if the risk aversion factor is high, then the optimal stopping rule moves towards certainty; whereas if the risk aversion factor is low, then the optimal stopping rule will indicate stopping control before reaching a probability of eradication of 0.95.

OPTIMISING TRAPPING EFFORT

In 2013–2014, TBfree New Zealand spent about $6 million trapping possums in areas where eradication of TB from possum populations was being undertaken and possum bodies were required for necropsy. Research to improve trapping efficiency helps improve effectiveness and increase efficiency. One area identified for research was to determine the optimum level of trapping required to cost-effectively catch 80 percent of the possums that could be caught; whether pre-feeding could improve the catch rate; and to determine the optimum number of traps to use in detection surveys to target trapping effort.

Landcare Research was contracted to determine the number of nights required to catch 80 percent of the possums that were trapped on a line over 10 nights, and the optimal number of traps to use at each detection site.

The work showed that 80 percent of possums were caught after four nights. There was a slight decrease in the number of trapping nights required after pre-feeding with pellets or bait stations, but the gain was more than offset by the extra time and cost. It was concluded that at least three traps should be set at each positive detection site. Setting more traps will catch more possums, but the catch rate per trap-night will decrease.

The researchers demonstrated that both the number of traps to set at a detection device and the number of trap-nights required depend on the proportion of the population that needs to be caught, and the marginal cost of more traps and nights relative to the marginal benefits (i.e., the value that each extra possum caught will contribute to achieving the management goal). If trapping for surveillance purposes only, where a kill of ≤50 percent is required, then a regime using more lines for fewer nights is more cost-effective than a regime using fewer lines for more nights.

These results were obtained from individual trap lines. The ability to obtain an 80 percent kill over a control area will depend on the spacing of trap lines and the number of nights trapped.

POST-CONTROL POSSUM AGGREGATION IN FORESTS AND NEAR FOREST FARMLAND

Post-control possum aggregation is central to the SPM, which is used to help determine whether possums in an area are disease-free. This research was contracted to Landcare Research to increase our understanding of the factors driving possum movements, as well as search processes, distances moved, home ranges and resulting patterns of possum aggregation after control.

Incorporating this information into the SPM will greatly improve site-specific predictions of disease persistence, and just as importantly, it will improve possum control efficiency and disease surveillance during the eradication phase.

The magnitude, spatial scale, and driving mechanisms of post-control possum aggregation in continuous forest and adjacent pastoral farmland, and the implications of aggregation for TB disease persistence were examined by mapping possum distribution and monitoring GPS-collared possums. Possum distribution is mapped immediately before and up to three years after control, using chew card surveys in a 2400-ha continuous forest habitat adjacent to a 3030-ha farmland/patchy habitat.

Fifteen GPS-collared possums that survived control at the farmland site, and a further 12 possums caught nine months after control at the forest site, are being monitored for up to 18 months. Because of concerns that the 12 collared forest possums had already aggregated, an attempt was made to isolate the GPS-collared possums by removing uncollared possums in a 600-hectare area in two blocks containing seven collared possums. Monitoring of these sites for aggregation and movement is continuing.

To date, significantly male-biased sex ratios suggest that immigration by dispersing males from adjacent areas not subject to control for several years is a major contributor to post-control possum populations at both sites. Results from the forest site indicated that the primary driver of post-control possum distribution may have been possums seeking mates. At the farmland site, the distribution of native habitat patches appeared to be the main driver of possum aggregation. Possum distribution at both sites was highly clustered, with a number of males located near each female.

Post-control home ranges at both the forest and farmland sites were found to be larger than recorded in previous studies. In forest, the average home range was 90 ha (range 39–176) with males averaging 99 ha and females averaging 62 ha. At the farmland site, the average home range was 47 ha (range 11– 119), with males averaging 79 ha and females averaging 27 ha.

The epidemiological impact of a larger home range is unclear, but it may prolong the persistence of TB-infected possum populations. A key unknown is whether terminally ill TB-infected possums have the energy to maintain a large home range while infectious.

GENOMIC CHARACTERISATION OF NZ TB ISOLATES

TBfree New Zealand contracted AgResearch to investigate whole genome sequencing (WGS) of *Mycobacterium bovis.* The study will determine whether the extra resolution obtained by undertaking WGS on bovine TB isolates will significantly improve veterinarians' ability to determine the specific source of new infection, compared with what is currently possible using VNTR typing. Last year's research showed that the improved precision of WGS helps veterinarians manage their investigations of newly identified infected herds. To successfully use WGS data in directing control efforts, it will be necessary to determine how rapidly the different lineages of *M. bovis* are evolving in New Zealand and what factors influence this process. To this end, AgResearch is collaborating with researchers in the UK to evaluate the mutation rate of a range of *M. bovis* isolates from both domestic and wild animals in defined areas in New Zealand.

AgResearch has also done WGS on 45 *M. bovis* isolates from Waiuku and Taranaki, with comparisons to possible sources from the West Coast. In addition, WGS of current and historical isolates from wildlife and domestic stock in Southland were reviewed.

The characterisation of *M. bovis* lineages identified from new infected herds in Taranaki and Waiuku has better defined the relatedness of the isolates from within each of these areas and differentiated them from other potential sources of infection. Together with West Coast/Southland lineages, they have also greatly contributed to the establishment of a more robust genomic library.

Future research will aim to sequence and characterise additional genomes that will fill in the obvious gaps in the data set, (including Central North Island, Marlborough/North Canterbury and the West Coast lineages) by WGS whilst continuing on work to determine *M. bovis* mutation rates.

PREVENTING WEKA EXPOSURE TO FERATOX

After finding weka were being killed by eating encapsulated cyanide (Feratox) possum baits, DOC banned Feratox from use where weka are present. In areas such as the West Coast of the South Island this means contractors have to use less efficient methods such as raised traps. TBfree New Zealand identified a need for a commercially viable rat-proof bait station that delivers Feratox to possums only and prevents spillage on the ground where weka can pick it up. The initial research project sought to test bait stations that would prevent rats and weka gaining access and also prevent possums from dropping Feratox pellets on to the ground.

Before agreeing to the use of Feratox in bait stations, DOC required two replicate trials of the modified bait station. Modified Excluder and Version 3 Sentry bait stations were reviewed in 2012. The reviewers concluded that the Version 3 Sentry bait station retrofitted with a clip-on pressure plate was the better option, and after further modifications this type was compared with an industry-standard Feratox bait station in an area where weka were not present. The Version 3 Sentry bait station demonstrated a similar possum kill efficacy to that of the industry standard in the field trial, so it was selected for the second replicate trial in an area where weka were present. In that second trial all 25 weka with radio transmitters survived the operation and no other weka carcasses were found. Field observation and use of trail cameras found no evidence of weka eating the baits. The stations with Feratox reduced

possums density to a 5 percent bite mark index (BMI) over most of the area, but in one area there was poor control. It was concluded that the Version 3 Sentry bait station with a Striker bait holder will greatly reduce but not eliminate the risk to weka from Feratox.

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AMERICAN FOULBROOD

American foulbrood (AFB) is caused by the bacterium *Paenibacillus larvae larvae*. This disease of honey bees has been regulated by an Apiaries Act since 1907. In October 1998 responsibility for managing AFB to reduce the reported incidence of the disease, passed to the National Beekeepers' Association Incorporated (NBA). The NBA developed a Pest Management Strategy (PMS) and became the management agency for the strategy. The PMS retained many of the provisions from the previous Apiaries Act 1969 plus some new ones. More information can be found at www.afb.org.nz and also at www.nba.org.nz. Owing to an amendment to the legislation, Pest Management Strategies have been renamed Pest Management Plans (PMPs). Key features of the American Foulbrood PMP are:

- An apiary is a place where bees are kept and every apiary must be registered. In addition all hives must be inspected annually by an approved beekeeper, who must also report on the disease status of the hives.
- Any case of AFB must be reported within seven days to the Management Agency.
- To become approved, beekeepers must first pass a competency test on AFB recognition and control and then submit a hive and AFB management plan to the management agency or their contractor, AsureQuality Ltd. This is called a Disease Elimination Conformity Agreement (DECA).
- Beekeepers must submit samples of bees and/or honey for AFB testing if so requested.
- All hives with AFB symptoms must be destroyed, although some equipment can be sterilised by heating in paraffin wax at 160°C for at least 10 minutes.
- Antibiotics cannot be used to control AFB in New Zealand.
- The AFB Plan is funded by an apiary fee levied under the Biosecurity (American Foulbrood – Apiary and Beekeeper Levy) Order 2003. All beekeepers are required to contribute through a base fee of $20, plus $14 per apiary (+ GST). Beekeepers with fewer than four apiaries and fewer than 11 hives pay the base fee plus one apiary fee. Those above the thresholds are levied a base fee plus $14 for each apiary registered on 31 March, the date the levy is assessed.

HIVE INSPECTION PROGRAMME TO 31 MAY 2014

AsureQuality Ltd collates beekeeping and AFB disease statistics to 31 May each year for the management agency, which encompasses a full beekeeping season. Between 1 June 2013 and 31 May 2014, 1138 cases of AFB were found by beekeepers (0.22 percent of hives) and/or AsureQuality staff, in 707 apiaries (2.3 percent). Corresponding AFB infection rates for 2012–2013 were 1177 hives (0.26 percent) and 530 apiaries (2.0 percent).

As of 31 May 2014 there were 2814 beekeepers with DECAs and a Certificate of Inspection Exemption (58 percent of beekeepers). These beekeepers are permitted to inspect their own hives for AFB and make reports to AsureQuality on the authorised forms. During the reporting period 402 new DECAs were approved and four existing DECAs were reviewed. No DECAs were revoked during the year.

APIARY REGISTER AND STATISTICS

There were 2002 beekeepers who owned 30 264 hives on 3271 apiaries that required a COI on 27 June 2014. The number of beekeepers in this category is up 18 percent from last year, with the number of hives per beekeeper increasing significantly. This upward trend is higher than that seen in the new beekeeper statistics, suggesting that the AFB competency training for beekeepers who want to apply for a DECA is not keeping up with the rate of beekeeper registrations. (**Figure 1**).

There were 4816 beekeepers, 30 690 apiaries and 507 688 hives on 31 May 2014. This compares to 4280 beekeepers owning 451 895 hives on 27 081 apiaries at the same time last year. As with the last few years, the industry has continued to grow over this reporting period. The net increase in beekeeper numbers (13 percent) has remained at a similar rate to last year and total numbers are now almost back to 'pre-varroa' levels. Since the low point in 2008, beekeeper numbers have almost doubled **(Figure 1)**. This net increase is a combination of both commercial and hobbyist beekeepers, which resulted in the average number of hives per apiary remaining steady. Hive numbers increased by 12 percent over last year, driven in part by new beekeeper registrations but much more by increased interest in the beekeeping industry

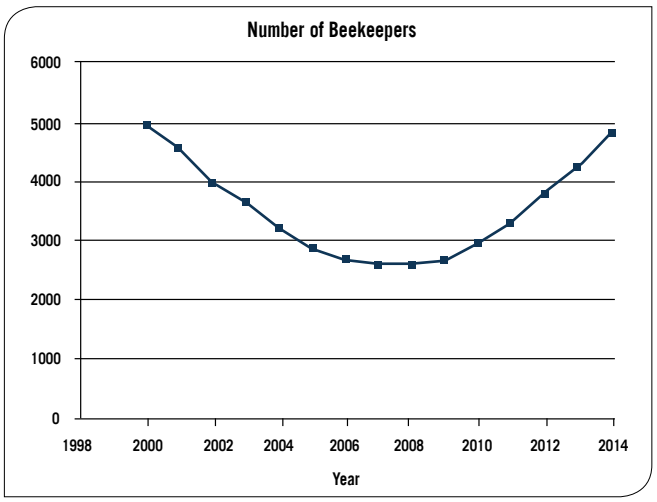

Figure 1: Number of beekeepers, 2000–2014

from corporates and large trusts. As commercial operations are acquired by corporates, trusts and the like, beekeeper managers have been charged with increasing hive numbers in the operation, sometimes by as much as 50 percent.

The main increases were again in the North Island, where 72 percent of the new beekeepers were registered. The beekeeper split between islands has been moving in favour of the North Island for some years and currently for every beekeeper in the South Island there are two in the North Island. This is the second highest net increase in beekeeper numbers and only five beekeepers short of the record set two years ago. There were 4956 registered beekeepers before the discovery of varroa in Auckland in March 2000. The increase in all statistics is partly driven by high manuka honey prices and also by a strong interest in pollination and home food production.

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ANNUAL REPORTS FROM INDUSTRY SURVEILLANCE AND DISEASE CONTROL PROGRAMMES: *BRUCELLA OVIS* ACCREDITATION SCHEME 2013

Numbers of animals tested in 2013 were about the same as in 2012. The overall infection rate (reactors/samples tested) was 1.9 percent. The infection rate should be treated with caution as it is skewed by several flocks with a more than 25 percent infection rate, which have had subsequent eradication tests.

As in previous years, the figure includes animals from a large number of commercial properties as well as flocks previously accredited (ram-breeder flocks and some commercial flocks). The infection rate for ram-breeder flocks will be significantly lower, but data is limited since relevant information is not always provided on laboratory submission forms.

Some of the above flocks, especially where there are only one or two reactors, may have had subsequent testing performed on the reactor samples, e.g. ELISA and/or gel diffusion, and their owners have opted not to re-test on the basis of results obtained.

TABLE 1: *BRUCELLA OVIS* TESTING AND ERADICATION, 2013

AREA	INFECTED FLOCKS*	FLOCKS WITH ERADICATION IN PROGRESS OR COMPLETED
Northland & Auckland	1	0
Waikato, Waitomo & BOP	14	4
Taranaki & Wanganui	15	7
East Coast	4	2
Hawke's Bay	1	1
Manawatu & Rangitikei	10	5
Wairarapa & Wellington	2	0
Marlborough & Canterbury	18	7
Otago & Southland	11	4

*Infected flocks are those that have had *B. ovis* reactors identified but not always confirmed by further testing. From the table, it is apparent that not all flocks with reactors were subjected to further investigation during 2013.

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INFECTIOUS BURSAL DISEASE ERADICATION PROGRAMME

In 1993, a low-virulence strain of infectious bursal disease (IBD) was identified in commercial poultry in New Zealand. As a result, in 1994 an IBD eradication programme funded and supervised by industry was put into place. Both active and passive surveillance are important parts of the programme, with passive surveillance taking place both on farms and in processing plants. No cases of IBD have been confirmed in commercial poultry since 1999.

During 2013 the two private poultry laboratories screened a total of 11 066 blood samples collected under the whole-flock testing programme. Samples were screened using the IDEXX FlockChek ELISA and 38 sera from 20 flocks tested positive. Six of these flocks tested negative on re-bleed and samples from the remaining flocks were forwarded to MPI's Investigation and Diagnostic Centre (IDC) for virus-neutralisation testing, returning a negative result. If required, further on-farm investigations by MPI including blood sampling, serology and collection of bursae for histology and PCR testing can be done.

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POULTRY HEALTH SURVEILLANCE

The tables presented here summarise results of health testing in the poultry industry during 2013. **Table 1** summarises serological test results. **Table 2** summarises *Salmonella* serotypes cultured from feed sources, environmental swabs and poultry samples. This report is based on information received from poultry testing laboratories.

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TABLE 1: SEROLOGICAL TEST RESULTS SUMMARY: POULTRY – 2013

DISEASE	CATEGORY	VACCINATION STATUS (V=ALL VACCINATED)	NUMBER TESTED	NUMBER POSITIVE
Newcastle disease†	1, 2		2 068	2 ‡
Egg drop syndrome	1, 3	V	1 016	243
Chicken anaemia virus	1	V	2 469	1 751
Avian encephalomyelitis	1, 3, 4	V	3 486	2 457
Infectious bronchitis	1, 2, 3	V	4 097	3 443
Reo virus	1 ,2	V	2 394	2 106
Infectious laryngotracheitis	1, 2, 3	V	1 025	622
Mycoplasma gallicepticum	1, 2, 3, 4	V	11 270	205
Mycoplasma synoviae	1, 2, 3	V	8 735	207
Salmonella Pullorum	1		2 990	0
Infectious bursal disease	1, 2, 3, 4		11 066	38 retest -ve ♠
Avian influenza	1		424	0

Category: 1=breeders, 2=broilers, 3=commercial layers, 4=turkey

† New Zealand has never experienced an outbreak of Newcastle disease. An asymptomatic enteric strain of avian paramyxovirus type 1 with an intracerebral pathogenicity index (ICPI) of 0.00–0.16, is endemic in this country.

‡ Confirmed false positives upon further investigation

♠ Refer IBD annual report, page 43

TABLE 2: SEROTYPES OF *SALMONELLA* ISOLATED DURING THE YEAR 2013*

NUMBER OF ISOLATES		
***SALMONELLA* ISOLATES**	**FINISHED AND FEED SOURCES**	**BROILER SAMPLES***
Agona		29
Anatum/Anatum 15+	8	
Derby		4
Havana		
Infantis	9	31
Mbandaka	2	
Senftenberg	1	6
Livingstone		
Tennessee		
Typhimurium RDNC		
Typhimurium 101	1	
Typhimurium 42		
Typhimurium 1		
Typhimurium 135		
Typhimurium 8		
Typhimurium 191		
Species group B		2
Species group C		1
Give 15+	1	
Frenzo	9	
Minnesota	1	
Total positive/total tested	**32/1417+**	**73/2365+**

* samples include environmental swabs and whole carcass rinse birds

QUARTERLY REPORT OF DIAGNOSTIC CASES: APRIL TO JUNE 2014

NEW ZEALAND VETERINARY PATHOLOGY

BOVINE

Nine dairy heifers from a mob of about 50 in the Far North were found dead one morning after being put on a paddock of plantain (*Plantago* spp.) One animal was examined post mortem. Histological examination was not significant, but the vitreous humour nitrate level was 100 mg/L. Levels of 100–150 mg/L are observed in poisoned cattle (Parkinson *et al.,* 2010). **Nitrate toxicity** was diagnosed.

In mid April, an adult Friesian cross dairy cow in South Waikato presented with haemoglobinuria. Serum chemistry revealed marked elevations of gamma-glutamyl transferase (1797 IU/L; reference range 0–36) and glutamate dehydrogenase (738 IU/L; reference range 6–41). Microhaemagglutination assays for *Leptospira* serovars Hardjo and Pomona were negative. **Acute sporodesmin toxicity** was diagnosed. A number of other animals from the Waikato, Coromandel, Auckland, Bay of Plenty and Taranaki regions presented similarly during the early part of this quarter.

An adult Friesian dairy cow in the Waikato had a severe dark-coloured scour with weight loss. Faecal culture revealed ***Salmonella* Typhimurium**.

A six-week-old autumn-born calf in the Bay of Plenty had a high temperature and foul-smelling, bloody diarrhoea. Cultures of faeces for *Salmonella* and *Yersinia* spp. were negative but large numbers of coccidial occysts were found on faecal flotation. **Coccidiosis** was diagnosed.

A beef calf from Whangarei presented with diarrhoea. No history was given. ***Salmonella* Ruiru** was isolated from the faeces. Antigen testing for rotavirus was negative.

In Nelson, five out of a group of 500 mixed-age ewes died over a week. The duration of disease was short, with animals seen sick one day with diarrhoea and dead the next. Histology on one dead animal revealed acute bacterial enteritis superimposed upon a more chronic enteropathy resulting from parasitism. ***Salmonella* Hindmarsh** was isolated from ingesta of one animal.

In Southland, three of a group of 14 grazing calves were affected by diarrhoea and condition loss. One died overnight. Two faecal samples were examined by faecal flotation. One had high numbers of strongyle eggs (9300 per gram). ***Salmonella* Typhimurium** was isolated from both samples. **Salmonellosis** complicated by **enteric parasitism** was diagnosed.

Two samples were submitted from dairy cows in the Hauraki region that had diarrhoea. No other history was given, but ***Salmonella* Kentucky** was isolated from the faeces of one.

A heifer in Taupo was ill after calving, with anaemia and haematuria evident clinically. Haematology revealed a marked Heinz body anaemia and urinalysis showed a marked haemoglobinuria. These findings are consistent with **S-methyl cysteine sulphoxide** toxicity, which is usually associated with feeding turnips.

Seventeen animals out of a mob of 70 calves in the eastern Bay of Plenty exhibited ill-thrift. They had been drenched about 10 days previously. *Yersinia pseudotuberculosis* was isolated from all six of the animals whose faeces were cultured. Serum pepsinogen levels were mildly to moderately elevated, ranging from 2.8 to 3.2 IU/L (reference range 0.0–2.6) in five of the 10 animals tested. **Yersiniosis** complicated by abomasal damage caused by **ostertagiasis** was diagnosed.

Five dairy calves in the Waitaki area presented with dependent oedema and swollen prepuces. One animal died. The calves had a history of exposure to acorns. Biochemistry on one revealed a severe azotaemia, with a creatinine level of 1807 umol/L (reference range 55–130) and a urea level of 96.2 mmol/L (reference range 2.7–12.3). Acute renal failure, likely due to **acorn toxicity**, was diagnosed.

In the Manawatu, five dairy calves out of a group of 120 animals aged 4–14 days died over a few days. Presentations included fever, diarrhoea, dehydration and depression. Faeces from five animals were positive for **rotavirus** antigen. Testing for *Cryptosporidium* (modified acid-fast stain) and coronavirus (faecal antigen ELISA) and culture for *Salmonella* were negative in all animals.

Dairy calves less than a week old in the Manawatu exhibited scouring. Only one sample was tested, but faecal antigen ELISA was positive for **rotavirus** and ***E. coli* (K99).**

Four heifers died from a group of eight in the Manawatu over a period of several weeks. Animals exhibited severe diarrhoea and on necropsy one had a diffuse thickening of the small intestine, with haemorrhage and fibrinonecrotic membrane visible over the mucosa of the duodenum. Histology revealed a marked enteropathy with severe crypt loss affecting both the large and the small intestines. Serum BVD antigen testing was positive. **Mucosal disease** was diagnosed.

Four cows in the Horowhenua region aborted and samples from one fetus were submitted for histology and microbiology. Histology revealed a neutrophilic and fibrinous placentitis, consistent with a bacterial **placentitis**. Culture of stomach contents resulted in a heavy growth of ***Salmonella* Typhimurium** phage type 156.

A heifer calf in the Waitaki area presented with marked pyrexia and corneal oedema. PCR revealed the presence of **ovine herpesvirus 2** in whole blood. **Malignant catarrhal fever** was diagnosed.

One calf out of a mob of ill-thrifty animals in the Waitomo region became acutely ill and died, with diarrhoea and gross evidence of enteritis. The mob had a history of yersiniosis. Histological examination revealed a marked erosive and ulcerative enteritis with intralesional adenoviral inclusions. **Adenovirus** is an uncommonly identified cause of enteritis in calves in New Zealand.

EQUINE

A horse in the Waikato had a large mass in the abdominal wall. Core biopsies were taken for histological examination and revealed that the mass was composed of large, irregular-shaped cells with large nuclei and prominent nucleoli. Numerous very large multinucleate cells were also visible, often containing up to 30 nuclei. **Giant cell tumour of soft parts** was diagnosed. This is an uncommon to rare tumour of horses that arises in soft tissues. Complete excision may be curative, although some cases do recur (Bush *et al.*, 2008).

OVINE

Two lambs in the Coromandel out of a mob of 620 died after showing signs of respiratory disease with coughing and nasal discharge. Post-mortem examination and histology revealed acute fibrinous pleuritis and bronchopneumonia. ***Pasteurella multocida*** was isolated from affected lung.

In Nelson, about a hundred mixed-age Romney sheep out of a mob of 3000 were observed with diarrhoea. Up to three died daily for several days. Stocking rates were considered relatively high by the submitting veterinarian and animals were being shifted every three days. Histology revealed a severe necrotising and ulcerative enteritis with numerous colonies of bacteria adherent to the ulcerated mucosa. ***Salmonella*** **Hindmarsh** was cultured.

CERVINE

A red deer from the Rodney district was found dead but in good body condition. Field postmortem revealed significant abnormalities in the lung, which was submitted to the laboratory. Gross examination of the lung revealed numerous worms in the bronchi. Histological examination revealed a chronic active severe pneumonia, with worms consistent with ***Dictyocaulus viviparous*** in the airways.

CAPRINE

A seven-year-old Angora goat in the Waitomo region had a history of weight loss and tremor. Serum chemistry revealed a moderate hypoalbuminemia of 14 g/L (reference range 20–44). A caprine arthritis and encephalitis antibody ELISA was negative, but a Johne's ELISA was positive. Protein-losing enteropathy caused by **Johne's disease** was diagnosed.

AVIAN

A rainbow lorikeet (*Trichoglossus haematodus*) from a zoo in Auckland was euthanased after having seizures. Histology revealed multiple foci of macrophages within the lung and the lamina propria of the small intestine. Acid-fast (Ziehl-Neilsen) staining revealed that these macrophages contained acid-fast bacilli, consistent with **avian mycobacteriosis**.

EXOTIC MAMMAL

A European hedgehog (*Erinaceus europaeus occidentalis*) presented in Auckland with hemorrhagic diarrhoea. Antigen testing revealed no evidence of giardia or cryptosporidia, but ***Salmonella*** **Enteriditis** was isolated from the faeces. Faecal cultures for *Campylobacter* and *Yersinia* were negative.

GRIBBLES VETERINARY PATHOLOGY

BOVINE

Ten milking cows were identified with ill-thrift and diarrhoea in a small Otago dairy herd. ***Salmonella*** **Typhimurium phage type 56** was cultured from the faeces of two affected cows.

Seven dairy calves in poor body condition were grazing on a Southland dairy farm. One calf developed melaena and died. There were no obvious gross findings on necropsy but histological changes consistent with a severe nephrosis were found in sections of the kidney. This finding is consistent with **acorn toxicity** and there were oak trees in the paddock where the calves had been grazing.

There were three outbreaks of **copper toxicity** in Southland dairy herds in late May to early June this winter. These herds had all been fed palm kernel extract over the milking period. In one herd an unknown number of cows had become recumbent and died over the transition period. Blood from two affected cows showed abnormally elevated glutamate dehydrogenase (GLDH) concentrations of 1530–4450 IU/L (normal range 0–59) and serum copper concentrations of 40–150 µmol/L (normal range 8–20), confirming copper toxicity. Copper concentration measured on a formalin kidney sample was also very high, at 744 µmol/kg (normal < 150). In a second case, a three-year-old cow became recumbent when yarded. When examined she was still recumbent with a subnormal temperature, appeared blind and was twitching. There was no response to treatment so the cow was euthanased and necropsied. This revealed a moderate amount of dark yellow fluid in the abdomen and a swollen liver that oozed a large amount of blood from a cut surface. There were numerous haemorrhages over other organs. There was no obvious jaundice. An antemortem serum copper test was very high at 80 µmol/L (normal 8–18), a GLDH of the same blood was 2309 IU/L (normal range 0–59) and the copper concentration of a fresh kidney taken at necropsy was 228 µmol/kg (normal < 150). These results all confirmed copper toxicity.

In the third case, a mob of dairy cows had been dried off and were trucked for one hour to a grazing block. Three were found dead or clinically ill over the next two days. Serum copper of a live affected cow was 58 µmol/L (normal range 8–20) and kidney copper in a dead cow was 1088 µmol/kg (normal < 150). Necropsy of the dead cow was unremarkable, with only an enlarged liver, small ulcers in the abomasum and a large haemorrhage over the epicardium of the heart. A month earlier the liver copper concentrations of four cull cows had been high (3060–5610 µmol/kg; adequate > 95), indicating the potential for copper toxicity.

A small mob of heifers were moved onto new grass on a Southland dairy farm. A few days later two were found dead and a third was recumbent and died shortly afterwards. Necropsy of one animal revealed that the intestinal tract was full of blood, from the distal end to the rectum. Histopathological examination of affected intestine revealed

large areas of mucosal haemorrhage and numerous intranuclear inclusions in the endothelium of the submucosal blood vessels. These findings are consistent with **adenovirus enteritis**. This mob had been shifted from being intensively fed on a feedlot, to being break-fed on a grass paddock. Another mob of the same age-group heifers that had been on grass since weaning were unaffected.

More than 30 heifers in a mob of 600 dairy cows on a Southland dairy farm were found to have mummified calves at scanning. There were also a number of abortions after scanning. Previous bulk milk bovine viral diarrhoea (BVD) antibody tests during the season had showed that the herd had been exposed to BVD but no current viral infection was found. Thirteen affected cows were blood-sampled. A pooled BVD antibody test found *a* pooled test sample to positive control ratio (S/P ratio) of 1.14 (> 0.75 indicates BVD virus exposure*)*, confirming exposure to BVD, and most had positive ELISA reactions to *Neospora caninum*. Four of the positives were re-tested using the *Neospora* IFAT, revealing a titre of > 1:1000. These results are consistent with a **Neospora abortion** problem, possibly exacerbated by exposure to **BVD virus**.

Six of a mob of 60 heifers on a Southland dairy farm aborted one to three days after being introduced to a crop. They were also being fed good-quality baleage and old hay. The hay was removed from the diet but another 14 heifers aborted over the next few days. The aborted calves were found to be progressively more decomposed as the abortions continued, suggesting a point-source abortifacient. A range of laboratory tests on one of the earliest calves aborted revealed no significant findings. These abortions may have been caused by a **mycotoxin** in the spoiled hay.

Fourteen out of 100 dairy cows were found dead over a two-day period on a Southland dairy farm shortly after being introduced to a swede crop. Eye fluid nitrate and kidney copper concentrations were normal in one of the dead cows. No deaths were reported in the adjacent paddock where a similar group of cows were grazing the same variety of swedes. A search of the paddock where the cows were grazing found large amounts of **black nightshade (*Solanum nigrum*)** and **hemlock (*Conium maculatum*)** growing in the grass verge. This had largely been grazed. The black nightshade was also mixed with the edge of the crop and would have been in the initial breaks provided. Both these plants are toxic.

In Southland there were several small outbreaks of **hepatic photosensitivity** in dairy cattle that were grazing swede crops. The signs were seen in a small number of cows about a week after being introduced to the crop. Blood samples had elevated serum gamma glutamyltransferase concentrations (240–824 IU/L; normal range 6–37), elevated glutamate dehydrogenase (30–797 IU/L; normal < 59) and bilirubin (18–103 umol/L; normal < 13). A few of these cows were also anaemic and had low serum proteins, suggesting a recent external or gastrointestinal haemorrhage. One of these anaemic cows was observed to briefly pass blood in the faeces. The cause of the hepatic damage was not determined.

Between 40 and 50 heifers from a mob of 180 on a Southland dairy farm developed a severe bilateral conjunctivitis that failed to respond to local antibiotic treatment. A PCR for **infectious bovine rhinotracheitis** on pooled eye swabs was positive.

Three of 20 cattle on a Southland dairy farm were found dead after grazing a kale crop. They had previously spent two weeks on another kale crop in a different paddock without problems. Samples of eye fluid from two of the dead cows tested positive for nitrate, confirming **acute nitrate toxicity.**

An aborted bovine fetus from Northland was presented for necropsy and histopathology. Multifocal necrotising encephalitis, myositis, and myocarditis with placental, hepatic and pulmonary necrosis were diagnosed via histopathology. These lesions were consistent with ***Neospora*-related abortion**. There was a previous high *Neospora* IFAT from another animal on the property.

Six out of fifty 11-month-old dairy heifer calves died suddenly in Northland. The submitting veterinarian suspected nitrate poisoning. There were elevated levels of aqueous humour nitrate (50 mg/L; reference < 6) and nitrite (2+ dipstick; normal no trace), confirming a diagnosis of **nitrate toxicosis**.

Four outbreaks of **adenoviral enteritis and nephritis** were diagnosed in a four-week period during late May and early June 2014. Two outbreaks occurred in central Hawke's Bay and two in Manawatu; in three cases the affected animals were Friesian bull weaners aged eight to nine months and the other case involved 10-month-old dairy cross heifers. The outbreaks were small, with death rates reported as 3/120, 2/150, 3/60 and 1/40, resulting in a total of nine deaths out of 370 at-risk weaners. Clinical signs were mucoid or haemorrhagic diarrhoea followed by rapid death. In three out of four herds the rest of the weaners were reported to be in suboptimal condition and drenching history was lax. Post-mortem examination was carried out on one affected animal from each outbreak. In all cases intestinal dilation and haemorrhagic or mucoid diarrhoea was identified. Histopathological findings included marked intestinal congestion and haemorrhage with areas of necrosis accompanied by large basophilic intranuclear inclusions in endothelial cells. In all cases there was also tubulointerstitial inflammation and there were variable numbers of intranuclear inclusions in the kidney. In two of four cases there was also histological evidence of significant abomasal ostertagiasis. Three affected animals tested negative for BVD antigen on skin, while cultures of intestinal contents or faeces were negative in three cases and produced scant growths of ***Campylobacter jejuni*** and ***Yersinia pseudotuberculosis*** in one.

Two cows from a Manawatu dairy herd aborted 6–6.5-month-gestation fetuses within a couple of days of each other. One fetus was submitted for

laboratory examination along with the placenta. The cotyledons were thickened, yellow and friable and had scant, purulent exudate on the surfaces. The intercotyledonary membrane was thickened and opaque in places. Occasional irregular yellow plaques 10–20 mm in diameter were observed on the foetal skin. Histopathology confirmed **mycotic abortion,** with necrotising placentitis, foetal dermatitis and foetal bronchopneumonia observed. There were occasional microscopic hyphae with morphology suggestive of ***Aspergillus* spp**. The herd had been supplemented with silage for some weeks owing to dry conditions and lack of grass, and this was considered the likely source of the infection.

A five-year-old beef cow from the Rangitikei region showed central nervous system signs and died. Liver lead was measured at 34.9 mg/kg (normal range 0.1–1.0), consistent with **lead toxicity**. The source of lead was not known.

Three Friesian steers from a mob of 30 in Rangitikei were found dead after being moved to a new paddock. Five more showed neurological signs prior to collapse and death. At postmortem large numbers of **kowhai *(Sophora microphylla)*** leaves and seeds were found in the rumen. Histopathological examination of a range of fixed tissues from the dead animals revealed no lesions to suggest another cause. Circumstantial evidence suggested this was a case of **kowhai toxicity**. In a previous case three bulls had been in a paddock for several months with no ill effects. Trimmings from some kowhai trees were thrown into their paddock and the next day one bull was dead and the other two appeared unco-ordinated. Kowhai leaves were found in the rumen of the dead bull (Hutton, 1996). All parts of kowhai but particularly the seeds are toxic (http://www.terrain.net.nz/friends-of-te-henui-group/table-1.html) The other affected steers recovered slowly over the next two weeks.

A first-calving cow from the central North Island had lost weight over the previous few months. On examination there were ulcers on her tongue, hard palate and muzzle. She had a calf at foot, which also had ulcers in the oral and nasal cavity. Serum samples were collected from the cow and calf and tested for **bovine viral diarrhoea virus** (BVDV). Both gave a high positive result, confirming persistent BVDV infection of both animals. Cows persistently infected with BVDV always produce a persistently infected calf.

Thirteen mixed-age Angus cross cows were dry at pregnancy scanning of a mob of 63 on a Wairarapa farm. Ten were blood-sampled and tested for ***Leptospira* Pomona** titres. Three of the cows had MAT titres of > 1:1600 against *L.* Pomona, and two others had low to moderate titres, suggesting recent infection and a possible reason for the abortions.

A mob of six-month-old dairy calves from the Bay of Plenty were losing weight and six had reddened and peeling skin. Serum samples from all six showed increased gamma-glutamyl transferase concentrations of 2193, 2012, 1734, 599 and 1795 IU/L (reference range 9–39), indicating marked bile duct damage and photosensitisation consistent with **sporidesmin toxicity**.

A six-year-old Ayrshire cow from south Waikato had been producing less milk than expected for the past three days and was slow to walk to the dairy shed. At morning milking she sat down in the yards and died about 15 minutes after the attending veterinarian arrived. Ante-mortem EDTA blood samples revealed that the cow was markedly anaemic, with a haematocrit of 0.07 (reference range 0.24–0.36) and a total RBC of 0.97 x 10^{12}/L (reference range 5–7.7 x 10^{12}). *Theileria* organisms visible on the red cells were subsequently confirmed as *T. orientalis* ikeda by qPCR, consistent with ***Theileria*-induced anaemia**.

Six of 30 nine-month-old Jersey calves developed dark, blood-tinged diarrhoea. Moderate to heavy concentrations of coccidia oocysts were seen in faeces from two affected calves, confirming a diagnosis of **coccidiosis**.

A six-year-old Friesian cow from a herd of 280 in Taranaki was weak and thin, with mild subcutaneous submandibular oedema. Serum albumin concentration was down, at 18 g/L (reference range 25–40), consistent with protein loss. A Johne's ELISA was positive, confirming a diagnosis of **Johne's disease**.

A single mature Friesian dairy cow from a herd in the Waikato developed ecchymotic haemorrhages and haematochezia and had markedly pale mucous membranes on veterinary examination. A platelet count was very low, at < 20 x 10^9/L (reference range 220–640 x 10^9), confirming a diagnosis of **thrombocytopaenia**. Thrombocytopaenia can be associated with bracken fern poisoning and bone marrow abnormalities. Idiopathic variants of thrombocytopaenia can develop hyphaema and recover in a few days.

In a mob of 180 rising-one-year-old calves on a North Canterbury property, 30 died suddenly. The calves were being grazed on a newly sown ryegrass paddock that had been topdressed with urea three weeks previously. Laboratory testing of the aqueous humor of 10 calves revealed nitrate levels > 100 mg/L, consistent with a diagnosis of **nitrate poisoning**.

A mid-Canterbury deer farm was losing seven to 10 weaners per week from a mob of 500. Many animals in the group were coughing. Three were examined at postmortem and all had **lungworm infestation**. Histological examination of one revealed lesions of interstitial pneumonia, typical of lesions caused by migrating lungworm, and had squamous metaplasia of the airways, typical of the effects of adult lungworm.

Several cases of **fungal abortion** in cows from farms all over Canterbury were diagnosed in May and June on histological examination of the placenta. Where culture of fetal stomach contents has been carried out, all the cases have been due to ***Aspergillus fumigatus***.

A farm in mid-Canterbury experienced ill-thrift and losses of calves caused by

BVD infection over a period of four to five weeks in April and May. The mob consisted of 287 calves and 27 had already died. Veterinary assistance was sought and one calf that died had a high BVD antigen ELISA result, consistent with its being a persistently infected (PI) animal. Another calf died soon after and it too was a PI animal. At that stage advice was given to bleed the entire mob, and of the remaining 259 calves a further 21 were PI calves.

OVINE

Thirty percent of the animals in a mob of 700 hoggets on a Southland sheep farm developed a severe diarrhoea with weight loss and deaths, three weeks after being drenched. The problem was so severe that the farmer thought it was an acute *Salmonella* outbreak, but a faecal sample culture was negative. Histopathological examination of sections of gastrointestinal tract confirmed a **severe parasitic enteritis.** In a similar case in Southland, 17 lambs died over a 72-hour period.

There were 15 outbreaks of acute salmonellosis in adult ewes in Southland between mid April and late June. ***Salmonella* Hindmarsh** was isolated from all cases. The numbers of deaths reported were low.

A farmer on an Otago sheep farm gave 670 hoggets injectable copper. Sixty died over the next three days. The concentration of copper in the kidney of one dead hogget was 326 µmol/kg (toxic level > 150), confirming **copper toxicity**.

Twelve of 200 hogget ewes on a feedlot system died from a severe, malodorous diarrhoea over a few days. They were being fed fava beans, barley, silage and grass. A similar number of older ewes mixed with the hoggets were unaffected. ***Listeria monocytogenes*** was isolated from the gastrointestinal tract of a recently dead hogget ewe. *Salmonella* cultures were negative. The silage was most likely the source of the listeria.

Three adult ewes from the East Coast died and were presented to the referring veterinarian for post-mortem examination. Clinical findings included green diarrhoea, haemorrhagic rectal mucosa and intestinal lymphadenomegaly. Faeces were submitted for culture and ***Salmonella* Hindmarsh** was isolated, confirming a diagnosis of **salmonellosis**.

Tissue samples were submitted from a sheep with a history of seizures, stiff joints, locked jaw and opisthotonus. The animal had been exhibited at an agricultural show 10 days previously. Histopathology of the cerebrum revealed multifocal necrosis of neurons associated with little or no gliosis, as well as vacuolation and clefting of the deep lamina with separation of the grey matter from the white matter of the centrum semiovale. In some areas there was also rarefaction of the underlying white matter. Spheroids (swollen axons) were seen in the mid-brain. These findings were consistent with a diagnosis of acute **polioencephalomalacia**.

A sheep farmer with 3000 mixed-age ewes on Manawatu hill country reported 50 ewe deaths had occurred over a period of four weeks in the autumn. The ewes had been given a single dose of *Salmonella* vaccine one week into the outbreak but continued to die at the same rate. Clinical signs ranged from a brief period of diarrhoea to apparent sudden death. Post-mortem findings on a recently dead ewe included congested, eroded and haemorrhagic abomasal and intestinal mucosa, enlarged mesenteric lymph nodes and a swollen gall bladder. Abomasal histology confirmed the presence of erosion, with mats of fibrin, bacteria and neutrophils overlying affected areas. Culture of abomasal contents produced a heavy growth of ***Salmonella* Hindmarsh**, confirming an outbreak of **salmonellosis.**

Another outbreak of **salmonellosis** occurred when ten out of 400 mixed-age ewes on a Manawatu sheep farm died suddenly over a period of three weeks. The ewes were in good condition. No significant changes were noted at postmortem. Salmonellosis was suspected clinically and was confirmed by a moderate growth of ***Salmonella* Hindmarsh** from the faeces of an affected ewe.

During May and June 2014, three **leptospirosis** outbreaks were diagnosed on sheep farms in coastal and central Hawke's Bay. All affected lambs were Romneys aged eight to nine months. In total, 47 deaths were reported out of 4400 at-risk lambs, with individual farms reporting death rates of 5/400, 12/500, and 30/3500. In all cases the lambs were grazing pasture and there was standing water, which in two cases was due to recent heavy rain and in the third case was due to grazing under a pivot irrigator. Outbreaks presented as trickling sudden deaths. One examined lamb was anaemic (haemocrit 0.15) and had red-tinged urine prior to death. Histopathology was conducted on individual lambs from each outbreak and revealed similar changes. There was centrilobular hepatic necrosis and heptatocellular dissociation along with variable amounts of haemoglobin in renal tubules. In one case, eight of 10 lambs tested had MAT titres of ≥ 1:800 to ***Leptospira pomona***. In unvaccinated lambs a titre of > 1:100 would be considered indicative of leptospira infection.

Ten out of 400 mixed-age ewes on a Manawatu sheep farm died suddenly over a period of three weeks. The ewes were in good condition and no significant changes were noted at postmortem. **Salmonellosis** was suspected clinically and was confirmed by a moderate growth of ***Salmonella* Hindmarsh** from the faeces of an affected ewe.

Three outbreaks of severe **enteric parasitism** were diagnosed during the autumn from sheep farms in Hawke's Bay, Manawatu and Wanganui. In Hawke's Bay, 10 out of 400 recently-bought-in two-tooth ewes developed diarrhoea and had body condition scores of about 1. The outbreak in Manawatu involved lambs that had been bought in and drenched with a triple combination product on arrival. Twenty-five days later many of these were in poor condition;

five had significant diarrhoea and four died. The Wanganui case was initially suspected to be a *Salmonella* outbreak, with widespread scouring and about 15 deaths in a flock of 200 two-tooth ewes. In all cases post-mortem findings were restricted to the intestinal tract, with thickening of the mucosa and enlargement of the mesenteric lymph node. Consistent histological features in these cases were intestinal villus blunting and crypt hyperplasia, with large numbers of nematodes associated with the mucosa. Morphological features of the nematodes were largely consistent with *Trichostrongylus* sp. Intestinal contents and faeces were cultured from two ewes from the Wanganui outbreak and no *Salmonella* species were isolated. Faecal egg counts from those animals were 12 700 and 12 200 eggs per gram. Larval culture of a pooled sample identified 93 percent *Trichostrongylus sp.* and 7 percent *Cooperia sp.*

Over the past few years a North Canterbury sheep farm with 1000 lambs had produced 10–20 lambs with ataxic hindlimbs each season. These had been noticed at tailing time and a veterinary investigation was sought this year. Histological examination of a spinal cord sample revealed lesions typical of **enzootic ataxia** and the liver copper level of the lamb examined was 75 µmol/kg (reference range 95–3000).

CAPRINE

Yearling dairy goats were sick and dying on a Waikato farm. The affected animals deteriorated rapidly after developing respiratory disease. On examination there was marked pyrexia, with rectal temperatures elevated to 41°C. On post-mortem examination of one dead goat there was about 300 ml of exudate in the thorax, and the lungs were firm and reddened. Histopathology revealed inflammation, haemorrhage and bacteria in the lung interstitium. Culture of the lung isolated a heavy pure growth of ***Mannheimia haemolytica,*** confirming this was the cause of the disease.

Multiple fluid-filled cysts were seen on the uterus of a euthanased adult Saanen doe from the Waikato that had been subject to repeated laparotomy and oviduct flushes. About 25 cysts up to 12mm in diameter and filled with clear fluid were randomly scattered on the serosal surface of the uterus. Histopathology of the uterus found the cysts were lined by a single layer of ciliated columnar cells, most suggestive of **adenomyosis**.

CANINE

A one-year-old female spayed Boxer dog from Auckland had a history of chronic intermittent diarrhoea with frank blood since she had been a puppy. Her diet was changed to raw food, including rabbit, tripe and bones. The stool initially improved but then became soft again with haematochezia. The owner also noticed significant weight loss since beginning the raw food diet. Faecal culture isolated ***Salmonella*** **Infantis**.

A litter of five three-month-old Heading dogs from a Wairarapa farm developed generalised pruritis with multiple small scabs over the skin surface. A skin biopsy was processed for histopathology. There was marked diffuse irregular epidermal hyperplasia and orthokeratotic to parakeratotic hyperkeratosis. Scattered among crusts of keratin, degenerate neutrophils and bacteria on the surface were occasional cross-sections of arthropods with chitinised cuticles and segmented appendages. There were also a few arthropod eggs. These findings were consistent with **sarcoptic mange.** The adult mites burrow into the stratum corneum and cause intense pruritis, epidermal hyperplasia and crusting. Mites are transmitted by direct contact between dogs, and in-contact humans may also be affected.

An eight-year-old male Huntaway from the Wairarapa was clinically dull, vomiting and had a temperature of 39.6°C. It was put on a drip. Blood sent to the laboratory showed severe azotaemia with creatinine of 1039 umol/L (normal range 48–109), urea of 99.9 mmol/L (normal range 2.5–9) and phosphate of 9.13 mmol/L (normal range 0.92–1.82). The potassium level was 6.9 mmol/L (normal range 4–5.4), and sodium was 139 mmol/L (normal range 141–153). Hepatobiliary disease was also present. Alkaline phosphatase was 283 IU/L (normal range 0–87), alanine transaminase was 283 IU/L (normal range 0–88), bilirubin was 145 µmol/L (normal range 1–3), and amylase was 2146 IU/L (normal range 0–1074). Although no urine specific gravity measurement was supplied, the severe azotaemia and hyperkalaemia indicated renal failure was likely. This may result in reduced deactivation of amylase, hence the increased level of amylase . A MAT titre of 1:800 for *Leptospira* Pomona was measured. The serum was negative to serovars Hardjo and Copenhageni. This was therefore a case of **leptospirosis** causing renal failure and hepatic disease following infection by ***Leptospira interrogans*** **serovar Pomona.**

FELINE

A nine-year-old male neutered Ragdoll cat from Auckland had a history of severe nasal congestion. Histopathology of nasal tissue revealed **nasal mycosis (probable aspergillosis)** with marked eosinophilic rhinitis.

A five-month-old cat from the Wairarapa had a history of persistent diarrhoea, yet was bright, alert and eating. Culture of faeces isolated ***Campylobacter upsaliensis/helveticus.*** An ELISA test for ***Cryptosporidium parvum*** was also positive, confirming two potential causes of chronic diarrhoea. A giardia ELISA test and faecal parasite egg examination were negative.

PORCINE

Formalin-fixed liver was submitted from an East Coast pig. The owner had noticed a cyst on the liver. Histopathology revealed a cysticercus surrounded by a capsule within autolysed liver. The parasite was identified as ***Cysticercus tenuicollis***.

ZOO ANIMAL

A 19-day-old hand-reared female black buck kid (*Antilope cervicapra*) from a Waikato zoo was found dead. At six days of age the kid had been diagnosed with septicaemia and treated with antibiotics. She had been bright and alert and eating since then, but always pyrexic.

Progressive anterior uveitis in the left eye had been slowly responding to treatment. At necropsy there was haemorrhage from the nares and occlusion of the trachea by blood. Histopathology confirmed a severe necrosuppurative **endophthalmitis**, along with vascular thrombosis in the spleen and lung, suggesting terminal **thrombocytopaenia** as a cause of the haemorrhage leading to asphyxia.

EQUINE

An 11-year-old Quarterhorse in a paddock on an Otago smallholding was found reluctant to move and in pain around the girth area. It was treated with anti-inflammatory medication and revisited a week later. It appeared to be moving a bit more freely but was still in pain around the girth and had developed ventral oedema. A sick equine screen that included muscle enzymes and haematology was normal but **blood selenium** was extremely low, at 120 nmol/L (normal range 1600–3200). After selenium supplementation it appeared to improve.

A yearling pony was found recumbent but still bright and alert, with an appetite. Its muscle enzymes were very high. Creatine kinase (CK) was 165 500 IU/L (normal range < 312) and aspartate transaminase (AST) was 27 750 IU/L (normal range < 590). These findings were consistent with **sycamore toxicity** and low to moderate numbers of sycamore seeds were found mixed with the grass in this paddock. The pony took about five days to recover with supportive treatment. It never lost its appetite, which was probably a good prognostic sign. Another blood sample taken a couple of days after it recovered showed much-improved AST of 756 IU/L and CK of 4501 IU/L. Most affected horses die of this condition.

An eight-year-old male Thoroughbred horse from the greater Auckland area underwent exploratory laparotomy for a suspected splenic abscess. A large inflammatory lesion was discovered in the spleen and was biopsied for culture and histopathology. Histology revealed extensive disruption and replacement of splenic parenchyma by multinodular coalescing granulomas with scattered multinucleated giant cells. Routine and special staining failed to reveal any bacteria, mycobacteria or fungi. Gram-staining revealed small needle-like inclusions within and among macrophages and multinucleated cells. Culture produced light growths of *Acinetobacter lwoffii* and *Pantoea* sp., both of which may be carried asymptomatically in the gastrointestinal tract. It was concluded that the most likely cause of the lesion was a migrating **foreign body** from the gastrointestinal tract.

When a five-month-old Arab colt from Taranaki underwent routine castration, one of the testes was noted to be markedly enlarged and cystic. Tissue was submitted for gross and histological evaluation. Grossly there was a small residual area of testicular tissue, while the rest of the mass was composed of fluid-filled or hair-lined cysts, fatty tissue and cartilage. Histology revealed the presence of mature adipose, skeletal muscle and cartilage, glandular and respiratory structures, haired skin with dermal adnexal structures, large nerves and blood vessels. The seminiferous tubules contained degenerative changes. The presence of a benign neoplasm with components derived from multiple embryonic germ layers confirmed a diagnosis of **testicular teratoma,** which is extremely rare in domestic animals apart from horses. They may be found in scrotal or cryptorchid testes and there are reports of large abdominal teratomas causing complications in foals. Most teratomas are well differentiated and benign.

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QUARTERLY REPORT OF INVESTIGATIONS OF SUSPECTED EXOTIC DISEASES

Exotic disease investigations are managed and reported by MPI's Investigation and Diagnostic Centre (IDC) and Response, Wallaceville. The following is a summary of investigations of suspected exotic disease during the period from April to June 2014.

EXOTIC VESICULAR DISEASES RULED OUT

A veterinarian from a slaughter plant reported suspect vesicular disease in cattle to MPI. The affected animals were in a mob of rising-two-year-old bulls. About 80 percent of a mob of 38 were reported to have erosive lesions around the coronary band.

An Initial Investigating Veterinarian visited the slaughter plant and carried out a clinical examination. There were a range of lesions observed but generally the affected cattle had ulcerations extending proximal to the coronary band and on other parts of the leg. Most of the lesions were seen on the caudal surface of the leg. No oral lesions were present in any affected cattle, nor did any of them present with a fever. Clinically the lesions observed were likely caused by trauma rather than an infectious aetiology.

We hypothesised that sexual riding behaviour of the bulls was responsible for the lesions observed. Vesicular disease was excluded on the basis of clinical and epidemiological findings.

A veterinarian phoned MPI after receiving a call from a client reporting vesicle-like lesions seen during the previous week on the legs and coronary bands of five adult dairy cattle from a milking herd of 305 animals. These cattle were also seen dribbling saliva but were otherwise apparently healthy. No other production issues were identified to the veterinarian, who went to the farm as an Initial Investigating Veterinarian, inspected the mob of cattle, clinically examined those that were affected, and confirmed that the case was not a vesicular disease. The lesions were granulomatous in nature and were located primarily on the haired skin above the coronary band. Samples were taken for further diagnostics.

No bacterial or viral aetiology (e.g., papillomavirus) was identified by bacterial culture or PCR testing. Cytology was also unable to identify a cause. Similar lesions have been seen in NZ dairy cattle as a result of trauma in the milking parlour with secondary bacterial infection. The investigation was closed as vesicular diseases were ruled out but further work by the veterinarian was recommended.

TSE RULED OUT

An MPI Verification Services inspector conducting ante-mortem examinations on animals at a slaughter plant reported to the MPI exotic pest and disease hotline a "downer" cow with signs of chronic problems of possible neurological origin, including ataxia. The cow was slaughtered and the carcass condemned. Brain and serum samples were sent to the AHL IDC, Wallaceville, to rule out exotic disease. The brain was negative for bovine spongiform encephalopathy by ELISA, bovine herpes virus 5 by PCR, and the Simbu serogroup of Bunyaviridae viruses (e.g., Akabane disease) by PCR. Serum samples tested negative for Akabane disease by VNT. As exotic diseases were excluded, the investigation was closed.

An MPI Verification Services veterinarian called the MPI exotic pest and disease hotline after examining a cow with neurological signs at a slaughter plant. The clinical signs were indicative of listeriosis (tilted head, droopy ears and eyelids) but could also have been bovine spongiform encephalopathy. However, on discussing the case with the farmer who owned the animal, it was established that the cow had fallen and hit its head on a water trough a year previously, and subsequently had developed the clinical signs. The case was stood down as there was no longer any suspicion of an exotic cause for the neurological signs seen.

HYDATIDS CONFIRMED IN IMPORTED COW

The liver and hepatic lymph nodes from a 14-year-old cow at a slaughter plant had granulomas and cysts at post-mortem inspection by an MPI Verification Services veterinarian. Samples were submitted for histology on suspicion of tuberculosis, and the carcass was condemned. MPI was notified by the pathologist via the exotic pest and disease hotline as the lesions were not due to tuberculosis but were consistent with hydatids, caused by *Echinococcus granulosus*. A second histological examination was performed, which concurred with the initial result.

A national eradication programme for hydatids operated in New Zealand for over 40 years and provisional freedom was declared in 2002. The last cases of fertile cysts were found in sheep on an offshore island in 1995. The cysts present in this cow were degenerate, infertile cysts, which could not be aged beyond six to 12 months. Remnants of cysts can last for many years. PCR then genetic sequencing contracted to the Hydatid Reference Laboratory in the UK confirmed the diagnosis of *E. granulosus*. As the cow's age was less than the period for which it is believed that hydatids has been absent from New Zealand, it was important to exclude the possibility that the cow had acquired the infection locally. The cow had been imported from Australia (where hydatids is present) along with another cow, more than 10 years previously. The other cow had also been sent to the works at the same time but no lesions were discovered. Home killing had never been practised on the small hobby farm and there were no dogs present. The two cows were the only imported animals on the farm. It was determined that the infection had probably been acquired in Australia. The life cycle of the parasite had not had the opportunity to be completed and to generate ongoing infection, as this would first require that fertile cysts in the cow were consumed by dogs. Therefore this animal posed no risk to New Zealand's hydatids-free status. All species of *Echinococcus* are notifiable organisms under the Biosecurity Act 1993 and New Zealand is currently

subject to a controlled area notice with respect to *E. granulosis*. (See http://www.biosecurity.govt.nz/files/regs/hydatids-controlled-area-notice-294-22-nov-2013.pdf which lists the control measures used to mitigate transmission of the parasite.)

SPORADIC BOVINE ENCEPHALOMYELITIS EXCLUDED

A Gribbles veterinary pathologist reported to the MPI exotic pest and disease hotline a calf in Canterbury that had pathology consistent with sporadic bovine encephalomyelitis (SBE). This disease is caused by *Chlamydophila pecorum*, an agent that is present in New Zealand but had not previously been associated with clinical disease. Around this time a separate investigation into a herd in the Manawatu was being conducted into another possible case of *C. pecorum* linked to clinical disease. The Canterbury case involved a two-month-old Hereford calf that was reported to be very unwell, hunched, pyrexic, underweight and with possible neurological signs including sternal recumbency and non-responsiveness. The case followed another similar-aged calf from another mob on the farm, which a week earlier had demonstrated hyperaesthesia, nasal catarrh and corneal opacity. This earlier animal had died without further investigation. The second calf did not respond to intravenous antibiotics so it was euthanased and tissues were collected and submitted for histopathology. The pathologist reported mild inflammatory changes within the lungs, liver, kidneys and muscle, mainly characterised by infiltrates of neutrophils or lymphocytes. The brain presented several different types of pathology including multifocal meningitis, vasculitis, encephalitis and cerebral cortical neuronal necrosis. The findings were indicative of an infectious process, with the targets of injury being parenchyma and vessels. Samples including brain, lung, liver, lymph nodes and serum were sent to IDC AHL. Testing included molecular and serological assays for *C. pecorum*, bovine herpesvirus 5 (bovine encephalitis virus) and malignant catarrhal fever; culture, particularly to look for endemic *Histophilus somni*; and virus isolation. Fresh tissues did not yield any pathogenic bacterial growth and no *Histophilus* or *Haemophilus* species were isolated. Virus isolation was negative for any viruses (including herpesviruses) that produce cytopathic effects on cells. PCR for Herpesviridae and *C. pecorum* were negative, as were serological assays. Unfortunately the PCR for *Chlamydophila* is less sensitive on formalin-fixed brain (which was received) than fresh tissue. No causal agent was established for the pathology present.

ANTHRAX RULED OUT

A veterinarian reported an acutely dead steer in a mob of 120 beef cattle. The dead steer exuded blood from several orifices, which was consistent with clostridial disease but also with anthrax. The steer was buried and samples were taken by the veterinarian for testing at IDC AHL. A smear was examined and no anthrax organisms were detected. Bacterial culture was also negative. Anthrax was ruled out and the investigation closed.

EXOTIC BOVINE BLOOD PARASITES EXCLUDED

A veterinary pathologist contacted MPI to report that a single dairy cow had a regenerative anaemia (HCT = 0.1) associated with blood parasites. The parasites seen by light microscopy appeared to be morphologically different to *Theileria orientalis*, the species commonly seen. Whole blood from the cow tested negative by PCR for *Mycoplasma* spp. using both a generic *Mycoplasma* PCR and a haemotropic PCR. However, it tested positive by PCR for *T. orientalis* Ikeda, which was determined to be the cause of the regenerative anaemia observed.

BLUETONGUE RULED OUT

A veterinary practitioner from Massey University phoned to report that a ram lamb in a research trial had developed oedema of the head, a lesion potentially consistent with bluetongue virus infection. Blood tested negative by PCR for all bluetongue virus strains represented in the NZ bluetongue surveillance programme. Clinical pathology blood work showed signs consistent with an infection and the lamb eventually responded to anti-inflammatories and antibiotics.

EXOTIC CAUSES OF INFECTIOUS KERATOCONJUNCTIVITIS INVESTIGATED

A veterinarian rang the MPI exotic pest and disease hotline to report that a client had a large number of sheep (350 out of 700) affected by infectious keratoconjunctivitis (contagious ophthalmia or "pink eye"). Culture of swabs was unremarkable but the veterinary pathologist was concerned that an unusual mycoplasma or exotic agent such as *Acholeplasma oculi* could be involved. Repeat samples were obtained and the AHL identified *Moraxella* and *Mannheimia* spp. by culture and PCR, and *Mycoplasma conjunctivae* by PCR only. *Moraxella ovis* and *Mycoplasma conjunctivae* were considered to be the most likely pathogens involved as they are common causes of keratitis and conjunctivitis in sheep. Sheep and goats around New Zealand have high seroprevalence to *M. conjunctivae*, indicating high levels of exposure (Motha, 2003). *M. glucosida* has been associated with ovine mastitis and can be a commensal of the upper respiratory tract, but is not considered a primary agent of conjunctivitis in sheep. Owing to the endemic status of the isolated organisms this investigation was stood down.

GREASY PIG SYNDROME EXCLUDED

A veterinarian reported two of four pigs (four to six months of age) that had unusual skin lesions. The pigs had been a fed an unusual diet consisting of scraps from a fish-and-chip shop. Skin biopsies and bacterial swabs were collected from several of the lesions. Histopathology indicated that the lesions were a result

of subacute multifocal superficial mycosis, with a secondary *Staphylococcus* infection. Fungal culture determined that the yeast isolated was a *Candida* species (not *C. albicans*; most likely *C. lambica*).

EQUINE INFLUENZA RULED OUT

A veterinary pathologist reported to the MPI exotic pest and disease hotline a case of unusual, severe, acute pneumonia causing death in a six-month-old foal. The pneumonia had presented shortly after a minor surgical procedure. The case was complicated by the owner's belief that the illness was a sequela of the surgery. Bacterial culture ruled out any primary bacterial pathogen. Histological findings indicated the most likely cause was toxic, but a viral infection could not be excluded. General anaesthesia had not been used, so toxic injury from oxygen administration was ruled out. The foal had lived its whole life in a paddock with its dam, had no contact with other horses, and the mare was unaffected. Assessment of the pasture identified no obvious toxic plants or other common sources of toxins. A second histological examination concurred with the first, but identified the additional possibility of a pulmonary neoplasm. Viral causes were ruled out at the AHL IDC, Wallaceville, after negative results on PCR for equine herpesvirus strains 1 and 4 and equine influenza virus. Virus isolation on both RK13 (rabbit kidney cells) and EEK (equine epidermal kidney cells) was carried out, with negative results. Glanders, an exotic bacterial disease caused by *Burkholderia mallei*, was also ruled out by negative PCR. Other exotic causes of equine pneumonia were excluded on epidemiological grounds. The cause of the pneumonia was not determined, but the involvement of a highly pneumotoxic substance seems most likely.

DEER FIBROMA VIRUS EXCLUDED

A veterinarian identified a tumour on the prepuce of a six-year-old elk and submitted a biopsy to Gribbles Veterinary Laboratory. The laboratory pathologist called the MPI exotic pest and disease hotline, concerned that the tumour might have been caused by deer fibroma virus, an exotic papillomavirus. Cutaneous fibromas caused by this virus are benign nodular lesions but can be mechanically obstructive or become ulcerated through trauma. Many cervine species are affected in other countries, especially white-tailed deer, and particularly in the USA and Canada; and the prevalence in wild populations seems to be about 1 percent (Sundberg *et al.*,1981).

PCR for papillomavirus subcontracted to IVABS, Massey University, was negative so the fibroma was not caused by this exotic virus. The probable cause was an exuberant reparative response to trauma or inflammation.

EQUINE HERPESVIRUS MYELOENCEPHALITIS CONFIRMED

A veterinary pathologist notified MPI of an outbreak of a rapidly progressive neurological disease in a group of Thoroughbred mares on a Waikato stud farm. Cases typically presented with varying degrees of ataxia, hindlimb weakness, urinary incontinence, cranial nerve deficits and in some cases recumbency with no prior clinical signs. These signs were consistent with previous reports of equine herpes myeloencephalopathy (EHM) and this was confirmed through diagnostic testing of affected and in-contact animals. Laboratory testing used to confirm the diagnosis included a positive PCR for the neuropathogenic strain of EHM (a single substitution from aspargine (N) to aspartic acid (D) at amino-acid position 752). The PCR was carried out on tissues collected at postmortem from mares euthanased and from nasal swabs collected from clinically affected animals. In addition, serology confirmed the diagnosis in a number of other mares. There was a fourfold rise in the VNT titre to equine herpesvirus subtype 1 from paired sera collected from several of the clinically affected horses.

A total of 15 clinical cases occurred in a group of about 290 at-risk animals within a 33-day period and seven affected horses were euthanased during this outbreak. EHM is considered an endemic disease so the investigation was closed.

WEST NILE VIRUS EXCLUDED

A veterinarian informed MPI via the exotic pest and disease hotline of a severely ataxic 14-year-old English riding pony mare. The mare had foaled recently, and the foal and the other two horses on the property were unaffected. There had been no overseas travel by any horses on the property, but one had been to Tauranga recently and been in contact with other horses. The condition began with hindlimb ataxia and this led to recumbency followed by incontinence and severe muscle wasting. There were no clinically significant changes on haematology. The owner of the horses voluntarily quarantined the property while the investigation was completed. Nasal swabs and bloods were taken from the three adult horses and submitted to the IDC, Wallaceville, for West Nile virus (WNV) and equine herpesvirus-1 (EHV-1) neurological strain diagnostics, with all negative results. The mare deteriorated and was euthanased and a post-mortem examination was carried out. Histological examination of the brain at IDC Wallaceville showed a mild lymphocytic encephalitis. The changes were non-specific and could have been caused by a variety of means, including infectious microorganisms. Molecular assays for WNV and EHV-1 on fresh brain tissue returned negative results. Exotic disease was excluded and the investigation was stood down.

A veterinarian called the MPI exotic pest and disease hotline to report a yearling horse that was recumbent and then ataxic when made to stand, and was pyrexic. The horse showed extreme behaviour that could have been a sign of a neurological problem, but it was not used to being handled. This case came soon after a localised outbreak of EHV-1 neurological strain in the Waikato. While this is accepted as being an endemic and sporadically occurring virus, testing was done to ascertain whether it had occurred in a different region. The PCR

for EHV-1 on a nasal swab and blood was negative, as was a PCR for West Nile virus. EHV-1 and EHV-4 ELISA tests were negative. Biochemistry and haematology suggested an infectious process. The horse responded well to antibiotics and made a full recovery.

EIA/EVA RULED OUT

A veterinary pathologist called the MPI exotic pest and disease hotline to report moderate anaemia in a 10-month-old Standardbred colt in Southland. There was an elevated fibrinogen of 10 g/L (reference range 1–4) and hyperglobulinaemia. Exotic causes of anaemia in horses include equine viral arteritis and equine infectious anaemia. The attending veterinarian noted that the foal was dehydrated, pot-bellied and had a rough coat. These signs were considered to be consistent with a high burden of the roundworm *Parascaris equorum*. The foal and dam had no recent travel history. A worming history revealed the foal had not been wormed since it was eight weeks old. Supportive treatment was given and the demeanour of the foal improved. Parasitism was considered the most likely cause of the anaemia, and the investigation was stood down.

A pathologist from Gribbles Veterinary Pathology informed MPI via the exotic pest and disease hotline of two Thoroughbred geldings with a history of inappetance and nasal discharge. Routine haematology had identified slightly reduced red-cell parameters and a mild inflammatory leucogram with elevated fibrinogen. The horses were New Zealand-bred but were resident on a training property with about 30 horses, some of which were from overseas. Equine viral arteritis and equine infectious anaemia were excluded after negative VNT and AGID results respectively, these tests being carried out on acute and convalescent sera at IDC Wallaceville. The horses recovered uneventfully and no more affected horses were identified. Exotic disease was excluded and the investigation was stood down.

BRUCELLOSIS EXCLUDED

A veterinarian notified MPI of a suspect case of fistulous withers in a six-year-old racing mare. A swollen, draining wound was present on the withers, which had been treated symptomatically with antibiotics but had not resolved. Fistulous withers can be caused by the exotic agent *Brucella abortus* and, less frequently, by *B. suis*, which both cause a suppurative bursitis of the supraspinus bursa. *Brucella* infections in horses are also associated with "poll evil", which is inflammation of the supra-atlantal bursa. Other possible non-exotic causes of this lesion include a penetrating wound or foreign body in the subcutaneous tissues of the withers, or bacterial infection secondary to a superficial wound. In this case, serum from the mare tested negative by ELISA for *Brucella abortus* and exotic disease was ruled out.

BRUCELLA CANIS EXCLUDED

A veterinarian contacted MPI via the exotic disease and pest hotline after neutering a dog and identifying unilateral swelling of the epididymis suggestive of epididymitis. Serum and tissues were submitted to the AHL at Wallaceville. *Brucella canis* was excluded after serum tested negative in the *B. canis* rapid slide agglutination test (RSAT). Histology identified a sperm granuloma affecting the epidiymal head. This condition may be congenital or hereditary and probably results from failure of one of 10–25 efferent tubules to join the main epididymal duct, leading to sperm buildup and rupture. No further action is required with respect to this detection.

EHRLICHIA CANIS RULED OUT

A veterinarian notified MPI that he could not exclude *Ehrlichia* as the cause of anaemia in a dog that had been imported from Italy. The dog had a very low haematocrit (0.18) and a thrombocytopaenia. A pathologist had examined a blood smear from the dog and observed what he considered to be blood parasites within the red blood cells. The dog had been imported about three years previously from Italy, where ehrlichiosis does occur. Blood samples were negative for *Ehrlichia* by PCR and serology (Immunofluorescent antibody test titre < 1/20). An autoimmune haemolytic anaemia was considered to be the most likely cause of the anaemia observed.

EXOTIC *LEPTOSPIRA* SEROVARS EXCLUDED

An MPI scientist contacted investigators after pre-export testing in an adult female neutered Bichon Frise showed a weak positive result for *Leptospira interrogans* serovar Canicola. According to documents and history provided by the owner and pet import company, the dog entered New Zealand in November 2013. Prior to this the dog had undergone a leptospirosis vaccination in January 2013. Before arriving in New Zealand the dog had been on a private yacht since leaving French Polynesia in October 2013, where she had been for the previous six months. On importation to New Zealand the dog tested negative for *L.* Canicola on a microscopic agglutination test (negative < 1/50), in accordance with the Import Health Standard. Since then it had resided continuously in New Zealand, travelling to cities in the North and South Islands and being kept on leash, and had visited no farms.

In April 2014 the dog was vaccinated for leptospirosis with a vaccine that contained inactivated *L.* Icterohaemorrhagiae. Two weeks later a serum test was performed to comply with Fijian Import Health Standards. This showed that she had low positive titres (MAT 2/100) on an *L.* Canicola MAT. Serum was redrawn two weeks later and run against serovars Canicola (MAT 2/100), Grippotyphosa (MAT < 1/50), Icterohaemorrhagiae (MAT 2/200), and Pomona (MAT 2/50). Titres were highest for Icterohaemorrhagiae > Canicola > Pomona. This is consistent with cross-reaction to vaccination with the Icterohaemorrhagiae serovar. Infection with *L.* Canicola was excluded by laboratory and epidemiological

findings, and infection of the dog while in New Zealand (which is free of *L.* Canicola) was determined to be unlikely. Weak-positive *Leptospira* titres such as these can occur in cases of chronic infection, but in this case the dog had tested negative six months prior. Therefore it had to have acquired the disease while in New Zealand and we would expect her titres to be high. Furthermore, she had led a sheltered existence so would have been unlikely to acquire the disease here even if it were known to be present.
The conclusion was that the most likely cause of the weak-positive titres was the recent vaccination for *L.* Icterohaemorrhagiae, following vaccination a year prior with a 4-in-1 *Leptospira* vaccine that most likely included Canicola. This was further supported by the fact that the highest MAT result was for *L.* Icterohaemorrhagiae, the serovar in the most recent vaccination.
The investigation was stood down. Dispensation for importation to Fiji was requested on the above grounds and was granted.

AVIAN INFLUENZA AND NEWCASTLE DISEASE RULED OUT

A regional council scientist notified MPI of a significant bird mortality event at an oxidation pond in the Rangitikei district. The number of birds dying over about two weeks was estimated to be about two thousand and involved a wide range of species. Affected birds showed signs of paralysis suggestive of botulism, including weakness, inability to fly and "limp neck". A field visit was made to the affected area. Classical botulism was confirmed based on the clinical signs observed. Post-mortems were conducted on about 12 dead birds and fresh and fixed tissues were collected. These tested negative by PCR for avian influenza and Newcastle disease. Based on clinical and epidemiological findings the outbreak was considered to be caused by botulism, and exotic disease ruled out.

EXOTIC TICKS INVESTIGATED

A traveller from Mexico arrived in New Zealand with a tick embedded in his skin. The tick was removed by a doctor, who notified MPI via the exotic pest and disease hotline. The patient was not suffering any ill health. He had done some tramping through the bush in Mexico before travelling to NZ. The tick was identified by an entomologist at the MPI PHEL, Tamaki, as a female *Amblyomma cajennense*, an ixodid tick known as the cayenne tick and which is not present in New Zealand. The patient had not been in contact with animals, and was advised to thoroughly check and clean all his tramping clothes and shoes, but it was unlikely there were other ticks involved in this interception. This species has been assessed to have a low disease and establishment risk in New Zealand (Mackereth *et al.*, 2007).

A person recently returned to New Zealand from travelling in South Africa found a tick embedded in their skin and had it removed at a medical clinic in Christchurch. The MPI exotic pest and disease hotline was called by the local laboratory to which the tick was submitted. A PHEL IDC (Tamaki) entomologist identified the tick as *Amblyomma* sp. (Ixodidae) but it could not be identified to species level. This genus is exotic to New Zealand and can transmit disease to humans. The medical staff were advised to ensure the patient was monitored for the onset of any illness, and that they should thoroughly search luggage, clothing and footwear for any more ticks.

A veterinarian called the MPI exotic pest and disease hotline to report two presumed exotic ticks on a six-year-old Maltese dog imported from Australia three days previously. The first tick was engorged and had been killed by the owner and was not available for identification. The second tick had been found by the veterinarian after careful examination. An MPI entomologist identified the tick as *Rhipicephalus sanguineus* (the brown dog tick). The dog lived in an apartment block in Australia and apparently had never left the building. Both the imported dog and another dog resident to New Zealand located in the same house were treated three times at fortnightly intervals with Frontline spray and inspected by a veterinarian for ticks each time. The imported dog was negative for *Babesia* on PCR carried out on blood two weeks after the ticks had been removed. There were no personal effects imported with the dog that could potentially have harboured tick life stages.

EUROPEAN FOULBROOD RULED OUT

A bee expert contacted MPI in early February 2014 with concerns about possible European foulbrood infection in multiple hives at a West Coast apiary near Rotomanu. Presenting signs included increased numbers of dead brood, and purple discolouration of brood. Not all the purple brood died, and the discolouration seemed to last only one brood cycle. Possible causes included the exotic bacterial disease European foulbrood (EFB), caused by *Melissococcus plutonius*, and endemic causes including American foulbrood, fungal infection and plant toxicity. Exotic diseases were of special concern because the hives were close to popular West Coast tourist destinations. Comb from an affected hive was collected and sent to the AHL. Five pooled samples of three or four affected larvae were tested by EFB PCR and fungal culture. All tests were negative and EFB was ruled out. American foulbrood was ruled out in the field using a hive-side test.

New Zealand native flowering plants are known in some cases to be toxic to introduced species of bee. A previous MPI investigation into discoloured and dead brood concluded that the cause was a species of *Hebe* (Rawdon *et al.*, 2011). For the present investigation a DOC botanist was contacted, who confirmed that *Hebe salicifolia* (koromiko) was in heavy bloom on the West Coast at that time. Furthermore, the beekeeper noted that other sources of pollen were

scarce and that bees would be most likely feeding heavily on koromiko. This species blooms every year yet this syndrome occurs rarely, so the link is uncertain, but the brood returned to normal after the koromiko flowering season. It was concluded that toxicity was the most likely cause and the investigation was stood down.

An AsureQuality apiculturist inspecting beehives as part of the South Island exotic bee disease surveillance programme found hives in Christchurch and Queenstown displaying damage and could not rule out European foulbrood (EFB) or *Melisococcus plutonius*. The apiculturist said it was most likely varroa damage but samples were collected from two hives and testing for EFB was undertaken at the IDC AHL Wallaceville. The PCR was negative and the investigation was closed.

An apiculture expert phoned MPI to report that during routine surveillance of an Auckland apiary as part of the Honeybee Exotic Disease Surveillance Programme, field personnel had discovered a single hive with increased numbers of dead brood. Sacbrood virus affected small numbers of brood from other hives and was considered a likely factor in this case. Other diseases that can cause dead brood include the exotic disease European foulbrood (EFB), American foulbrood (AFB), halfmoon syndrome (caused by queen dysfunction), and parasitism (e.g., from *Varroa* or tracheal mites). Samples sent to the AHL tested negative by PCR for EFB. While the cause of the brood deaths was not determined in this case, it was thought most likely to be an endemic disease such as AFB or sacbrood. Follow-up with the beekeeper showed that the hive had recovered. With exotic disease ruled out, the investigation was stood down.

In a similar case, an apiculture expert phoned MPI to report that during routine surveillance of a small Nelson apiary as part of the same surveillance programme, one of three hives had increased numbers of dead brood. Unfortunately there was a substantial delay before sample submission in this case, which compromised sample quality and prevented additional diagnostics from being performed on the hive. PCR at the AHL was negative for EFB. The cause of the brood deaths was not determined in this case. With exotic EFB ruled out and follow-up with the beekeeper indicating that the hive had recovered and was thriving, the investigation was stood down.

TRACHEAL MITE EXCLUDED

An AsureQuality Apicultural Officer used the MPI exotic pest and disease hotline to report paralysed bees associated with hives in Central Otago. Masses of trembling bees were present at the entrances to most of the hives in the beekeeper's apiaries, around Bannockburn. Control of *Varroa destructor* infestation at the apiaries was thought to be poor, and the paralysis was most likely due to the endemic chronic bee paralysis virus (CBPV). The prevalence of CBPV infection can be higher when associated with varroa. The beekeeper reported similar signs in the past whenever the hives had been stressed, even before the arrival of varroa in the area. Specimens of bees were sent to the AHL IDC, Wallaceville, for PCR testing for the exotic agents Israeli acute paralysis virus and acute bee paralysis virus, and the endemic agents Kashmir bee virus and chronic bee paralysis virus. All tests were negative, with the caveat that there was no positive control for the CBPV PCR so that result was uncertain. Entomological examination at the PHEL IDC, Tamaki, found no tracheal mites present.

ISRAELI ACUTE PARALYSIS VIRUS EXCLUDED

A Victoria University research laboratory notified MPI that it had tested Argentine ant colonies in several locations in New Zealand and found Israeli acute paralysis virus (IAPV). This virus is a pathogen of honey bees and exotic to NZ. A test validation process was initiated with the Victoria University laboratory and the IDC AHL as the suspect test results required validation and methodology review. Testing by the IDC AHL with a different PCR with different primers did not find IAPV in fresh ant samples. However, it did find the closely related Kashmir bee virus and deformed wing virus. This is consistent with published findings on ants, and both of these viruses are known to be present in NZ bee populations. Further validation work is necessary and collaboration between the two labs will continue in order to understand the source of the false-positive results. The investigation was closed as IAPV had been ruled out.

RISK GOODS INVESTIGATED

Feta cheese imported from Bulgaria was found for sale in a food store by an MPI staff member and reported via the exotic pest and disease hotline as a possible risk good. Usually milk products from Bulgaria may be imported if they meet the import health standard. However, as there had been a foot-and-mouth-disease (FMD) outbreak in Bulgaria at the time, imports of dairy and meat products required biosecurity assessment on a case-by-case basis prior to entry. There were no import permits accompanying this consignment to demonstrate that such an assessment had been done. Enquiries by Incursion Investigators revealed that the products had arrived via Australia and had probably been granted biosecurity clearance for New Zealand through equivalence with Australian Quarantine and Inspection Service certification. Alternatively, biosecurity clearance might have been granted on the basis that the feta was a shelf-stable dairy product that met the requirements of another import health standard. A risk analysis was conducted to determine whether the product posed a biosecurity risk. The risk of FMD virus being present in the cheese was assessed by the Risk Analysis Team as negligible, because making feta cheese involves acidifying the product to a lower pH than the FMD virus inactivation level; and the long curing time makes it even more unlikely the virus would survive. The product was determined not to be a biosecurity risk. The importers were made aware that they needed to declare the product and apply for an import permit, and the investigation stood down.

An importer contacted MPI regarding the importation requirements of a mustard product that contained honey. The Import Health Standard requires that products that have more than 2 percent honey be treated before importation into New Zealand. The importer said he would inform the company of the requirements but also mentioned that he believed similar products were available in New Zealand. An Incursion Investigator checked retail outlets to see whether similar products were on the market and found four mustard products with more than 2 percent honey listed in the ingredients. An Incursion Investigator asked the importers of these products for the related importation documentation and received it for three of the products. The documentation showed that the products had been heat-treated in accordance with the IHS. The fourth product had cleared the border even though the list of ingredients included 6 percent honey. Unlike the other mustard products this product did not have the word "honey" in its name so had been missed as a risk good by Border Clearance. The importer offered to voluntarily recall the product from all stores. An inspection of all of the recalled mustard was undertaken by an Incursion Investigator on 4 June 2014. The importer's preference was that the product be destroyed and MPI directed that this be done and that a destruction certificate be presented on completion. The investigation was stood down.

An MPI Border Clearance Officer notified an Incursion Investigator of a basil seed drink that contained honey being sold in retail shops. An Incursion Investigator visited the importer of the beverage and requested import documentation. The importer provided the manufacturer's declaration, which stated that the drink contained 1 percent honey. This met the IHS so the investigation was stood down.

A potential risk product containing honey was reported to Animal Imports by a member of the public. The report was transferred to MPI's Incursion Investigation Team for assessment. The product was "Jun Scoby", a bacterial mat grown in a substrate of green tea with honey, similar to Kombucha Scoby, which is a mixture of bacteria and yeasts grown in sugared black tea. The product is ordered over the internet from the US, looks like a small pancake and is shipped vacuum-packed with a small amount of fluid consisting of honey tea ferment remnants. The Incursion Investigator made contact with the overseas company to determine the ingredients, which were assessed by MPI's Risk Analysis, Animal Imports and Imported Foods Regulation & Assurance Teams. It was determined that the product was not a biosecurity risk, was compliant with MPI's Import Health Standards, and was not considered to be a consumer risk. Biosecurity risk was excluded and the investigation was stood down.

A Quarantine Inspector found rice dumplings that possibly contained pork in an Asian food store in Auckland. An Incursion Investigator visited the importer to request the importation documentation associated with the products. The manufacturer's declaration states that the dumplings were less than 5 percent pork and had been treated to be shelf-stable. Therefore the product was found to have met the requirements of the Import Health Standard and the investigation was stood down.

MPI was notified by the Bee Industry Group of a company importing bee-collected pollen from China as a food supplement for bumblebees. There was no record of an MPI permit being issued to the company to import any product. Bee-collected pollen from overseas could be contaminated with bacteria, viruses and fungi. Of particular concern would be the presence of the bacterium that causes European foulbrood (*Melissococcus pluton*). The company premises were inspected by MPI staff and a Apiculture Officer. There was no evidence of any imported pollen. All pollen on the premises was traced to a New Zealand supplier. As there was no biosecurity risk the investigation was stood down.

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MARINE SURVEILLANCE ANNUAL REPORT

This annual report includes summary information for the National Marine High Risk Site Surveillance Programme and the Marine Invasive Taxonomic Service (MITS) for the winter and summer periods between May 2013 and April 2014.

The targeted surveillance programme for non-indigenous marine species focuses surveillance activities at 11 major ports and associated marinas around the country (**Figure 1**). Surveillance is designed to detect the presence of selected non-indigenous and potentially invasive marine flora and fauna identified as presenting a significant risk of arriving, establishing and having significant impacts on the New Zealand economy and environment. It also aims to monitor changes in the distribution of established non-indigenous or pest species at these high-risk locations.

The majority of marine pests targeted are listed in the New Zealand Register of Unwanted Organisms under the Biosecurity Act 1993. These include primary target species (Northern Pacific sea star *Asterias amurensis*, European shore crab *Carcinus maenas*, the marine aquarium weed *Caulerpa taxifolia*, Chinese mitten crab *Eriocheir sinensis* and the Asian clam *Potamocorbula amurensis*) and secondary target species (Australian droplet tunicate *Eudistoma elongatum*, Asian bag mussel *Arcuatula senhousia*, Mediterranean fanworm *Sabella spallanzanii* and the clubbed tunicate *Styela clava*). All unidentified suspect samples detected during surveillance activities are sent for identification to the Marine Invasives Taxonomic Service (MITS) operated by NIWA, and are entered into the marine invasives database for future reference (http://www.marinebiosecurity.org.nz/#panel-2).

Figure 1: Locations of the 11 ports and associated marinas covered by the targeted surveillance programme

SAMPLE COLLECTION

A total of 2923 sites were surveyed during the 2013 winter sampling period (May to September) and 2892 sites were surveyed during the summer months (November 2013 to April 2014), representing 100.2 percent and 99.2 percent of the target number of sites, respectively. Habitats sampled included soft and hard surfaces (such as mud and gravel bottoms, intertidal rocky shores), and artificial structures including marina pontoons, pilings, moorings, jetties and commercial vessel berths. Techniques used included crab condos, crab box traps, epibenthic sled tows, and diver and shore searches (**Table 1**). No primary target species were detected during the survey period across all high-risk sites, but at least one of the four secondary target species was found in seven of the ports surveyed (**Table 2**). In two of these instances these finds are the first detections of target species from these locations: *Sabella spallanzanii* in Nelson Harbour and *Styela clava* in Picton. Both these incursions are currently being managed.

TABLE 1: SAMPLE METHODS UTILISED FOR HIGH-RISK SITES SURVEYED IN 2013–2014*

METHOD	TARGET SPECIES	NON-TARGET SPECIES	HABITAT	SPATIAL COVERAGE	EFFECTIVENESS
Epibenthic sled tows	*Asterias amurensis* *Eudistoma elongatum* *Arcuatula senhousia* *Potamocorbula amurensis* *Sabella spallanzanii* *Styela clava*	*Acentrogobius pflaumii* *Chaetopterus* sp. *Charybdis japonica* *Didemnum* sp. *Grateloupia turuturu* *Hypnea* sp. *Theora lubrica* *Pyromaia tuberculata*	Subtidal soft sediments. Particular focus on known shellfish beds (for *Asterias*) and areas next to public access (e.g., wharves, boat ramps, marinas for *Caulerpa, Sabella*).	Narrow width but 50m tow length and high replication enables a reasonably large area to be sampled (ca 2500m^2 per location).	Reliable sample collection including asteroids, infaunal and epifaunal bivalves and polychaetes and macroalgae.
Box (crab) traps	*Asterias amurensis* *Carcinus maenas* *Eriocheir sinensis*	*Acentrogobius pflaumii* *Charybdis japonica* *Pyromaia tuberculata*	Adjacent to wharf pilings and other artificial habitats. Intertidal and shallow subtidal rocky shores, breakwalls and saltmarsh, with a focus on habitats with complex physical structure.	Area sampled depends on dispersion of bait odour. High replication possible.	Quick to deploy and recover so high replication is possible. Effectively samples other species of crabs (e.g., *Ovalipes, Macrophthalmus*).
Crab condos	*Carcinus maenas* *Eriocheir sinensis*	*Acentrogobius pflaumii* *Charybdis japonica* *Pyromaia tuberculata*	Intertidal and shallow subtidal banks of rivers. Particular focus on brackish water habitats with complex physical structure (e.g., saltmarsh or fringing vegetation).	High replication possible. Availability of suitable estuarine habitat may limit deployment.	Effectively samples other species of crabs (e.g., *Austrohelice, Macrophthalmus*). Higher rates of detection of crabs than baited traps in some conditions.
Shoreline searches	*Carcinus maenas* *Eriocheir sinensis* *Eudistoma elongatum* *Arcuatula senhousia* *Sabella spallanzanii* *Styela clava*	*Chaetopterus* sp. *Charybdis japonica* *Clavelina lepadiformis* *Didemnum* sp. *Grateloupia turuturu* *Hypnea* sp.	Sloping sandy shorelines, intertidal rocky reefs and areas where drift material is likely to accumulate. Prevailing winds on preceding days are a useful guide to where material may accumulate.	Wide: can cover long stretches of intertidal habitat quickly.	Used effectively in delimitation studies of *Styela.*
Diver searches	*Asterias amurensis* *Carcinus maenas* *Eudistoma elongatum* *Sabella spallanzanii* *Styela clava*	*Chaetopterus sp.* *Charybdis japonica* *Clavelina lepadiformis* *Didemnum sp.* *Grateloupia turuturu* *Botrylloides giganteum*	Wharf piles, marina piles and pontoons and other artificial structures; intertidal and shallow subtidal reefs	Good: large numbers of piles or lengths of hard substratum can be searched in detail	Depends on water clarity and level of biofouling

*Note: Species underlined have been collected using this method during the present or previous surveillance programmes

TABLE 2: SUMMARY FOR THE MARINE HIGH-RISK SITS SURVEYED IN 2013–2014. SPECIES IN BOLD ARE RANGE EXTENSIONS

LOCATION	SAMPLING ROUND	TARGET NUMBER OF SITES	ACTUAL NUMBER OF SITES	TARGET SPECIES FOUND
Opua	Winter 2013	243	251	*Eudistoma elongatum, Styela clava*
	Summer 2013–2014	243	245	*E. elongatum, Styela clava*
Whangarei	Winter 2013	243	243	*Arcuatula senhousia, E. elongatum, Sabella spallanzanii, Styela clava*
	Summer 2013–2014	243	243	*A. senhousia, E. elongatum, Sabella spallanzanii, Styela clava*
Auckland	Winter 2013	486	485	*A. senhousia, Sabella spallanzanii, Styela clava*
	Summer 2013–2014	486	491	*A. senhousia, Sabella spallanzanii, Styela clava*
Tauranga	Winter 2013	243	243	
	Summer 2013–2014	243	243	
New Plymouth	Winter 2013	243	243	
	Summer 2013–2014	243	248	
Wellington	Winter 2013	243	243	
	Summer 2013–2014	243	243	
Picton	Winter 2013	243	245	***Styela clava***
	Summer 2013–2014	243	245	
Nelson	Winter 2013	243	244	*Styela clava*
	Summer 2013–2014	243	243	***Sabella spallanzanii****, *Styela clava*
Lyttelton	Winter 2013	243	243	*Sabella spallanzanii, Styela clava*
	Summer 2013–2014	243	242	*Styela clava*
Dunedin	Winter 2013	243	243	*Styela clava*
	Summer 2013–2014	243	204	*Styela clava*
Bluff	Winter 2013	243	240	
	Summer 2013–2014	243	245	

* Currently the subject of an incursion response

TABLE 3: SAMPLES COLLECTED AND SENT TO MITS FROM EACH SAMPLING LOCALITY, 2013–2014. NON-INDIGENOUS SPECIES ARE IN BOLD

LOCATION	TAXONOMIC IDENTIFICATION	
	TAXONOMIC GROUP	SPECIES
Opua	Alga	*Pterocladiella capillacea*
	Annelid worm	*Polydora haswelli*
	Ascidian	*Pyura doppelgangera*
	Bivalve	*Corbula zelandica, Crassostrea gigas, Limnoperna pulex*
	Bryozoan	*Celleporaria umbonatoidea*
	Crab	*Heterozius rotundifrons*
Whangarei	Annelid worm	*Sabella spallanzanii, Branchiomma curtum,* Polychaeta§
	Ascidian	*Styela clava, Styela plicata, Microcosmus squamiger, Botrylloides giganteum*†
	Bivalve	*Corbula zelandica*
	Crab	*Liocarcinus corrugatus*
	Phoronid worm	*Phoronis ijimai*†
Tauranga	Alga	*Grateloupia turuturu, Anotrichium crinitum, Plocamium cartilagineum*
	Crab	*Nepinnotheres atrinicola, Liocarcinus corrugatus*
New Plymouth	Ascidian	***Alcyonium***
	Crab	*Liocarcinus corrugates, Ovalipes catharus, Neommatocarcinus huttoni, Nectocarcinus antarcticus, Pyromaia tuberculata*
Wellington	Annelid worm	***Galeolaria hystrix, Pseudopotamilla laciniosa***
	Ascidian	***Didemnum vexillum***
	Bivalve	***Aulacomya maoriana***
	Crab	*Ebalia laevis*
	Hard coral	*Culicia rubeola*
	Soft coral	*Alcyonium* sp.
	Sponge	*Halisarca dujardini*
Picton/ Havelock	Annelid worm	***Chaetopterus chaetopterus* – B, *Lepidonotus banksi***
	Ascidian	*Microcosmus squamiger, Styela clava*
	Echinoid	***Pseudechinus albocinctus***
Nelson	Annelid worm	*Sabella spallanzanii*
	Crab	*Hemigrapsus crenulatus*
Lyttelton	Nudibranch	***Hoplodoris nodulosa***
Dunedin	Algae	*Schizoseris griffithsia*
Bluff	Algae	*Bryopsis vestita, Callophyllis variegate, Echinothamnion hystrix, Griffithsia crassiuscula, Polysiphonia* sp. §, *Pugetia* sp.*, *Scytosiphon lomentaria*
	Hydroid	*Ectopleura crocea*

*Taxonomic nomenclature currently being revised

†First detection in New Zealand

§Unidentifiable

NUMBER OF SPECIMENS COLLECTED AND SENT TO MITS

A total of 59 specimens (26 for the winter round and 33 for the summer round) were sent to MITS for identification. Suspect specimens detected at high-risk sites represented 13 taxonomic groups and included 14 non-indigenous species (**Table 3**), two of which are new records for New Zealand: the phoronid worm *Phoronis ijimai* (Oka, 1897), found in July 2013, and the ascidian *Botrylloides giganteum* (Pérès, 1949), found in February 2014. Both species were found at Marsden Cove Marina, Whangarei. MITS also received 126 samples through passive surveillance during this period via the MPI exotic pest and disease hotline.

Most of the information collected from marine biosecurity surveillance is now available through the Marine Biosecurity Porthole webpage (www.marinebiosecurity.org.nz), which houses data from the MPI-funded marine surveillance programmes, MITS and other verified observations. Anyone with an interest in marine biosecurity can access very recent information on what has been recorded in New Zealand waters, where (and in many cases, when). The website enables users to view sites surveyed and examine distribution records for individual species. It also gives access to information about significant marine pests and a catalogue enabling information and reports to be found and downloaded.

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

Exotic marine pest and aquatic disease investigations are managed and reported by MPI's Investigation and Diagnostic Centre and Response, Wallaceville. The following is a summary of investigations of suspected exotic marine diseases and pests during the period from April to June 2014.

OFFSHORE FOULING INVESTIGATED

Biofouling was seen on the waterline of an offshore support vessel that arrived in New Zealand. Border inspectors were concerned that the fouling might pose a risk and informed the Regulation and Assurance branch, who conducted a topside inspection. Despite evidence of hull-cleaning undertaken before arrival in New Zealand, the vessel's recent movement and biofouling management history suggested that niche areas on the hull might still contain biofouling. An underwater inspection was conducted and 14 different species were identified from samples collected, including barnacles, hydroids, oysters, anemones and tubeworms. Twelve of these were non-native and two had never been recorded from New Zealand before: the barnacle *Megabalanus occator* and the oyster *Dendrostrea folium*. The red alga *Pyropia suborbiculata* was also found, which is not established outside of Northland. These species are of tropical and subtropical origin and considered unlikely to pose a significant risk in the South Island, where the vessel was operating for the duration of its stay. The vessel left New Zealand soon after the samples had been identified, so with the risk having effectively left the country, the investigation was closed. The vessel operator's failure to abide by conditions specified in the border clearance documentation, and lack of response to subsequent requests to mitigate the biosecurity risk, proved a major impediment to the investigation. However, the company responsible for this vessel is consulting with MPI to incorporate appropriate biosecurity measures into its standard operating procedures and prevent a future recurrence.

EUDISTOMA ELONGATUM RANGE EXTENSION NEGATIVE

A member of the public called the MPI exotic pest and disease hotline after finding two items that concerned her on a beach on the Coromandel Peninsula. She thought one might be the Australian droplet tunicate (*Eudistoma elongatum*), which if confirmed would be a range extension in New Zealand. Photographs were sent to the Marine Invasives Taxonomic Service (MITS) provided by NIWA, and the definitive identification was provided by the Museum of the Northern Territory, Australia. The suspected tunicate was in fact an egg mass of the bubble snail, *Philine angasi*. This mollusc has an internal shell and burrows into and lives in the sea floor. Its egg mass is shaped like a long balloon filled with coils of white eggs, and is usually attached to the substrate by a thread, to rest vertically above the sand. The egg masses concerned were detached and were found in tidal pools on the beach. The second item of concern was confirmed as a snake eel or serpent eel, *Ophisurus serpens*, which is native to New Zealand. These results were communicated to the notifier and the investigation stood down.

PATHOLOGY ON FINFISH INVESTIGATED

Six snapper (*Pagrus auratus*) were caught by a recreational fisherman off Whangaparoa with ball-like growths on some vertebrae. The angler had caught one fish with a similar affliction earlier in the year near Army Bay, Whangaparoa. Neither he nor anyone he knew had seen anything like this before. The fisherman called the MPI pest and disease hotline and sent some photos of the fish, from which an MPI pathologist was able to identify a condition of the bone called hyperostotic pterygiophores. This is a malformation of the vertebrae that can cause issues with filleting, but it is not hazardous to human health and not considered an exotic disease. Grabda (1982) suggested it was caused by a *Candida* infection but this has been disputed, so the informant agreed to send the fish to AHL for testing. Attempts to make further contact with and recover samples from the fisherman were unsuccessful, therefore the investigation was closed.

AEROMONAS INFECTION OF SALMON INVESTIGATED

Red, slightly ulcerated lesions were found on chinook salmon smolt (*Onchorhyncus tshawytscha*) in a land-based hatchery. These signs were associated with increased mortalities (about twice normal). Only one raceway in the hatchery affected fish, and no other obvious clinical signs were seen such as abnormal swimming behaviour. This was reported via the MPI pest and disease hotline and subsequently samples were submitted to the MPI AHL (Wallaceville). Bacterial culture yielded several types of motile aeromonad but the important pathogen *Aeromonas salmonicida* ssp. *salmoncida* was ruled out. The hatchery manager was advised that any of the other aeromonad species could cause disease, but could be controlled by management and husbandry. Aeromonads are ubiquitous so no biosecurity risk was identified and the investigation was closed.

MOSQUITO FISH CONFIRMED

A Hastings man called the MPI exotic pest and disease hotline, concerned about some fish he had seen in his garden pond. He thought that while they looked like inanga (*Galaxias* spp.) they were unlikely to be these species. The fish were breeding and he was concerned about their being of biosecurity concern. He caught some and sent them to the AHL (Wallaceville), where they were identified as mosquito fish (*Gambusia affinis*), an unwanted organism and pest fish that

is known to exist in Hawke's Bay. The Department of Conservation (DOC) is in charge of long-term management of freshwater pest fishes, so both DOC and the caller were informed of the identification and the investigation was closed.

CHAETOPTERID WORM INVESTIGATED

A domestic vessel was having its sea chest cleared of *Sabella spallanzanii* while in Port Nelson, as part of an MPI response operation. During these operations two organisms (a chaetopterid worm and a crab) were found that scientists on site could not identify, so these specimens were sent to MITS. The chaetopterid worm could not be identified but was a cryptogenic species of which large numbers were found in the Hauraki Gulf in 1995 though they have not been seen elsewhere. Since it was seen only in the sea chest of the vessel, this was not considered a true range extension, though it shows the possibility of spread by domestic vessel traffic. The crab was identified as the native red rock crab, *Guinusia chabrus*. No biosecurity risk was identified so the investigation was closed.

RISK GOODS

Members of a church received gifts of what was purportedly mud from the Dead Sea sealed in glass jars, from a member of the public who had recently moved to New Zealand from Australia. The person who reported this was concerned that the mud might be a biosecurity risk. The mud was heat-treated to destroy any biological risk.

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NATIONAL INVASIVE ANT SURVEILLANCE PROGRAMME ANNUAL REPORT 2013–2014

The National Invasive Ant Surveillance programme (NIAS) detects newly established exotic ant species in New Zealand and provides information on range extensions of species already known to be established. Ants are widely dispersed by human activity and commonly intercepted in air and sea cargo including fresh produce, timber, sea containers and personal baggage. They are major urban pests anywhere food is readily available; they threaten biodiversity by displacing native invertebrates and encourage horticultural pests. Invasive ants such as Singapore ant (*Monomorium destructor*) gnaw holes in fabric and rubber goods, remove rubber insulation from electric lines and damage polyethylene cable. Cars parked overnight in infested areas can fail to start the next day after the ants have shorted ignition systems (Global Invasive Species database, 2014).

Figure 1: NIAS sugar pottle containing foraging *Iridomyrmex* sp. workers. Photo: Paul Craddock, Flybusters

High-risk sites for ant entry are determined by pathway and site risk analyses undertaken annually. High-risk sites include seaports, airports, devanning sites, sea container storage sites (**Figure 1**) and other Transitional Facilities that receive international freight. Sites are then scheduled to be surveyed from mid-summer to early autumn each year.

The identified risk sites are surveyed by ground teams co-ordinated by AsureQuality Ltd. Small plastic pottles, alternately baited with carbohydrate (sugar solution) (**Figure 1**) or protein (peanut butter, oil and sausage meat) are placed in 10 x 10m grids, with some 48 000 pottles being laid at sites throughout New Zealand. Additional pottles are used to collect live ants where these are found by visual inspection. Pottles are left out at each site for about two hours under favourable environmental conditions to maximise the number of foraging ants collected while also minimising the risk of the bait drying out and becoming less attractive. GPS locations and associated data are recorded on hand-held data loggers. Samples are tracked electronically from the field to identification in the laboratory. Pottles are sent to the Flybusters Antiants Consulting Ltd diagnostic laboratory for initial identification. Suspect exotic ant specimens are sent to MPI's Investigation and Diagnostic Centres and Response (IDC&R) for validation of ID. Once an exotic ant find has been validated, an investigation is initiated to track down and eradicate nests near the location of the find.

RESULTS

In the 2014 season of NIAS there was a 12.4 percent increase in the number of pottles deployed (48 526) compared to 2013 (43 165). This was partly due to favourable weather in January and February, which enabled rapid and efficient deployment of pottles with minimal weather interruption.

The warmer than average winter (NIWA, 2014) before the 2014 NIAS season was favourable for ant activity (Porter, 1988) and thought likely to result in more exotic ant detections than usual. This was countered, however, by a dry summer with high soil moisture deficits (NIWA, 2014), which in theory should reduce the potential for exotic ants to establish nests successfully. Overall, the result was a season where exotic finds were on a par with previous seasons. There were 19 finds, compared to 20 last season. Of these, 13 were from independent events, while twice the same exotic nest was detected by two or more different sample pottles collected in the same area. Again, this was a similar result to last season, when 15 nests were found. Only two exotic species were recorded: *Paratrechina longicornis* (crazy ant) and *Monomorium* sp. (**Table 1**).

Ten of the 13 separate detections were confirmed to be from active established nests during follow-up inspections under urgent measures, while three exotic incursions were not found again during follow-up. All exotic ants and associated nests were eradicated.

In summary, the 2013–2014 NIAS season again demonstrated the value of early intervention in preventing the establishment and spread of exotic ants. Two exotic species were detected on a number of occasions and prevented from spreading.

TABLE 1: DETECTIONS OF EXOTIC ANT SPECIES, 2014

SPECIES	LOCATION	NO OF DETECTIONS	NO OF POTTLES WITH ANTS	NO OF NESTS FOUND
Paratrechina longicornis	Port of Wellington	11 Jan	1	1
Paratrechina longicornis	Ports of Auckland	22 Jan	2	nil
Paratrechina longicornis	Ports of Auckland	23 Jan	5	3
Paratrechina longicornis	Ports of Auckland	29 Jan	1	nil
Monomorium sp.	Port of Tauranga (Sulphur Point)	29 Jan	1	1
Monomorium sp.	Port of Tauranga	30 Jan	1	1
Paratrechina longicornis	Ports of Auckland	30 Jan	1	3
Monomorium sp.	UCL Oak Road (Auckland)	5 Feb	1	nil
Monomorium sp.	Port of Tauranga (Sulphur Point)	11 Feb	1	1
Paratrechina longicornis	Port of Lyttelton	17 Feb	1	2
Paratrechina longicornis	Ports of Auckland	24 Feb	2	2
Monomorium sp.	LPC Depot (Christchurch)	24 Feb	1	1
Monomorium sp.	Port of Timaru	27 Feb	1	1

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NATIONAL FRUIT FLY SURVEILLANCE PROGRAMME 2013–2014

There are currently about a hundred species of fruit fly listed on the MPI website as regulated organisms. The absence of economically important fruit flies enables fresh produce to be exported without the need for fruit fly treatments, thus facilitating trade. It also enables crops susceptible to fruit fly to be grown here without the need to manage fly populations and the associated damage that they cause. As an illustration of how important this is, produce exports in 2013 earned $3.6 billion, and more than 90 percent of fresh fruit and vegetable exports by value were of species that are considered hosts for fruit flies (Horticulture New Zealand, 2013).

Fruit flies belong to the family Tephritidae, which includes more than 4500 species. The economically important species monitored here are Mediterranean fruit fly *(Ceratitis capitata)*, Oriental fruit fly *(Bactrocera dorsalis),* and Queensland fruit fly *(B. tryoni)*.

Since 1989 there have been eight recorded fruit fly interceptions: five in Auckland and three in Northland. Five of these involved three different *Bactrocera* spp. and one involved *Ceratitis capitata*. Only the *C. capitata* find resulted in an eradication programme being initiated; all other finds (including the most recent, in January and April 2014) were determined, by heightened surveillance, not to be from an established breeding population.

AsureQuality has conducted fruit fly surveillance, both as part of MAF and for MPI, for almost 20 years. A total of 7572 fruit-fly traps were serviced fortnightly in 149 individual trap runs by AsureQuality staff servicing the North and South Islands (**Table 1**). A trap run is a series of traps from within a defined geographic area, which are serviced by a trained trapper, and the number of traps in a run ranges from seven to 98, with a mean of 51. Traps are placed in the centres of cells making up a grid located in a high-risk area (**Figure 2**). Within each cell, a host tree is selected for trap placement using a hierarchical ranking system.

New Zealand's National Fruit Fly Surveillance Programme entails seasonal monitoring for the presence of economically important fruit flies with lure traps placed at high-risk locations throughout the country (Figure 1). This programme was initiated in the mid-1970s to help provide assurance that New Zealand is free from economically important fruit flies, and as an early warning of fruit fly incursions to assist in an eradication effort.

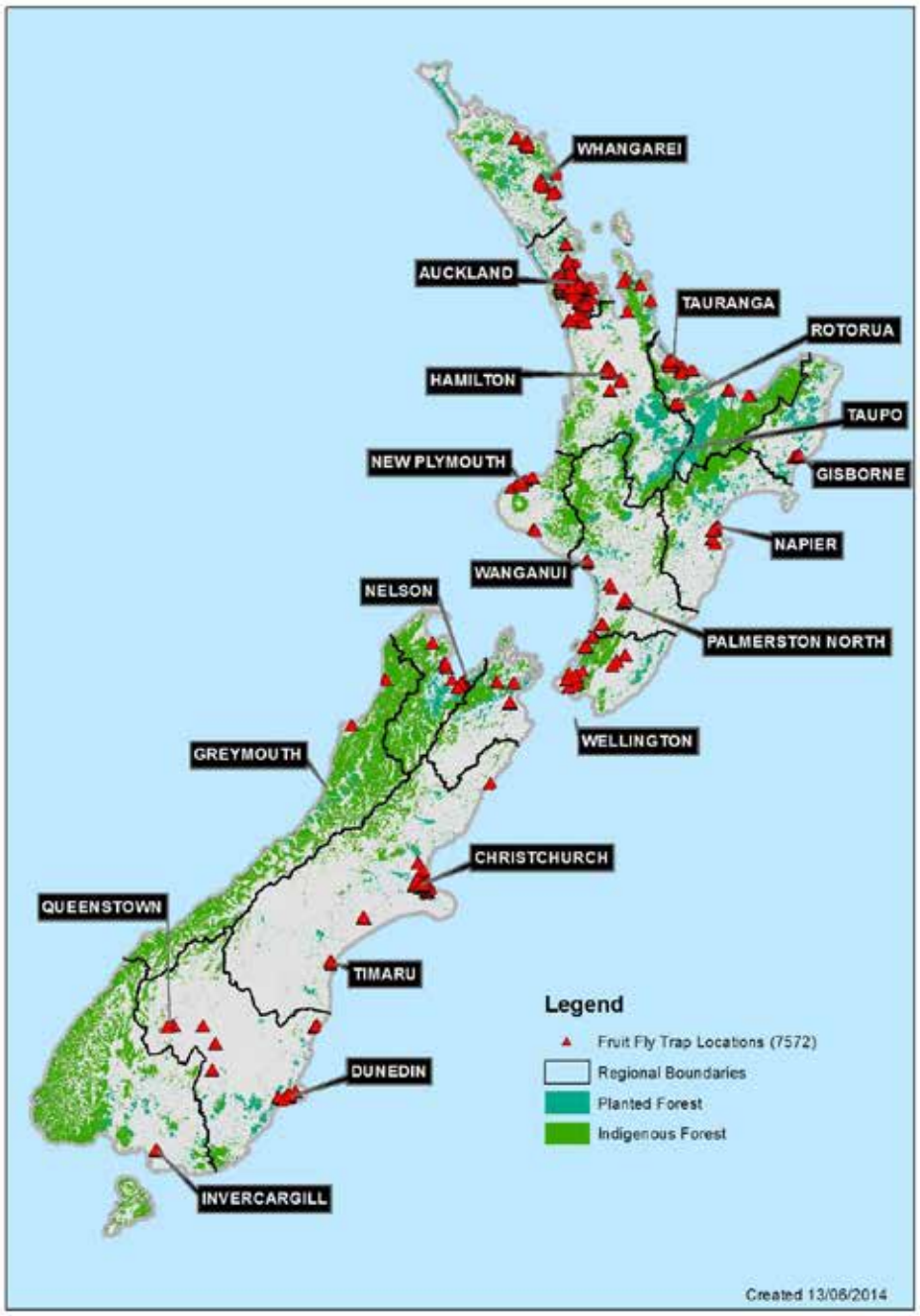

Figure 1: Map of New Zealand showing distribution of trap sites for fruit fly surveillance

TABLE 1: NUMBERS OF TRAPS AND TRAP RUNS BY REGION, 2013–2014 SEASON

REGION	NUMBER OF TRAP RUNS	NUMBER OF TRAPS
Auckland/Northland	71	4 841
Waikato/Bay of Plenty	18	672
Lower North Island	28	928
Upper South Island	20	757
Lower South Island	12	374
Total	**149**	**7 572**

A pheromone-impregnated fruit fly lure and a plastic strip impregnated with an insecticide (dichlorvos) are placed into Lynfield-type fruit fly traps, which are inspected every 13–15 days. Suspect flies are submitted to either the Tamaki or Christchurch Investigation and Diagnostic Centre (IDC) for taxonomic identification.

Although the Fruit Fly Surveillance Programme season ran from mid-September 2013 until the end of June 2014, each region had its own start and finish dates based on local temperature, which is considered to accurately reflect the risk of fruit fly establishment. This season's sampling effort ran from 16 September 2013 to 27 June 2014.

TRAPPING

Each trap is clearly labelled "Fruit Fly Trap" and displays the MPI and AsureQuality logos and a freephone contact number. The spacing between grid cell centres that contain the traps is based on the efficacy of each lure and biology of targeted species. For example, grid cells that contain trimedlure and cuelure traps are 400 x 400 m while grid cells that contain methyl eugenol traps are 1200 x 1200 m. The minimum size of the trapping network is two adjacent grid cells, and both cells are selected so as not to overlap if possible. An example of a grid network on Te Atatu Peninsula, Auckland, is shown in **Figure 2**.

Host trees are preferentially selected as close to the grid centre as possible, and the trees themselves are ranked by four host preference types: evergreen fruit trees, deciduous fruit trees, New Zealand native evergreen trees with fleshy fruit, and gooseberry bushes.

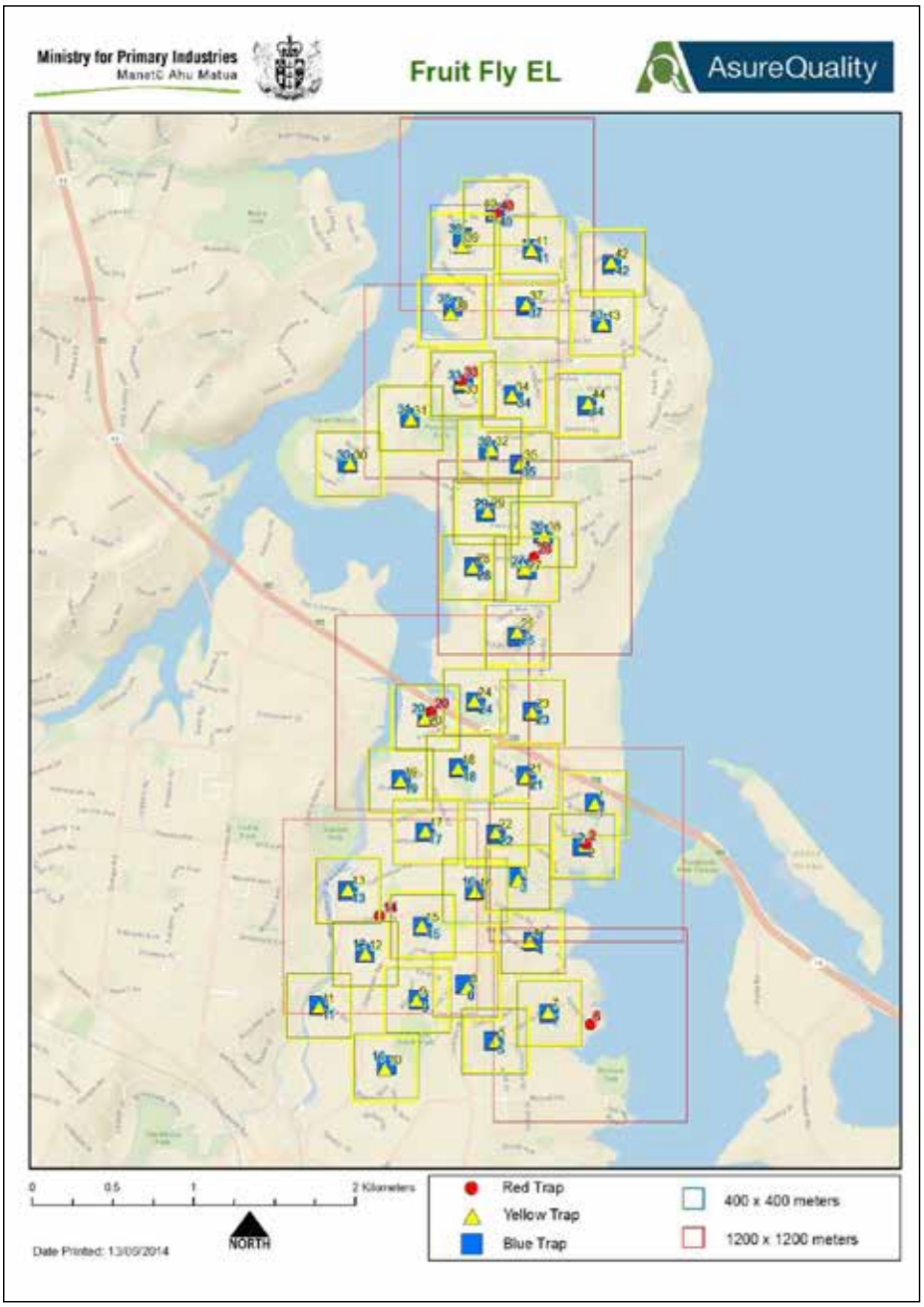

Figure 2: Grid cells overlaid on aerial photograph showing network of Queensland (yellow) and Mediterranean fruit fly (blue) traps and Oriental fruit fly (red) traps, Te Atatu Peninsula, Auckland

Traps are placed so that they are protected from direct sunlight, wind and dust, and are typically located at least 1.3 m above the ground, in an area of dappled light within the foliage and not beneath the canopy. These factors increase the chance of attracting the target species. To avoid cross-contamination between lures the traps are placed at least 3 m apart, and also at least 3 m from any other insect trap (e.g., for codling moth or gypsy moth).

Any fly from three to 15 mm long is regarded as suspect. Suspect submissions are submitted to the diagnostic laboratory within two working days of trap servicing. Nil returns are also submitted, to confirm that the traps have been checked for suspect submissions.

New traps are used at the start of each season and all traps and lures are destroyed within two weeks after the end of the season.

Trappers attend refresher courses every year on trap servicing, where they are also updated on any changes of procedure.

RESULTS

It is considered here that in terms of meeting the programme's objectives, the 2013–2014 surveillance season was a success. Two fruit flies were found during the season: each detection was a single Queensland fruit fly, *Bactrocera tryoni,* found in a trap during routine annual fruit fly surveillance at Parahaki, Whangarei, in January and April 2014 (**Figure 3**). Although the two detections were only about 400 m apart it was determined that there was no connection between the two fruit fly detections in Whangarei and both were isolated incidents. The last time a fruit fly was detected during routine surveillance in New Zealand was in May 2012 at Avondale, Auckland.

Figure 3: Queensland fruit fly

A response was initiated by MPI that included increased trapping surveillance and fruit monitoring over a two-week period for each 2014 detection. There were 123 additional submission events as a result of the two Whangarei responses, and the additional runs established led to a further 43 vial submissions of suspect fruit flies. No further fruit flies were found, but as a precautionary measure 37 more Queensland fruit fly traps were established in the Northland area at locations considered to be high risk and where gaps were identified in the current grid. This led to 77 more fruit fly traps being permanently established in the annual Northland surveillance grid in the spring of 2014 for the three fruit fly species of economic concern. As a precautionary measure 35 Queensland fruit fly traps were also placed within a 400 m radius of the April 2014 find and these will remain in place until mid-November 2014.

There were 2789 routine submission events, with a total of 3595 suspect fly samples. An additional seven suspect samples were forwarded for taxonomic determination as a result of trapper passive surveillance within the fruit fly programme.

Table 2 records that a total of 3595 suspect fly submissions were made. The Auckland/Northland region recorded the highest number of suspect samples (1312, or 36 percent of the total number of samples). The number of traps per run ranged from seven to 98 (mean = 51, S.E. = 0.6), with a total deployment of 7572 traps (**Table 1**).

Half of the submissions (50 percent) were made from October to January (**Table 2**).

The number of suspect sample submissions generally followed a similar pattern to previous years (**Figure 4**), with the majority of submissions made between October and February, with the

TABLE 2: NUMBERS OF SUSPECT SUBMISSIONS BY REGION, 2013–2014 SEASON

MONTH/REGION	AUCKLAND/ NORTHLAND	WAIKATO/BAY OF PLENTY	LOWER NORTH ISLAND	UPPER SOUTH ISLAND	LOWER SOUTH ISLAND	TOTAL
September 2013	96	15	38	13	0	162
October 2013	210	17	64	135	75	501
November 2013	192	22	90	144	102	550
December 2013	241	49	121	178	146	735
January 2014	151	25	51	118	97	442
February 2014	90	11	50	94	89	334
March 2014	66	9	32	67	43	217
April 2014	81	44	55	110	69	359
May 2014	71	23	34	40	13	181
June 2014	114	0	0	0	0	114
Total	**1 312**	**215**	**535**	**899**	**634**	**3 595**

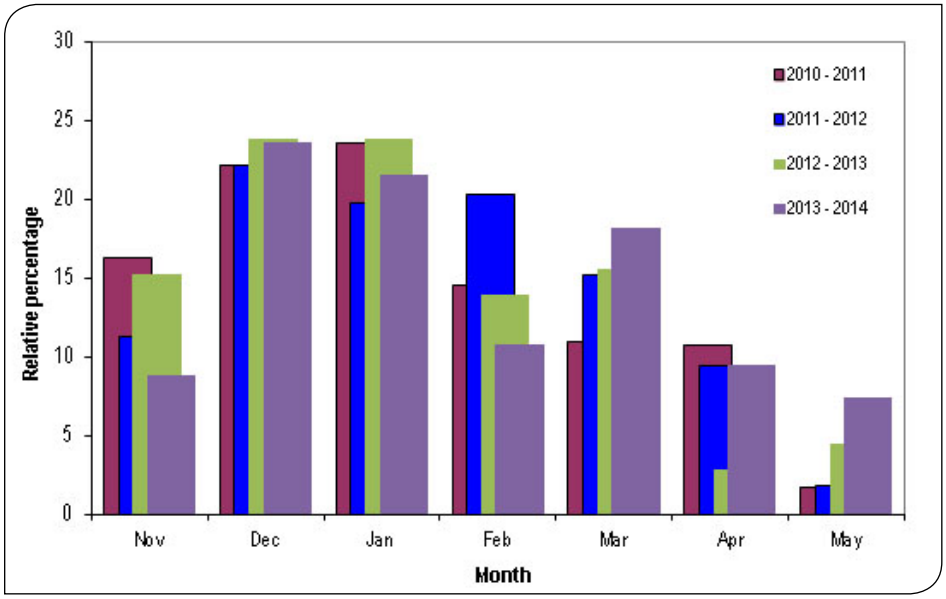

Figure 4: Fruit fly sample submissions by month and year

exception of April where the increase of sample submissions can likely be attributed to the April 2014 detection. This indicates that a trapping season from September to May/June sufficiently spans the period fruit flies are most likely to be captured.

As in past seasons, MPI favoured starting the surveillance programme in September to maximise the chance of detecting fruit fly incursions. This period is considered the best compromise of operational effectiveness and biological considerations. The increase in temperature at this time increases insect activity and the season is long enough for plenty of trap days to gather a large sample size.

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NATIONAL SALTMARSH MOSQUITO SURVEILLANCE PROGRAMME 2013–2014

The National Saltmarsh Mosquito Surveillance Programme (NSP) is designed to detect exotic mosquito species post-border in breeding habitats associated with low coastal marshland habitat subject to saline influence. These habitats include classic natural saltmarsh subject to periodic tidal or wind/storm-driven flooding by seawater; former seabed uplifted by seismic action; former intertidal land reclaimed for agriculture; and drainage works intersecting saline habitat or saline water tables. The prototype exotic mosquito species upon which the NSP was originally modelled in 2005 is the southern saltmarsh mosquito (SSM) *Aedes (Ochlerotatus) camptorhynchus* (Thomson, 1869).

SSM was finally declared eradicated from New Zealand in June 2010. The estimated cost of the eradication programme, from December 1998 to June 2010, was $70 million. There is strong evidence that the infestations of SSM in its various New Zealand locations were disseminated from a single introduction. The pathway by which SSM entered New Zealand before it was first detected in Napier (estimated to be at least three years prior) has not been identified. The NSP maintains surveillance in receptive habitats for high-risk exotic mosquitoes likely to use saline and associated habitats.

The NSP is flexible in its application of surveillance resources and responds to information on interceptions of relevant exotic mosquitoes species at the border. In May 2014, a suspect exotic mosquito was intercepted at a Transitional Facility (TF) by border control officers in Auckland and sent to the Mosquito Consulting Services NZ (MCSNZ) laboratory for identification. It was an adult mosquito identified as *Aedes (Ochlerotatus) taeniorhynchus* (Wiedemann, 1821) a saltmarsh mosquito native to North and South America. The NSP immediately re-prioritised tasking of surveillance officers and commenced enhanced field surveillance within a 10 km radius of the TF. At the time of this report, no further detections of *Ae. taeniorhynchus* had been made but enhanced surveillance was continuing.

In 2013 the NSP underwent a major external review by Professors Scott Ritchie and Richard Russell (Ritchie & Russell, 2013) (**Figure 1**). The review assessed Mosquito Consulting Services NZ's discharge of its obligations under the existing NSP contract and considered changes that have occurred since the NSP's creation in 2005, especially in relation to a number of years' absence of SSM and increasing use of Transitional Facilities that create many virtual ports where border control processes are initiated. It is known that many, but at present an undefined number of, TFs are adjacent to potential receiving habitats for exotic mosquitoes.

The findings of the Ritchie and Russell review provided favourable commentary on the performance of NSP tasks by MCSNZ. The review also identified a number of recommendations to take the NSP forward in the context of changed and changing risk factors for surveillance of exotic mosquitoes in New Zealand.

Figure 1: Prof. Scott Ritchie during the NSP external review in 2013

In 2013–14 a total of 11 177 larvae and 1818 adult mosquitoes from 10 species across five genera were collected and processed for identification to species. **Tables 1 and 2** list the mosquitoes identified by species by the NSP last year. No exotic species were found by the NSP last year but the *Ae. taeniorhynchus* interception resulted in the NSP providing enhanced post-border surveillance.

Following the NSP external review and receipt of its recommendations, the NSP will develop a fresh model for future post-border mosquito surveillance. The risk algorithm input that previously applied high weighting on saltmarsh habitat formerly positive for *Ae. camptorhynchus* will be relaxed. The risk input of habitat proximity to a port of entry will, however, be modified to include Transitional Facilities as virtual ports of entry. With these changes, habitat surveillance effort (surveillance hours per site per year) will be recalculated in line with the expected shift in surveillance. The timely evolution of NSP, in response to changing risk input factors and their weighting, will ensure the government continues to receive value for money for this important post-border mosquito surveillance programme.

TABLE 1: LARVAL MOSQUITOES IDENTIFIED, 2013–2014

Cx. pervigilans	9396
Ae. antipodeus	1126
Ae. subalbirostris	422
Ae. australis	118
Ae. notoscriptus	60
Op. fuscus	54
Cx. quinquifasciatus	1
Total	**11 177**

TABLE 2: ADULT MOSQUITOES IDENTIFIED, 2013–2014

Ae. antipodeus	819
Cx. pervigilans	810
Cq. irucunda	75
Ae. notoscriptus	52
Cx. quinquifasciatus	47
Ae. subalbirostris	9
Cs. tonnoiri	3
Cq. tenuipalpis	2
Op. fuscus	1
Total	**1818**

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HIGH RISK SITE SURVEILLANCE ANNUAL REPORT 2013–2014

High Risk Site Surveillance (HRSS) is a post-border risk-pathway-focused surveillance programme operated by the Ministry for Primary Industries (MPI), targeting vegetation (primarily trees and shrubs) and wooden materials. The primary objective of the HRSS programme is to detect new plant pests that pose a biosecurity risk or may impact on trees and shrubs (e.g., plantation forests, native forests and urban trees).

METHODS

The HRSS programme identifies high-risk sites (where the risk of introduced organisms is high owing to movement of tourists or cargo) and groups them into Risk Site Areas (RSAs) that include ports, Transitional Facilities, camping grounds, tourist venues and golf courses, based upon identified clusters of sites. Risk and required detection probability are calculated to improve allocation of surveillance resources. Surveillance transects are assigned within RSAs to cover areas of potential host vegetation and provide discrete, repeatable packets of intensive surveillance. Field surveyors thoroughly inspect trees, shrubs and woody material within these transects. Suspect samples that may (in the opinion of the field surveyor) be a biosecurity risk are collected and forwarded to the appropriate laboratory for identification. New records are recorded in MPI's Plant Pest Information Network (PPIN) database and reported for further appropriate action.

HRSS is administered by AsureQuality on behalf of MPI. SPS Biosecurity is responsible for most of the required field work throughout New Zealand and AsureQuality carries out surveillance in the Wanganui-Manawatu region. Methods used in the HRSS programme are further detailed in Stevens (2011).

A trial carried out last year to increase the number of submissions to Scion's Forest Health Reference Laboratory (FHRL) led to significantly increased pressure on the diagnostics staff. While the increased submissions led to increased numbers of new host and new region reports, it was recognised that increasing the number of submissions did not significantly increase the probability of finding major new biosecurity risks. Because of this the numbers of submissions were reduced back to normal for this season.

While data collection for the HRSS programme has been electronic since 2010, paper forms have still been used for sample submissions. This season sample forms for submissions to FHRL went completely electronic. As with any electronic system there were teething problems but by the end of the season everything was running smoothly and Scion's diagnosticians could pull up sample data electronically at the same time as they were inspecting the physical samples.

Changes made to the risk model in previous years to enable a risk factor to be allocated to each individual RSA throughout New Zealand were maintained this season. All risk sites and calculated risk are mapped in GIS. This enables better allocation of surveillance resources and makes the programme more effective.

Probability of detection in HRSS is based on Carter (1989). Using this model, it is clear that additional repeated surveys within RSAs further increase the detection probability. Additionally, as the risk of incursion is ongoing, repeated inspections are more likely to find incursions in a smaller population. For these reasons the RSAs with the highest calculated risk were inspected up to four times during the survey season.

RESULTS

FIELD SURVEILLANCE

During the 2013–2014 season 552 RSAs and 7006 transects were surveyed. Most surveillance was carried out around Transitional Facilities or their associated vegetation-rich areas (VRAs) (89 percent of all transects).

(**Table 1**) shows an example of calculated biosecurity risk compared to the actual transect inspections completed by region, for the 10 regions most at risk. It shows that Auckland has the highest biosecurity risk in the country; this is directly related to the volume of goods and passengers entering the country and/or being unloaded there.

TABLE 1: CALCULATED REGIONAL RISK COMPARED WITH PERCENTAGE OF TRANSECT INSPECTIONS COMPLETED IN 2013–2014

REGION	PERCENTAGE CALCULATED BIOSECURITY RISK	PERCENTAGE OF COMPLETED TRANSECT INSPECTIONS
Auckland	62.24	46.02
Mid-Canterbury	12.37	6.48
Wellington	5.20	6.87
Bay of Plenty	5.71	8.35
Hawke's Bay	2.77	3.11
Waikato	2.00	4.60
Dunedin	1.35	2.93
Southland	1.06	1.88
Taranaki	1.04	1.28
Nelson	0.99	1.88

Source: Fraser *et al.*, 2013

TABLE 2: SUMMARY OF DETECTION PROBABILITIES FOR THE MAJOR RISK PORTS, 2011–2014

SITE RISK	MEAN DETECTION PROBABILITY 2011–2012 (PERCENT)	MEAN DETECTION PROBABILITY 2012–2013 (PERCENT)	MEAN DETECTION PROBABILITY 2013–2014 (PERCENT)
Auckland seaport	87	91	85
Auckland Airport/ Auckland Metro	76	89	88
Tauranga seaport	89	93	90
Wellington seaport/Airport	63	55	60
Christchurch Airport	69	55	63
Lyttleton seaport	62	57	55

Source: Fraser *et al.*, 2014

Table 2 is a summary of the detection probabilities for the major risk ports. Detection probabilities have been maintained at previous levels and aligned with the calculated risk.

DIAGNOSTICS

Most diagnostic support for the HRSS programme is provided by Scion's Forest Health Reference Laboratory (FHRL). MPI's Investigation and Diagnostic Centre, Plant Health and Environment Laboratory (IDC-PHEL) undertook diagnostics for samples not associated with trees and shrubs or suspected of containing viruses, bacteria or nematodes and was responsible for validation for all new to New Zealand identifications.

From 1 July 2013 to 17 June 2014 the diagnostic labs were sent 860 submissions (**Table 4**). These were divided into potential risk organisms and identifications made from these specimens. Insect specimens and plant samples showing insect damage were the most common (61 percent of all samples received over the year). Fungi were identified in 16 percent of samples, but many of the samples with inconclusive results were further processed by the pathology laboratory to rule out fungi as a cause of damage. In 21 percent of samples, no insect or pathogen could be found or identified. A total of 1154 identifications were made during the season, of which about 70 percent were made to species level. October and November 2013 were the busiest months, with over 38 percent of all submissions processed during this time.

TABLE 3: SAMPLES RECEIVED BY FHRL AND PHEL DURING THE 2012–2014 SEASON

SAMPLE TYPE	2012–2013 (PERCENTAGE)	2013–2014 (PERCENTAGE)
Entomology	47	61
Mycology	33	16
Inconclusive or other	20	23
Total	**100**	**100**

Source: Fraser *et al.*, 2014

From the identifications a total of 141 PPIN reports were forwarded to MPI from FHRL. All species identifications made by FHRL were completed or fully evaluated for their potential to be a biosecurity threat within 15 days, and 93 percent of insect identifications were completed within 15 days.

HRSS generated 55 sample submissions directly to the IDC-PHEL. These samples generated a total of 81 organism identifications. Twelve PPIN reports were generated out of the submissions directly reported to IDC-PHEL.

FHRL and PHEL both reported that submission quality from the field was of the same high standard as last year.

DISCUSSION

Numbers of significant samples identified provide one measure of the effectiveness of any surveillance programme. **Table 4** shows the number of samples received and significant identifications (either new to New Zealand, new to science, new host associations or new distributions) made in 2013–2014. The number of significant identifications is down on 2012–2013 and about the same as for 2011–2012.

TABLE 4: DIAGNOSTIC TRENDS BETWEEN 2011 AND 2014 (FHRL + PHEL)

TYPE	2011–2012	2012–2013	2013–2014
Submissions	740	1 106	860
Identifications	966	1 627	1 154
New to New Zealand	5	6	2
Significant to PPIN	147	228	153
Significant detections (% of total submissions)	20%	21%	18%

Source: Fraser *et al.*, 2014

CONCLUSION

As demonstrated by the number of significant detections reported to MPI, the HRSS programme continues to provide effective detections of plant pests potentially posing a biosecurity risk. While the proportion of submissions that are "significant to PPIN" has decreased slightly, the total number of significant detections has been maintained at the level achieved in 2011–2012. The number of new to New Zealand records from this programme has dropped since last year. There could be many factors contributing to this, including increased resources in border biosecurity.

The efficiency of the programme continues to be demonstrated by the ability to allocate surveillance resources to areas of known risk magnitude and with calculated detection probabilities for the highest-risk sites.

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GYPSY MOTH SURVEILLANCE PROGRAMME ANNUAL REPORT 2013–2014

Gypsy moth, *Lymantria dispar*, is a severe defoliator of trees and is described as both an economic and environmental high-impact pest. A major outbreak of gypsy moth in New Zealand could severely impact the horticulture, forest and tourism industries and might also affect the indigenous flora.

It was recognised that high-risk pathways existed for the accidental importation of gypsy moth from other countries, such as international shipping, imported used vehicles and cargo containers. Thus in 1992 the Gypsy Moth Surveillance Programme (GMSP) was developed to provide early warning of gypsy moth incursions, to facilitate eradication and assist with assurance of New Zealand's status as a country free from gypsy moth. To achieve this the GMSP conducts seasonal monitoring with pheromone traps placed on specific hosts at strategic locations, and a communication programme is carried out using letters, leaflets, cards and reports to promote the biosecurity message about this unwanted species.

AsureQuality has delivered the GMSP, both as part of MPI and for MPI, for almost 20 years.

TRAPPING

The surveillance season runs from November to May. Pheromone traps are placed in cells making up a grid that is strategically located in areas regarded as high risk for an incursion of gypsy moth. Each cell measures 750 x 750 metres and contains a single pheromone trap for the duration of the surveillance season. The minimum size of each grid is two adjacent cells. In coastal areas a buffer is used to intercept any moths that might fly to land from nearby vessels, and it is only one grid cell in width. The distribution of surveillance locations throughout New Zealand is shown in **Figure 1**, and an example of a grid overlying a topographical map is shown in **Figure 2**.

Within each cell, a host tree is selected for trap placement, using a hierarchical ranking of the most suitable host trees, as close to the grid centre as possible. The traps are attached to the trunk or a branch of a suitable host tree (or, rarely, an artificial structure) and are located 1.3–2 metres above the ground. Each trap is a green delta trap with two sticky internal sides and is clearly labelled "Gypsy Moth Trap", displaying both MPI and AsureQuality logos, and a freephone contact number (**Figure 3**). Each trap contains a commercial disparlure pheromone lure to attract male gypsy moths. Lures are independently tested and calibrated before each surveillance season and are replaced once during the season, after they have been in the field for 12–14 weeks.

Measures are in place to ensure the programme is robust. New traps are used at the start of each season and all traps and lures are destroyed within two weeks after the end of the season. To avoid sampling bias, gypsy moth traps are not placed in trees bearing any other pheromone traps. Traps are replaced immediately if they are recorded as missing or deemed by the trapper to be significantly damaged.

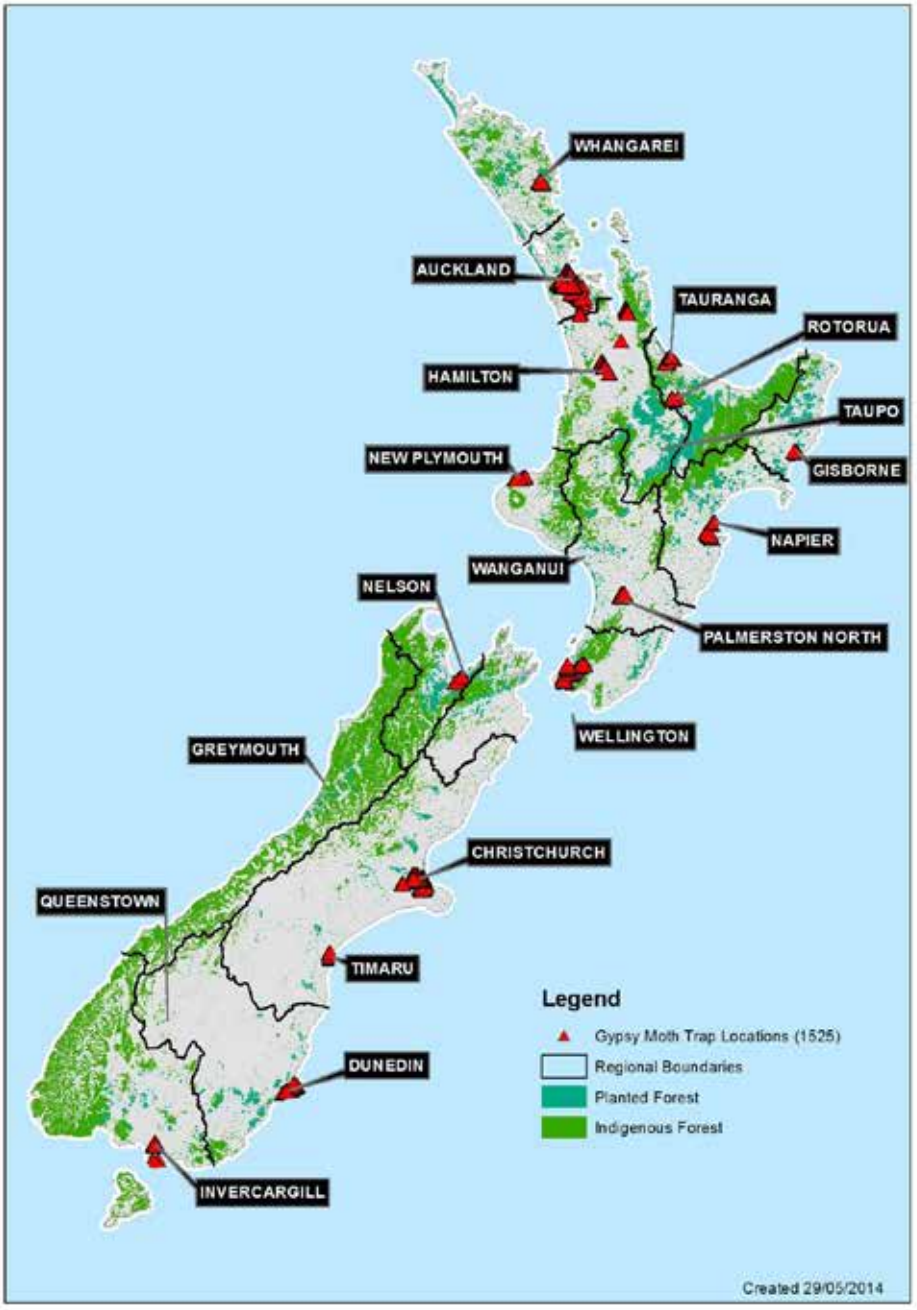

Figure 1: Map of New Zealand showing distribution of trap sites for gypsy moth surveillance 2013–14

Figure 2: Example of a trapping grid overlying a topographical map, Mount Maunganui. Each cell within the grid measures 750 x 750 metres.

Figure 3: Attaching a gypsy moth pheromone trap to a tree

Trappers attend annual refresher courses on trap-servicing procedures and any changes of procedure.

RESULTS

The gypsy moth trapping season ran from 4 November 2012 until 16 May 2014. The number of traps per run ranged from four to 81 (mean = 41), with a total deployment of 1525 traps. A trap run is a series of traps within a geographic area that are serviced by one trapper and the number of traps in a trap run varies from four to 81. Any suspect moths were submitted to the Scion diagnostic laboratory for identification to family level. Combining the trap run data across the season gave a total of 20 998 trap servicing/inspection events.

In total there were 148 suspect moths submitted. The lower North Island recorded the highest number of submission events (65, or 46 percent of the total) and the highest number of suspect moths (67, or 45 percent) (**Table 1**).

The largest fraction of submissions (23 percent) was made during December and January (**Figure 4, Table 1**).

The relative percentage of sample submission events made per month over the trapping season is shown in **Figure 4**. The majority of submissions are from December to January, with about 23 percent of the total made in each of those months. The number of samples submitted diminishes going into autumn (April and May). **Table 1** shows the number of samples submitted each month by region. The lower North Island appears to consistently make the most submissions almost every month, except in the last two months of the season when zero submissions were made. Moths collected in May in the Waikato/Bay of Plenty and Auckland regions were mainly from marked specimen collections.

No gypsy moths were found during the entire season. Moth specimens submitted were mainly of the family Noctuidae (63 percent). Other moth families normally represented in the samples collected annually include: Tortricidae (this season < 1 percent), Geometridae (9 percent), Oecophoridae (< 1 percent), Crambidae (8 percent), Tineidae (0 percent), Arctiidae (0 percent), Pyralidae (0 percent), Hepialidae (5 percent) and miscellaneous (13 percent).

The 2013–14 surveillance season was a success in terms of meeting the programme's objectives. No new incursions of gypsy moth were recorded. Large numbers of samples were collected and submitted for taxonomic

TABLE 1: NUMBERS OF SUBMISSION EVENTS AND SUSPECT SAMPLES SUBMITTED DURING THE 2013–2014 SURVEILLANCE SEASON, BY REGION

		NUMBER OF SAMPLES SUBMITTED BY MONTH							
REGION	NUMBER OF SUBMISSION EVENTS	NOV	DEC	JAN	FEB	MAR	APR	MAY	TOTAL
Auckland/Northland	32	3	9	5	2	7	4	4	34
Waikato/Bay of Plenty	20	1	1	1	3	6	5	4	21
Lower North Island	65	9	17	21	8	12	0	0	67
South Island	25	0	8	5	3	2	5	3	26
Total	**142**	**13**	**35**	**32**	**16**	**27**	**14**	**11**	**148**

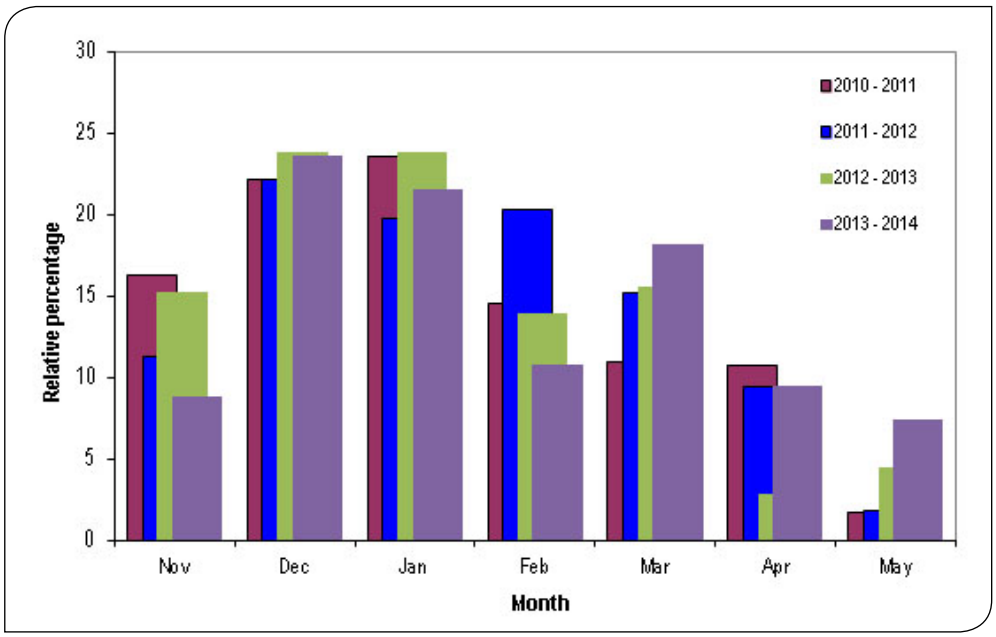

Figure 4: Percentage of gypsy moth sample submission events by month

determination and the samples were obtained by a scientifically robust grid-based sampling process.

ACKNOWLEDGEMENTS

MPI would like to thank Asurequality and Scion for their contribution to this report.

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PLANTS AND ENVIRONMENT INVESTIGATION REPORT

The Ministry for Primary Industries (MPI) Investigation and Diagnostic Centres and Response Directorate (IDC & R) is responsible for delivering the core functions of surveillance, incursion investigation, diagnostics and response by managing the surveillance and investigation of notifications of suspected exotic pests and diseases that may affect New Zealand's primary industries or aquatic and terrestrial environments.

FIREBLIGHT OF RASPBERRIES RULED OUT

In late July 2014 a berryfruit grower notified MPI of suspected *Erwinia amylovora* f.sp. *rubi* (the causal agent of fireblight) on raspberry plants that had been released from post-entry quarantine (PEQ) in June 2013. Fireblight had not previously been reported on raspberry plants in New Zealand.

Strains of *E. amylovora* are separated into two groups based on host range: strains isolated from *Rubus* spp. (known as *Rubus* strains) and strains isolated from non-*Rubus* species including *Malus* (apple), *Pyrus* (pear) and *Crataegus* (hawthorn) species. *Erwinia amylovora* f.sp. *rubi* is reported to be host-specific.

MPI's Plant Health and Environment Laboratory (PHEL) conducted tests to verify the initial identification and found that all samples tested were negative for *E. amylovora*. PHEL concluded that a closely related saprophytic bacterium generated the false positive result originally reported. This conclusion was supported by findings from 874 PCR tests on 74 samples that included the original suspect cultures, a second set of cultures and the *Rubus* mother plants of the potentially infected PEQ clones. All samples tested negative for *E. amylovora* and *E. pyrifoliae*. Consequently, those results averted the unnecessary destruction of about 11 000 plants and valuable tissue culture collections and, as one grower put it, "financial failure".

WATER HYACINTH RE-INTRODUCTION AT A HAMILTON RESIDENTIAL PROPERTY

In early August 2014, a case of potential water hyacinth re-introduction at a Hamilton residential property was notified to MPI by an AsureQuality officer. Water hyacinth (*Eichhornia crassipes*) is a noxious weed (and a Notifiable Plant) that is managed under the the National Interest Pest Response (NIPR) programme. This programme is managed by the Investigation, Diagnostic Centres and Response Directorate in collaboration with AsureQuality and regional councils. AsureQuality is contracted by MPI to undertake all containment and eradication operations for this noxious weed.

Water hyacinth is considered a threat to New Zealand's freshwater aquatic plants and animals and can block open waterway very quickly. The noxious weed was detected by AsureQuality officer at the Hamilton property in December 2013 and subsequently removed. However, in a follow-up six-monthly inspection, the weed was found at the property again. AsureQuality had mailed notices to the property owner but the owner did not reply or could not be identified or located. The property was not able to be accessed owing to the presence of guard dogs. AsureQuality requested MPI's assistance in locating the property owner. The property owner was subsequently located and the matter discussed with him. The property was visited with the AsureQuality officer and the weed was removed again. Three more properties in the Hamilton area, belonging to the same property owner, were also checked but water hyacinth was not detected at those properties. MPI was advised that the owner had inherited the plants when he bought the property about a year previously and this information matched with the purchase date of the property. As per standard NIPR procedures, a six-month follow-up inspection is planned by AsureQuality, to ensure the weed is completely eradicated. If no water hyacinth is found at the six-month inspection, then further surveillance will not be required and the site will then be classified as "historic". However, historic sites are still subject to random unannounced inspections in the future.

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PEST WATCH: 17 MAY 2014 – 15 AUGUST 2014

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

This information was collected from 17 May to 15 August 2014. 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
Insect	*Glyphipterix simpliciella* cocksfoot moth	Swept from vegetation	Northland Auckland Hawke's Bay	Landcare Research (General Surveillance)	Determined through examination of recent and previously unidentified specimens: Whangarei (2014), Whatipu, Auckland (2011) and Hawke's Bay (2000). Caterpillars feed on the seeds of cocksfoot (Dactylis glomerata) and tall fescue (*Festuca arundinacea*).
Insect	*Myzocallis punctata* oak aphid	*Quercus bicolor* swamp white oak	Auckland	S. Thorpe (General Surveillance)	This aphid is nNearctic in origin. It is reported to occur on numerous Quercus species, especially on species of the white oak group in eastern North America.
Insect	*Philobota chionoptera* no common name	Light trap	Hawke's Bay	Landcare Research (General Surveillance)	Collected in 2011. *P. chionoptera* is endemic in Australia and a potential wind-blown arrival in New Zealand.
Mite	*Trachygamasus ambulacralis* no common name	Attached to the bodies of moth flies (Psychodidae)	Gisborne	IDC & R (surveillance)	Found during biting midge (*Culicoides*) surveillance.
Virus	*Hibiscus latent Singapore virus* HLSV	*Hibiscus* sp.	Auckland	IDC & R (General Surveillance)	Symptom expression depends on temperature and cultivar; infected plants are usually symptomless.
Virus	*Hibiscus latent Fort Pierce virus* HLFPV	*Hibiscus* sp.	Auckland	IDC & R (General Surveillance)	Symptom expression is dependent on cultivar, presence of other viruses and environmental conditions.
Virus	Opium poppy mosaic associated virus (proposed) OPMaV	*Papaver rhoeas* field poppy	Auckland	IDC & R (General Surveillance)	OPMaV is a helper virus for *Opium* poppy mosaic virus, which has previously been recorded in New Zealand. This virus complex is likely to be well established and widespread in New Zealand.

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

Veterinary Diagnostic Laboratories

GRIBBLES VETERINARY PATHOLOGY

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

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

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

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

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

NEW ZEALAND VETERINARY PATHOLOGY

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

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

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

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

0800 80 99 66

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

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

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

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